PUBLIC ATTITUDES TOWARD COYOTE CONTROL

Richard G. Stuby
Edwin H. Carpenter
Louise M. Arthur

U.S. Department of Agriculture
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A survey of the attitudes and beliefs of U.S. adults regarding the control of coyotes on western sheep ranges was conducted to aid the evaluation of coyote control policy alternatives. Most people interviewed did not side strongly with the plight of either sheep or coyotes. Humaneness was found to be a more important evaluation criteria than specificity or cost. Nonlethal control methods were more acceptable than lethal methods, but direct economic aid to ranchers was less acceptable than all nonlethal and most currently used lethal control methods.

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FOREWORD

This is one of a series of reports on the western sheep producing industry and the control of predators. This report focuses on the public's beliefs, attitudes, and preferences regarding predator control. Other reports in the series focus on characteristics of the sheep industry, levels of sheep and lamb losses, reasons for the decline of sheep production in the West, costs and returns of western sheep producers, and a simulation evaluation of alternative strategies for coyote control.

The research was conducted by the Economic Research Service, U.S. Department of Agriculture, in cooperation with State universities, at the request of Congress. On January 1, 1978, the Economic Research Service was merged with the Statistical Reporting Service and the Farmer Cooperative Service to form the Economics, Statistics, and Cooperatives Service.

SYNOPSES OF OTHER REPORTS IN THIS SERIES

"Sheep and Lamb Losses to Predators and Other Causes in the Western United States"
by C. Kerry Gee, Richard Magleby, Warren R. Bailey, Russell L. Gum, and Louise M. Arthur
Agricultural Economic Report No. 369

Predators, principally coyotes, are the major cause of lamb and sheep losses in the Western States, according to 9,000 farmers and ranchers surveyed in 1974. Rates of loss to coyotes varied considerably among farmers and ranchers; while many had no or minor predation problems, others reported very high losses. Overall, western losses attributed to coyotes in 1974 numbered 728,000 lambs (more than 8 percent of all lambs born) and 229,000 adult sheep (more than 2 percent of inventory), representing a third of the total lamb deaths to all causes and a fourth of the adult sheep deaths. These losses cost U.S. sheep producers some $27 million in lost returns in 1974, while consumers lost $10 million in benefits because of higher prices for lamb and reduced quantities available.

"Enterprise Budgets for Western Commercial Sheep Businesses, 1974"
by C. Kerry Gee
ERS-659

Sheep enterprise budgets for 1974 are presented for major producing areas of the 17 Western States. Summaries of production, costs, returns, and operating practices are given for enterprises of various sizes and with different management systems. Most sheep businesses did not have sufficient sales in 1974 to cover all expenses, and about 35 percent are unable to pay cash costs. Businesses in Texas-New Mexico realized the greatest return to invested capital. Small farm flocks in the wheat-corn areas of the Northern Plains States are least profitable.

"Characteristics of Sheep Production in the Western United States"
by C. Kerry Gee and Richard S. Magleby
Agricultural Economic Report No. 345

About 80 percent of U.S. sheep are raised in the West, where extensive private and public ranges provide the bulk of the feed. Only about 41 percent of the West's sheep producers have commercial scale operations of 50 head or more, but they own nearly 93 percent of the region's sheep. About one-third of these commercial producers have specialized in sheep, while two-thirds have diversified livestock operations. More

than two-thirds operate as sole proprietors, while the rest have formed partnerships and family corporations. Many have substantial equity positions which indicate past profitability. About one-fifth will likely be retiring in the next 10 years, which could result in many operations going out of sheep production. About half the feed requirement for commercial sheep comes from private range, while public range supplies one-fifth. Over half the commercial sheep are grazed under the care of herders, usually on open range. Most lambing occurs in late winter and early spring. More commercial producers practice shed lambing than range lambing, but the number of sheep involved is less. The principal marketing problem is the few number of buyers bidding on lambs.

