# Perceptions by Alabama Livestock Producers of Coyotes

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*Abstract:* During the last 20 years, coyote populations in the Southeast have increased. Information about livestock producers' perceptions towards coyotes and about economic and actual damage caused by coyotes in the Southeast was needed. We mailed questionnaires to 825 members of the Alabama Cattleman's Association (ACA) and to 189 members of the Alabama Lamb, Wool, and Mohair Association (LWMA) to evaluate knowledge and attitudes of Alabama cattle, sheep, and goat producers towards coyotes; and determine real or perceived economic losses caused by coyotes. Of the 1,014 livestock producers surveyed, 52 were unaccounted for, 5 respondents returned nonusable questionnaires, and 129 of the remaining 181 LWMA producers and 544 of the remaining 776 ACA producers surveyed returned useable questionnaires. Ten percent ($n$ = 28) of the nonrespondents were contacted and no nonresponse bias was found. Average attitudinal scores were 3.87 (ACA) and 3.86 (LWMA) and were higher (i.e., favored coyote control) for respondents with coyote damage than for those without coyote damage. Agricultural producers in Alabama lacked basic knowledge about coyotes, with mean knowledge scores of 0.37 for ACA respondents and 0.36 for LWMA respondents on a scale where 1 was a perfect score. There were several items which producers believed had been damaged by coyotes in Alabama: calves, sheep, watermelon, cows, goats, horses, domestic fowl, corn, and dogs. This diversity may be attributed to the diverse number of agricultural products generated within the state and the opportunistic feeding style of the coyote. Although relatively few respondents reported coyote damage ($N$ 192) and average economic losses were not high (max. $\bar{x}$ \$994, min. $\bar{x}$ = \$100, total \$141,340), there appeared to be an intolerance to any losses associated with coyote depredation.

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Coyotes (*Canis latrans*) have become both common and controversial throughout the southeastern United States. Although present in the Southeast since the 1920s (Anon. 1929), coyote populations have increased during the last 20 years (Kennedy 1987). As noted by Jones (1987:320), "Because the coyote is a relatively recent inhabitant of the Southeast, there is considerable concern about the impact of coyotes on livestock, crops, wildlife, pets, and people." In Alabama, county extension agents received an average of 14.5 calls/year about coyotes and listed the coyote as 1 of the top 4 species in perceived or real damage (Armstrong 1991).

Research in the Southeast has focused on coyote diet and effect of coyotes on other wildlife species (Wooding et al 1984, Lee and Kennedy 1986, Blanton and Hill 1989, Hoerath and Causey 1991), but information about economic and documented damage caused by coyotes in the Southeast is lacking.

Wildlife professionals in the Midwest and West have done extensive research on coyotes and several of these projects have dealt with attitudes of livestock producers and the general public towards coyote (Buys 1975, Arthur et al. 1977, U.S. Fish and Wildl. Serv. 1978, Kellert and Berry 1980, Arthur 1981, Kellert 1985, Hafer and Hygnstrom 1991). Results from these studies have reported low tolerance of coyotes by livestock producers. These studies also reported that livestock producers prefer lethal (i.e., shooting, trapping, or poisoning) control methods.

We evaluated knowledge and attitudes of Alabama cattle, sheep, and goat producers towards coyotes and discuss real or perceived economic losses caused by coyotes and control methods used by Alabama livestock producers. We do not make statistical comparisons among cattle, sheep, and goat producers.

## Methods

Surveys have been used to determine extent of animal damage (Crabb et al. 1987). We developed a mail-back questionnaire using established guidelines (Dillman 1978, Converse and Presser 1986, Fowler 1988). Each questionnaire consisted of 4 sections including livestock producers' attitudes toward coyotes, nature and extent of damage as estimated by respondents, knowledge of respondents about coyotes and coyote behavior relative to predation, and demographics of respondents. The attitudinal section was subdivided into 3 parts: (1) 10 statements to solicit respondents attitudes towards coyotes; (2) a list of 9 items (7 animals, 1 fruit, and 1 vegetable) were provided to determine how serious respondents considered coyotes a threat to these items; and (3) a list of 8 animal species were provided for respondents to rank from 1 to 8, with 1 being the most liked animal and 8 being the least liked animal. Damage information requested included livestock species or crops being damaged, species believed to be causing damage, number or amount of livestock species or crops damaged, estimated economic loss, and time of year damage occurred. We also asked participants what coyote control methods they had implemented and to rate effectiveness of each. Respondent's knowledge of coyotes and coyote behavior relative

to predation were measured using 11 questions. Demographics consisted of respondent's age, number of years farming/ranching, highest educational level completed, farm/ranch distance was from nearest town, number of acres of land owned and/or leased, variety of crops or breeds of livestock, and whether educational materials about coyotes had been received.