"Factors in the Decline of Sheep Production in the Western United States"
by C. Kerry Gee, Darwin B. Nielsen, Delwin H. Stevens,
and Richard S. Magleby
Agricultural Economic Report No. 377

Former sheep producers in Colorado, Texas, Utah, and Wyoming were surveyed to determine why they had discontinued sheep production. From 40 to 60 percent were found to have continued in some form of agricultural business, usually involving cattle. The others had retired or taken off-farm employment. Generally, the former sheep producers had smaller scale operations, more equity in the business, higher predation losses, and lower earnings; they were older than producers continuing in the sheep business. Factors which they rated of greatest importance in their decisions to discontinue sheep production were high predation losses, low lamb and wool prices, shortage of good hired labor, and their own age.

"Coyote Control: A Simulation Evaluation of Alternative Strategies"
by Russell L. Gum, Louise M. Arthur, and Richard S. Magleby
Agricultural Economic Report No. 408

Current and alternative coyote control strategies in the Western States are evaluated via a computerized simulation model which predicts the economic and socio-environmental impacts of each strategy. A gradual decrease in lamb losses and an increase in net economic benefits are predicted if the 1974 level of coyote control, $7 million, is increased to $20 million. Socio-environmental benefits did not change significantly under that simulation. Beyond the $20 million level of expenditures, net economic benefits are predicted to decline slightly and socio-environmental benefits decline rapidly. At expenditures below 1974 levels, both economic and socio-environmental benefits decline substantially. Changes in mixes of control methods are discovered which permit both economic and socio-environmental benefits to increase. These alternatives include increased use of the M-44 and aerial gunning and decreased use of traps.

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AUTHORS

Richard G. Stuby is a sociologist, Economic Development Division, ESCS. Edwin H. Carpenter is a rural sociologist, University of Arizona. Louise M. Arthur is a social science research analyst, Natural Resource Economics Division, ESCS.

HIGHLIGHTS

A May-June 1976 telephone survey of a sample of 2,041 adults in the 48 contiguous States and the District of Columbia assessed their beliefs, attitudes, and preferences regarding coyote control on western sheep ranges. The study found that:

1. Forty-four percent had heard about the coyote-sheep issue and about the same number thought the issue to be important. Eighty-two percent believed coyotes sometimes kill sheep.

2. Respondents generally liked predatory mammals less than domestic animals or other nonpredatory wild animals. However, there was almost equal concern for the killing of sheep by coyotes and the killing of coyotes by man. The majority did not side strongly with the fate of either coyotes or sheep.

3. Two-thirds felt a farmer should have the right to kill a wild animal that killed his livestock. But well over half of these felt that the farmer should not have the right to kill other animals of the same kind in order to prevent future losses. When told that some control measures may kill animals for which they were not intended, respondents had much less concern for nonoffending coyotes than for other wild animals or domestic animals.

4. Respondents rated humaneness as the most important criterion for evaluating control methods; specificity (the degree to which the control measure affects only offending animals) was second, while cost was a distant third.

5. Fast poisons and ground shooting were thought more acceptable than aerial gunning, denning, trapping, or using slow acting poisons. Respondents preferred action against the coyote over direct economic aid to sheep ranchers.

6. A near majority accepted severe control of coyotes in case of extremely high lamb losses. Less than 10 percent held out for no control of coyotes when lamb losses were high. Moderate control, safe to other animals, was the policy preferred by respondents when lamb losses were less than extreme.

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INTRODUCTION

When use of chemical poison was severely curtailed by Presidential Executive Order and Environmental Protection Agency (EPA) regulations in 1972, western sheepmen began to report increased coyote predation and consequently asked for renewed chemical control programs. 1/ Meanwhile, environmental and wildlife interest groups have continued to support the existing bans on poison.

Both sheepmen and environmentalists contend that the well-being of the general public is at stake in control policy decisions. It follows, then, that policymakers should consider public attitudes, opinions, and preferences as they make predator control decisions. This report measures the extent of public knowledge about coyote control and presents results of a survey of public attitudes toward the coyote-sheep issue.