The questionnaire was pilot tested and refined twice. We used Cronbach's alpha (Crocker and Algina 1986) to estimate score reliability on the attitudinal, threat (which was a subsection of the attitudinal portion of the questionnaire), and knowledge scales. Items not contributing to overall reliability were modified or removed. Reliability estimates for the attitudinal, threat, and knowledge scales were 0.86, 0.88, and 0.49, respectively. The questionnaire was reviewed by 2 survey design experts and 3 wildlife damage management experts who rated items for content validity.

Mail-back questionnaires consisting of a cover letter, a questionnaire, and a self-addressed postage-paid envelope were sent to all 189 members of the LWMA and to 825 ACA members randomly selected from the current mailing list of 12,000. Ten days after initial mailing, a postcard reminder was sent to all participants. After three weeks, nonrespondents were sent a second cover letter and a replacement questionnaire. In addition, we surveyed a sample of 10% ($N = 28$) nonrespondents by telephone and no nonresponse bias was found with a MANOVA ($F = 1,145; 1, 1, 333$ of f; $P = 0.348$).

### Data Analysis

We analyzed data using the SPSS/PC+ statistical package (SPSS, Inc. 1990). MANOVA was used to check nonresponse bias, ANOVA and Kruskal-Wallis were used to test differences between respondents with real or perceived coyote damage and respondents without real or perceived coyote damage and to test the relationship between test scores, and crosstabs and frequencies were used to analyze survey results and calculate test scores. We calculated attitudinal, threat, and knowledge scores. These scores were correlated with relevant survey questions to determine extent that landowner perceptions about coyote damage are influenced by landowner knowledge of coyotes, measured by the knowledge-question portion of survey.

### Test Score Calculations and Scales

Attitudinal scores, gathered from the 10 statements to solicit respondents' attitudes towards coyotes and calculated for each group of producers, were based on a scale of 1 to 5 where 1 = maximum protection of coyotes and 5 = maximum control of coyotes. Mean attitudinal scores were calculated for each respondent by separately summing the points to the attitudinal statements and dividing by 10. Mean scores for each sample group (i.e., ACA and LWMA) were tabulated by summing the attitudinal scores of each respondent and dividing by the number of respondents.

Mean threat scores, gathered from the 9 statements in the second subsection of the attitudinal portion of the questionnaire, were based on a scale of

1 to 4, with 1 meaning coyotes were a very serious threat, 2 a serious threat, 3 a minor threat, and 4 no threat. Individual threat scores were calculated by summing points from each listed item and dividing by 9. Mean threat scores for the group were determined by summing means of respondents and dividing by number of respondents. Overall mean threat scores for each listed item were drawn from the frequency results.

Data obtained from the 11 knowledge questions were transformed to reflect either a correct or incorrect response. A score of 1 was given for a correct answer, and 0 represented an incorrect answer. Knowledge scores were calculated for each respondent by separately summing points to the knowledge questions and dividing by 11. Mean scores for the sample group were tabulated by summing knowledge scores of each respondent and dividing by number of respondents.

### Response Rate

Of the 1,014 livestock producers surveyed, 52 (46 from ACA and 6 from LWMA) had either moved and did not leave a forwarding address or had retired from active agribusiness. Five respondents (3 from ACA and 2 from LWMA) returned nonusable questionnaires. Seventy-one percent ($N = 129$) of the remaining 181 LWMA producers and 70% ($N = 544$) of the remaining 776 ACA producers surveyed returned useable questionnaires. Ten percent ($N = 28$) of the 284 nonrespondents were reached by telephone and provided responses to the questionnaire.