Both sides of this issue claim to be acting in the public interest. Sheepmen argue: (1) unreasonable losses of lambs to coyotes could destroy an important sector of the agricultural economy; (2) if there are no sheep to convert low quality vegetation to food and fiber, an important resource will not be fully utilized; and (3) if supplies of sheep products decline, consumer prices for them will rise. In contrast, wildlife and environmental organizations speak of: (1) a need for natural balance between predator and prey populations; (2) unnecessary destruction of individual coyotes or other predators which do not kill sheep; and (3) the danger of certain control methods to domestic animals and nontarget species of wildlife.

This report addresses the following questions. (1) Are people aware of the coyote-sheep issue and is it important to them? (2) How much do people know about coyotes? (3) What is the relative social value of coyotes and sheep compared to other animals? (4) What criteria should be used to evaluate coyote control methods? (5) How acceptable are various methods of coyote control? (6) What level of control is most appropriate for given levels of predation?

SURVEY PROCEDURES

Study data came from a May-June 1976 telephone survey of adults during evenings and weekends in a stratified probability sample of households within the 48 contiguous States and the District of Columbia. Telephone numbers were selected by a random digit dialing process. Each household's respondent was selected by alternately specifying either a male or female 18 years of age or older and then randomly selecting one person from all eligible persons of the specified sex. Each unanswered number was

1/ The 1972 restrictions included Executive Order 11643, which prohibited use of chemical toxicants for predator control on Federal lands and in Federal programs, and subsequent EPA restrictions on interstate shipment of the same toxicants.

called back at least three times to minimize sample bias. Completed interviews were obtained in 78 percent of the contacted households, providing 2,041 cases for analysis.

All respondents were first asked a series of general questions about various wild and domestic animals, including how much they liked them, how animals should be treated, and how they should be used by people. 2/ The specific coyote-sheep interest was not revealed until later to avoid biasing responses to general attitude questions.

After obtaining data on general attitudes toward animals from all respondents, the topic was narrowed to coyote control. The controversy between ranchers and environmentalists was stated: "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." Respondents were asked whether they had heard about the issue and whether they considered it important. Those indicating either awareness or personal concern about the issue (1,321 respondents) were then asked specific questions regarding different aspects of the issue. All other respondents (718) were asked only the final questions concerning their personal and demographic characteristics.

SURVEY RESULTS

Awareness and Interest

Less than half the respondents were aware of the coyote-sheep issue before the interview; about the same number (but frequently not the same persons) considered the issue important to them at the time of the interview (table 1). Two extremes emerged: 35 percent of the total sample were neither aware of the issue nor considered it important, and 23 percent were both aware of the issue before the interview and considered it important. This report focuses on three groups shown in table 1: (1) the total sample of 2,041 (table 1 total of 2,039 plus 2 missing cases); (2) the 1,321 who had heard about the issue or who thought it important when they did hear (table 1 total of 903 and 418); and (3) the 718 respondents indicating no knowledge of the issue and no concern.

Table 1--Awareness and perceived importance of coyote-sheep issue by survey respondents

Importance of issue	Awareness				Total	
	Heard about issue		Have not heard about issue			
	No.	Pct.	No.	Pct.	No.	Pct.
Important	474	23	418	21	892	44
Not important	429	21	718	35	1,147	56
Total	903	44	1,136	56	1/ 2,039	100

1/ Does not include two cases of missing data.

2/ Single copies of the questionnaire are available free from: Natural Resource Economics Division, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Knowledge About Coyotes

Responses to specific control issues might be biased by misinformation or be invalid due to a lack of information. A quick check on the respondents' level of information was made by asking whether they believed a series of statements about coyotes to be true.

Most respondents believed that coyotes sometimes kill sheep (82 percent) and help control rodents (76 percent). However, only 39 percent believed that coyotes were numerous and ranged on both sides of the Mississippi. Almost half thought that coyotes sometimes kill pets in suburban areas. Only 22 percent believed that coyotes adapt easily to urban areas. These results demonstrate limited public knowledge about the range and adaptability of the coyote, but rather general knowledge that the coyote is a predator on both sheep and rodents. 3/

The number of correct responses to the six statements varied across the four awareness-importance categories shown in table 1. Respondents who were both aware of the issue and considered it important had an average of 3.7 correct responses while the "aware but unimportant" category averaged 3.5 correct and the "unaware but important" category registered 3.3 correct responses. Finally, the 718 respondents who were both unaware of the issue and did not consider it important averaged only 3.0 correct responses. Thus, the 1,321 respondents answering the control-specific questions had somewhat more knowledge about the nature of coyotes than the 718 respondents not asked the specific questions.

Relative Social Value of Coyotes and Sheep

The survey sought to assess the relative social value of both sheep and coyotes by finding out how much people liked each animal compared to other wild and domestic animals. The 2,041 respondents were asked to assign a value to each of 16 animals, including coyotes and sheep, by comparing that animal to a deer. The value of a deer was arbitrarily set at 50 points and each respondent was told he could assign any number of points between 0 and 100 that would reflect the extent to which he or she liked that animal compared to a deer. The average points assigned to each animal were then taken as an index of the social value of that animal.

The 16 animals were mentioned to the respondents in random order to avoid response bias. 4/ Predators had lower average scores than domestic animals except that the most liked predatory mammal, the bear, had a higher score than the least liked domestic animal, the chicken. Even though the respondents liked sheep less than other domestic mammals or wild animals such as antelope, robins, and ducks, they clearly liked sheep more than either predators in general or the coyote in particular.

Relative Concern for Sheep and Coyotes

On a 0 to 10 scale, with 0 meaning no concern and 10 meaning extreme concern, the average response level of the 1,321 respondents who were aware of the coyote-sheep issue or thought it to be important was 5.9, reflecting concern that sheep and lambs are sometimes killed by coyotes. Yet when subsequently asked how concerned they were

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3/ After the survey was completed, it was pointed out to the research team that while coyotes kill or prey upon rodents, it may be overstated to say they control rodents. However, any ambiguity in the question is of a highly technical nature, and it is the opinion of the research team that responses were in terms of the coyotes' predatory behavior and not the aggregate effects on rodent populations.

4/ For a discussion of order effects, see (1).

that coyotes were sometimes killed as part of a program to protect sheep and lambs, the same respondents had an average concern score of 5.8, indicating almost equal concern that both sheep and coyotes are killed.

The same respondents were then asked to show the relative weight of their concern by allocating 100 points between the killing of sheep and lambs by coyotes and the killing of coyotes by people. They could allocate the same number of points if they felt equal concern for both coyotes and sheep. Again, almost equal concern for coyotes and sheep was indicated. The concern that sheep and lambs are sometimes killed by coyotes received an average allocation of 52 points out of the 100 while the concern that coyotes are sometimes killed by people received a 48-point average.

However, these averages mask some important extremes in the levels of concern. A frequency distribution of total sample is shown in table 2, including those respondents who were not asked the specific question because they were unaware of the issue and did not consider it to be important. Nearly half the total sample (the 13 percent with equal concern for both plus the 35 percent with little concern for either) did not side strongly with either animal.

Table 2—Respondents' concern for coyotes being killed versus sheep being killed

Level of concern	Responses	
	Number	Percent
More concern for coyotes	591	29
More concern for sheep	459	23
Equal concern for both	258	13
Unaware of issue and consider it unimportant	1/ 718	1/ 35
Missing data	15	2/
Total respondents	2,041	100

1/ These respondents were not asked to allocate 100 points between their concern for coyotes being killed versus sheep being killed but are included here to add perspective to the distribution of concern in terms of the total sample. By stating that they were unaware of the issue and considered it unimportant, they, in essence, have indicated little concern for either sheep or coyotes.
2/ Less than 1%.

Criteria for Evaluating Control Methods

This study determined differences in public preferences among alternative methods of coyote control, recognizing that one of the alternatives is no control. Because preferences for various control methods can be based on different criteria, it was necessary to determine the relative importance of the criteria themselves.