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## Results

Respondents with damage had significantly higher average attitudinal scores (i.e., supported coyote control) than those without damage (Table 1, $P < 0.001$). Overall threat and knowledge scores were independent of attitudinal scores for LWMA respondents ($X^2$ 1198.43, 1155 df, $P = 0.182$; $X^2 = 249.74$, 264 df, $P = 0.727$, respectively). Knowledge scores were independent of attitudinal scores for ACA respondents ($X^2 = 568.17$, 560 df, $P = 0.396$); however, attitudinal scores were not independent of threat scores ($X^2 = 3146.69$, 2800 df, $P < 0.001$).

Mean attitudinal scores were (Table 1) 3.87 (ACA) and 3.86 (LWMA). Most respondents (LWMA and ACA = 73%) felt coyotes in Alabama were not beneficial to the environment and that they have a substantial negative impact on wildlife. Sixty percent of the LWMA and ACA respondents thought coyotes

**Table 1.** Average attitudinal[a], threat[b], and knowledge[c] scores for Alabama livestock producers with coyote damage (CDMG) and without coyote damage (NCDMG), 1992.

| Group | | | Average scores | | |
|---|---|---|---|---|---|
| | | | Attitude[d] | Threat[d] | Knowledge |
| LWMA[e] | CDMG | ($N$ = 33) | 4.27 | 2.03 | 0.35 |
| | NCDMG | ($N$ = 96) | 3.73 | 2.42 | 0.37 |
| | Total | ($N$ = 129) | 3.86 | 2.32 | 0.36 |
| ACA[f] | CDMG | ($N$ = 159) | 4.11 | 2.18 | 0.37 |
| | NCDMG | ($N$ = 385) | 3.75 | 2.56 | 0.36 |
| | Total | ($N$ = 544) | 3.87 | 2.45 | 0.37 |

[a]Attitudinal scores were based on a scale of 1–5 where 1 = maximum protection of coyotes and 5 = maximum control of coyotes.

[b]Threat scores were based on a scale of 1–4 with 1 meaning coyotes were a very serious threat, 2 a serious threat, 3 a minor threat, and 4 no threat.

[c]Knowledge scores were based on a scale of 0–1 with 0 being an incorrect response and 1 being a correct response.

[d]Average attitudinal and threat scores between respondents with coyote damage and without coyote damage for both LWMA and ACA differ ($P \leq 0.05$) (ANOVA).

[e]Respondents from Alabama Lamb, Wool, and Mohair Association.

[f]Respondents from Alabama Cattleman's Association.

should be eradicated from Alabama. Over 65% of all respondents disapproved of using nonlethal methods to control coyotes. Seventy percent of all respondents favored unlimited shooting and trapping of coyotes in Alabama. Less than 30% of those completing the survey considered selective removal of offending coyotes as an adequate control approach.

Mean overall threat scores (Table 1) were 2.45 (ACA) and 2.32 (LWMA). Respondents with coyote damage had significantly lower threat scores than those without coyote damage (Table 1, $P < 0.001$); but, the lower the score, the greater fear of damage by coyotes. Most (53%) respondents stated that coyotes were a very serious or serious threat to sheep, goats, cattle, domestic fowl (e.g., chickens), wild turkey (*Meleagris gallopavo*), Northern bobwhite (*Colinus virginianus*), or fruits (e.g., watermelons). LWMA respondents felt white-tailed deer (*Odocoileus virginianus*) and vegetables (e.g., corn) were only slightly threatened or not threatened by coyotes. However, about half (51%) of the ACA respondents perceived the coyote to be a serious threat to white-tailed deer.

The most liked animals for both agribusiness groups were dogs, cows, white-tailed deer, and sheep. Least liked animals were coyotes, skunks (*Mephitis mephitis* or *Spilogale putorius*), foxes (*Vulpes vulpes* or *Urocyon cinereoargenteus*), and raccoons (*Procyon lotor*), with the coyote being the least liked overall.