The study addressed three criteria which people might consider in forming control alternative preferences. These were: (1) humaneness (lack of pain and suffering to the animal); (2) specificity (extent to which only offending animals are subject to control measures); and (3) cost of implementing control.

Humaneness. The 2,041 respondents were asked to rate the amount of perceived suffering caused by several actions toward animals. Rating was done by assigning a number from

0 through 10 to each action with 0 meaning no suffering and 10 meaning extreme suffering. Average scores were:

Action	Average score (0-10 scale)
Trapping wild animals in steel leghold traps	9.0
Using poisons that kill in a few hours	8.7
Using poisons that kill in less than a minute	5.0
Killing animals in meat packing plants	4.5
Keeping animals in high quality zoos	4.2
Killing animals instantly with guns	3.1

Two actions unrelated to predatory control were mentioned to the respondents to get some perspective on the rating assigned to predator control practices. These two items--killing animals in meat packing plants and keeping animals in high quality zoos--were rated lower than trapping, slow poison, and fast poison, but higher than killing instantly with guns.

If actions causing less suffering to animals are considered to be more humane, killing instantly with guns was considered to be much more humane than trapping with leghold traps or using poisons that kill in a few hours. Fast acting poisons lie between these but are clearly more preferable than slow poisons or trapping.

Specificity. The first aspect of specificity of control deals with whether a control measure affects only coyotes that attempt to kill or have actually killed sheep. The second deals with whether the control may affect animals of other species that are not part of the control problem, such as domestic farm animals, household pets, or other wild animals.

The first aspect was addressed in the first part of the questionnaire before the coyote-sheep issue was introduced. The 2,041 respondents were asked: "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?" The 70 percent answering yes were then asked: "Do you think the farmer should have the right to kill other animals of the same type to help prevent future losses?" The majority said no.

Three distinct points of view emerged on this point. The largest group (39 percent) favored very specific control of offending animals; the other respondents were about equally divided between more general control (29 percent of the total sample) and not killing wild animals at all (26 percent of the total sample).

The second aspect of the specificity question deals with the problem that certain control measures may kill animals of nontarget species as well as of the predatory species for which intended. The 1,321 respondents aware of the coyote-sheep issue or thinking it important were told that: "Three classes of animals might be unintentionally killed by the methods used to kill coyotes." They were then asked which of the three concerned them most and how they would allocate 100 points to indicate the degree of their concern. Results indicated greatest concern for domestic animals and wild animals other than coyotes.

Concern for type of animal	Percent of respondents	Average points
Most concern for domestic animals	49	42
Most concern for wild animals other than coyotes	37	38
Most concern for nonoffending coyotes	7	20
Don't know or don't care/missing data	7	

Cost. The 1,321 aware-important respondents were asked to rank and then allocate 100 points among the cost, humaneness, and specificity criteria in terms of their perceived importance of each for evaluating control methods. Cost was ranked as the least important criterion. 5/

Importance of criteria	Percent of respondents	Average points
Humaneness most important	64	52
Specificity most important	25	32
Cost most important	7	16
Don't know or don't care/missing data	4	

Acceptability of Control Alternatives

While perceptions regarding the general criteria of humaneness, specificity, and cost are important as guidelines, the study also sought direct specific reactions to several control measures.

The 1,321 aware-important respondents were asked to rate the acceptability of 11 control alternatives on a scale from 0 to 10 where 0 meant not at all acceptable and 10 meant extremely acceptable. The alternatives were described on two lists. The question associated with the first inquired about the prospective acceptability of five nonlethal alternatives, now being considered or developed, if they were developed to a practical state. Results indicate a general preference for action against the coyotes rather than direct economic aid to ranchers:

Potential nonlethal controls	Acceptability score (0-10 scale)
Guard dogs to keep coyotes away from sheep	7.1
Repellent chemical to keep coyotes away from sheep	7.0
Birth control measures to keep coyote population in check	5.8
Paying ranchers for lambs lost to coyotes (indemnification)	3.1
Paying ranchers not to raise sheep (subsidization)	1.8

The second list of alternatives included currently used lethal control practices:

Currently available controls	Acceptability score (0-10 scale)
Poisons that kill in less than a minute	4.3
Shooting from the ground	4.3
Shooting from airplanes and helicopters	2.5
Locating coyote dens and killing pups	2.3
Trapping with steel leghold traps	1.6
Poisons that kill in a few hours	1.3

None of the lethal alternatives were as acceptable as three of the nonlethal control measures--guard dogs, chemical repellents, or birth control--even though two of the lethal alternatives--fast poison and ground shooting--were rated more acceptable than either indemnity or subsidy payments to ranchers.

5/ These responses, of course, beg the important economic question of how much cost might be involved. While this question could not be addressed within the boundaries of the survey reported here, it has been examined in a computer simulation model that treats tradeoffs among evaluation criteria in a more detailed, analytical fashion (3).

Concern for Method Versus Number Killed

Public concern about coyote control may also focus on the number of target animals killed. Respondents were asked to allocate 100 points between their concern for the number of coyotes killed and their concern for the method used to kill them. The 1,321 aware-important respondents allocated an average of 56 points to the method of killing and 44 points to the number killed, indicating greater concern over the method of killing.

Appropriateness of Control Level

The survey also attempted to find out if the respondents would prefer increasingly severe control measures as lamb losses mount. That is, will severe control measures be more acceptable in cases where predation is high than in cases where predation is low? They were given a choice of three control levels at four levels of lamb losses--5, 10, 20, and 40 percent. 6/ The three control levels were:

> Severe: kill coyotes with methods that kill the most coyotes and save the most lambs but which sometimes kill other wild animals.
>
> Moderate: kill coyotes with methods that kill fewer coyotes and save fewer lambs but which are safe to all other wild animals.
>
> No control: kill no coyotes and let them continue to kill (X) percent of the lambs.

As the lamb loss levels were increased, the proportion of respondents favoring severe control increased from 16 to 61 percent, while the proportion favoring no control dropped from 13 to 2 percent (fig. 1). At all but the extreme loss levels, however, half or more of the respondents favored a moderate control level that did not endanger wild animals other than the coyote.

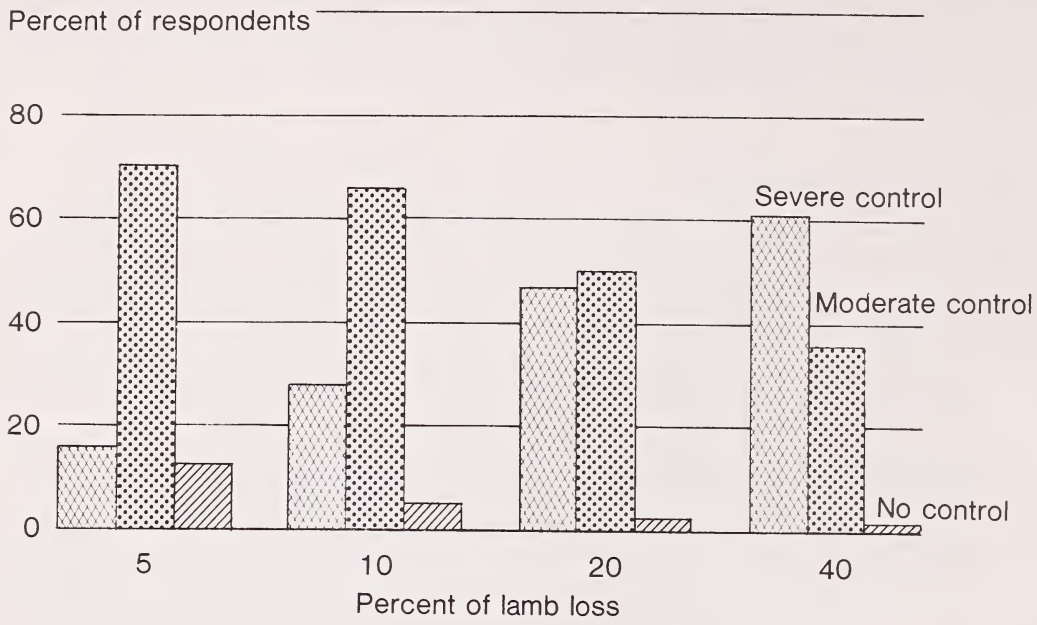
These results must be interpreted carefully because humaneness and cost effectiveness were not explicitly considered in the scenarios. For example, the methods that would not harm other animals include methods that either were perceived to cause extreme suffering or are effective only at high costs. These other aspects of control method acceptability are discussed more fully in another study (3). However, it is reasonably clear that responses were affected by the situation and when respondents were informed of increasingly severe problems they tended to accept more severe levels of control.