Coyote damage (occurring in the last 12 months only) was reported by 33 (26%) LWMA respondents and 159 (29%) ACA respondents. Estimated average annual losses were \$555 (range = \$100–\$3,000; mode = \$100) and \$837 (\$100–\$6,000; mode = \$600) for the LWMA and ACA, respectively. Calves, sheep, watermelon, cows, and goats received the most damage (Table 2). Crops were included in agricultural products damaged because we asked respondents to list all types of wildlife damage that they had incurred in the last 12 months. Al-

though many respondents (43% ACA, 49% LWMA) reported damage from other species, coyotes were still perceived as the most damaging. Other animals implicated in damage were white-tailed deer, feral and free-ranging dogs, raccoons, armadillos (*Dasypus novemcinctus*), blackbirds (Icteridae), foxes, and squirrels (*Sciurus carolinensis*).

Several respondents (ACA, $N = 248$, 46%; LWMA, $N = 99$, 77%) reported using 1 or more control measures to stop or reduce coyote damage during the last 12 months (Table 3). LWMA respondents who used control methods preferred nonlethal methods. Most (50%, $N = 64$) of the LWMA respondents implemented fencing, while 45% ($N = 58$) owned and used guard dogs or donkeys.

**Table 2.** Alabama livestock producers reports of annual economic loss of crops and livestock to coyotes in Alabama, 1992.

| Commodity damaged | $N$[a] | $\bar{x}$ ($) | Total ($) |
|---|---|---|---|
| Calves | 107 | 994 | 106,380 |
| Sheep | 23 | 690 | 15,880 |
| Watermelon | 22 | 461 | 10,150 |
| Cows | 4 | 650 | 2,600 |
| Goats | 10 | 232 | 2,315 |
| Horses | 3 | 533 | 1,600 |
| Domestic Fowl | 7 | 181 | 1,265 |
| Corn | 4 | 263 | 1,050 |
| Dog | 1 | 100 | 100 |
| | | Grand total | 141,340 |

[a]Number of respondents reporting financial losses.

**Table 3.** Coyote control methods used by Alabama livestock producers with coyote damage (CDMG—ACA[a], $N = 109$; LWMA[b], $N = 28$) and without coyote damage (NCDMG—ACA, $N = 139$; LWMA, $N = 71$), 1992.

| | LWMA | | | | ACA | | | |
|---|---|---|---|---|---|---|---|---|
| | CDMG | | NCDMG | | CDMG | | NCDMG | |
| Control method | $N$[c] | (%)[d] | $N$[e] | (%)[f] | $N$[c] | (%)[d] | $N$[e] | (%)[f] |
| Trapping | 9 | (32) | 9 | (13) | 29 | (27) | 32 | (23) |
| Shooting | 15 | (54) | 26 | (37) | 91 | (83) | 96 | (69) |
| Fencing | 17 | (61) | 47 | (66) | 17 | (16) | 15 | (11) |
| Guard dog/donkey | 13 | (46) | 45 | (63) | 15 | (14) | 20 | (14) |
| Scare techniques | 0 | (0) | 2 | (3) | 12 | (11) | 7 | (5) |
| Poisoning | 6 | (21) | 7 | (10) | 20 | (18) | 18 | (13) |
| Other | 1 | (4) | 4 | (6) | 3 | (3) | 4 | (3) |

[a]Number of respondents from Alabama Lamb, Wool, and Mohair Association reporting use of a control method.
[b]Number of respondents from Alabama Cattleman's Association reporting use of a control method.
[c]Number of LWMA or ACA respondents with coyote damage reporting use of control method.
[d]Percentage of LWMA or ACA respondents with coyote damage reporting use of control method.
[e]Number of LWMA or ACA respondents without coyote damage reporting use of control method.
[f]Percentage of LWMA or ACA respondents without coyote damage reporting use of control method.

Some of the sheep and goat producers used lethal control methods (Table 3). Over half (54%) of the cattle producers used no control methods; however, most of those that did selected lethal control methods. Shooting (34%, $N = 187$), trapping (11%, $N = 61$), and poisoning (7%, $N = 38$) were control methods used most frequently, though poisoning coyotes is illegal in Alabama. Half of the respondents (50%) reported control measures were somewhat effective. Of all respondents with coyote damage, less than 15% had sought any educational material about coyotes, coyote control measures, or had attended any coyote workshops.