WHAT THE UNAWARE-UNIMPORTANT CATEGORY MIGHT SAY

The 718 respondents who indicated they were unaware of the coyote-sheep issue and that it was unimportant to them were not asked questions specific to coyote control. A special cluster analysis was performed on this category to see if the overall results of this study would change if they became more aware of the issue or changed their minds about its importance. Results indicated that the response for the entire U.S. adult population would likely be slightly more in favor of currently used control methods and more in favor of severe control levels than estimated from the control-specific data shown earlier in this report.

6/ The 40% loss level was included to detect extreme attitudes. However, lamb losses of up to 24% have been documented on some western ranges. Adult sheep loss levels are not as high or as well documented (2).

Figure 1: Respondents' Preferences for Control



The cluster analysis procedure (see appendix A) predicted a person's responses to the specific questions about coyote control from the person's general attitudes toward both wild and domestic animals (4). Then, using the predicted scores for those who did not answer the specific questions along with the actual scores from those who did, the mean scores for the entire sample were recalculated to see if any previous conclusions would be changed.

Had the 718 respondents who did not answer the control specific questions been proportionately distributed across all nine types of respondents defined by the cluster analysis, no shift in the overall sample means would have occurred. However, these 718 respondents in the unaware-unimportant category were not distributed proportionately. As shown in table 3, the average scores for the total sample (including the estimated scores from the unaware-unimportant category) showed slightly greater acceptability of currently used lethal control methods, but only slight differences for nonkilling methods under development. Similarly, at each lamb loss level, the total sample, including those respondents with estimated scores, favored more severe control.

Table 3--Mean acceptability of various control alternatives with and without inclusion of computed responses for respondents in the unaware-unimportant category

Control alternatives	Unaware-unimportant category	
	Without	With
	Mean score 1/	
Potential nonlethal controls: 1/		
Guard dogs to keep coyotes away from sheep	0.49	0.49
Repellent chemicals to keep coyotes away from sheep	.45	.45
Birth control measures to keep coyote population in check	.15	.18
Paying ranchers for lambs lost to coyotes (indemnification)	-.60	-.61
Paying ranchers to not raise sheep (subsidization)	-.93	-.93
Currently available controls:		
Poisons that kill in less than a minute	-.25	-.22
Shooting from the ground	-.27	-.24
Shooting from airplanes and helicopters	-.74	-.70
Locating coyote dens and killing pups	-.82	-.78
Trapping with steel leghold traps	-1.02	-.99
Poisons that kill in a few hours	-1.08	-1.05
Lamb loss scenarios (percent):		
5	1.97	1.94
10	1.78	1.75
20	1.57	1.54
40	1.40	1.38

1/ In the cluster analysis, raw scores reported earlier were standardized to Z-scores having a mean of 0 and a standard deviation of 1.0. The scores reported here are thus the Z-scores showing the deviation of each item from the average of all items.

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APPENDIX A--CLUSTER ANALYSIS

Appendix table 1 summarizes results of the cluster analysis. In the first step, each of five factors or descriptive characteristics was derived from the answers to the general questions asked of all 2,041 respondents. That is, a cluster of variables was used to provide a score for each respondent on each of five general characteristics. These five characteristics, seen across the top of the table, involve the degree to which a person likes wild predators, likes farm animals, likes pets, whether a person approves or disapproves of legal hunting, and the degree to which a person values viewing wild animals, just knowing they exist, or believing that they help maintain a balance in nature.

The cluster analysis procedure then grouped respondents into nine types of individuals similar in the five defining characteristics. These nine types are shown in appendix table 1 with the signs positive (+), negative (-), or neutral (0) to show the direction of the deviation of the average score for the type from the average score for the sample as a whole. That is, a (+) would mean that the types' average score was higher than the average score for the entire sample. A (-) would mean it was lower, and a (0) would mean that it was about the same.

Each type is characterized in the table by its pattern of scores. Type 1 respondents have a higher average score than the sample as a whole for the degree to which they like wild predators, farm animals, and pets. They like all kinds of animals and thus they are assigned that label. They also have a higher average score for the esthetic value of wild animals. Type 2 respondents also like wild animals and have higher esthetic value scores than the sample as a whole, but they have a below average score for farm animals and about average score for pets. Type 3 is characterized by high scores for both farm animals and pets and type 4 is identified by its strong affinity for farm animals and a high esthetic value for wild animals, but is only average with regard to pets.

In contrast, types 5, 6, 7, and 8 show a progression of dislikes for farm animals, then predators, wild animals in general, and finally, all animals.

The approval or disapproval of legal hunting varies quite a bit, with types 2, 3, 4, and 7 having about average approval scores and types 1, 5, and 6 showing general disapproval. Type 9, however, is unique in that it has average scores on all dimensions except approval of hunting where the approval score is much higher than the average approval score for the entire sample.

A total of 1,879 persons out of the 2,041 in the sample could be classified into one of the nine types described above. There were 155 persons who did not fit into any of the above types and did not form any additional type. Each of these is considered to be unique in terms of the classification scheme used here. Finally, there were seven respondents with incomplete or missing information that had to be excluded from this analysis.

The method of predicting the responses of the 718 persons who were unaware of the coyote-sheep issue and considered it unimportant is based on the assumption that persons with similar general attitudes toward wildlife would have similar specific attitudes toward coyote control. Thus, the best estimate of the response for those who were not asked the control-specific questions is the mean value of the specific response within each of the nine types for those who did answer the control specific questions. That is, each of the 718 persons in the unaware-unimportant category was assigned the mean score of the aware-important respondents within his or her respective group for each of the control specific questions.

Appendix table 1--Type identification and number of respondents by descriptive characteristics for 1,879 cases in cluster analysis 1/

Respondent type	Descriptive characteristic					Respondents in type
	Likes wild predators	Likes farm animals	Likes pets	Approves of legal hunting	Assigns esthetic value to wild animals	
	Score					No.
1. Likes all animals	+	+	+ 2/	-	+	242
2. Likes wild animals	+	-	0	0	+ 2/	216
3. Likes domestic animals	0	+ 2/	+ 2/	0	0	190
4. Likes farm animals	0	+ 2/	0	0	+	154
5. Dislikes farm animals	0	-	0	-	0	204
6. Dislikes predators	-	0	0	-	0	247
7. Dislikes wild animals	-	0	0	0	- 2/	178
8. Dislikes all animals	- 2/	- 2/	- 2/	0	0	224
9. Approves of legal hunting	0	0	0	+ 2/	0	224

Notes on symbols:

+ = score higher than sample average ($\geq$ + .5).

- = score lower than sample average ($\geq$ - .5).

0 = score close to sample average ($<$ $\pm$ .5).

1/ 1,879 were classified; 155 were unclassifiable; missing data for 7.
2/ Deviation > $\pm$ 1.0.

After each of the unaware-important respondents was assigned the mean score of his or her respective group for each of the control specific questions not actually answered, the overall mean of the total sample (now including all 2,041 respondents minus missing data or item nonresponse) was recalculated.

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