Mean knowledge scores were low, with ACA members scoring 0.37 and LWMA members scoring 0.36 on a scale where 1 was a perfect score. Of the 11 knowledge questions asked, all but 3 were answered incorrectly or with "don't know" over half the time (Table 4). Weight of coyotes in Alabama, diet of coyotes in Alabama, and tail position of coyotes were the 3 questions answered correctly over half the time. There were no significant differences ($P - 0.05$) in mean knowledge scores between producers who had experienced damage from coyotes and those who had not.

## Discussion

### Attitude

Attitudes for ACA and LWMA members favored control of coyotes. Fifty-nine and 64 percent of the LWMA and ACA samples, respectively, agreed with the statement "Coyotes should be eradicated from Alabama as soon as possible." Only 10% of members from both agribusiness organizations agreed that

**Table 4.** Alabama livestock producers' mean knowledge[a] scores for individual questions concerning their knowledge of coyotes, 1992.

| Question category | LWMA | ACA |
|---|---|---|
| **Multiple Choice** | | |
| Coat color | 0.30 | 0.35 |
| Weight (size) | 0.69 | 0.70 |
| Food habits | 0.54 | 0.60 |
| Track | 0.43 | 0.35 |
| Tail position | 0.58 | 0.60 |
| How long in Alabama | 0.05 | 0.03 |
| Introduced into Alabama | 0.47 | 0.36 |
| **True-False** | | |
| *N* Deer is low where coyote *N* high | 0.26 | 0.27 |
| Hybridization with dogs | 0.24 | 0.28 |
| Increased *N* coyotes have decreased *N* deer | 0.35 | 0.29 |
| Winter diet | 0.11 | 0.19 |

[a]Knowledge scores were based on a scale of 0–1 with 0 being an incorrect response and 1 being a correct response.

"in Alabama, coyotes are beneficial to the environment." While none of these percentages are convincing alone, in combination with written comments (i.e., some respondents wished "we" would eradicate the coyote from Alabama because it was a useless menace) imply a negative attitude toward coyotes. While these statements are not biological facts, they are an indication of attitudes. It is not our goal to argue whether coyotes are beneficial in the environment. However, per Seimer and Decker (1991), landowners who have positive attitudes about the ecological, educational, and appreciative values of wildlife have a higher tolerance of wildlife damage to their property, livestock, or crops.

Additional evidence of a dislike for coyotes by Alabama livestock producers was evident in the rank order of animals, where the coyote was the least-liked animal. This negative view towards coyotes as a part of the environment could be based on a lack of factual information about the role of coyotes in the environment, or it could result from actual coyote problems.

Further, most respondents ($\geq$64%) stated that as many coyotes as possible should be shot or trapped. Although these control methods do not guarantee discontinuation of damage, it is possible that producers receive some satisfaction from killing animals perceived to be doing damage. Nonlethal control methods (e.g., live-trapping and relocating coyotes) and hunting or poisoning only depredating coyotes were preferred by <25% of respondents. Some respondents (2%) wrote that they opposed poisoning because of incidental or nontarget deaths. Three respondents stated that they strongly opposed poisons as a control technique because they had used them and subsequently killed their own pets.

Sheep and goat producers used long term control methods that have a higher possibility of preventing current and future damage, whereas cattle producers wanted to stop damage immediately and disregarded possibility of future damage. Prevention of future damage also was evident in that 58% of LWMA members rated the control methods (i.e., fencing and guard dog or donkey) they used as effective in controlling coyote damage, while only 22% of ACA members felt *their* control method was effective.

Feat of coyote damage was evident from the threat scores with both Alabama agribusiness organizations rating the coyote as a serious to very serious threat to their livestock (ACA = 61%; LWMA = 87%). Most Alabama livestock producers also were concerned about the coyote's effect on local wildlife populations (e.g., white-tailed deer, wild turkeys, bobwhite quail, and rabbits [*Sylvilagus floridanus*]). Thus, livestock producers, even though they may not incur coyote damage, are concerned about the possibility of damage, not only to their livestock but to wildlife.

### Damage

Our study shows that coyotes are perceived to be killing and/or damaging calves, cows, sheep, goats, horses, domestic fowl, watermelons, and corn. Other studies in the southeastern United States reported coyotes as being perceived to

have damaged watermelons, calves, cows, poultry, sheep, goats, swine, dogs, and rural gardens (Jones 1987, Armstrong 1991).

Economic loss data in many surveys may not provide an accurate estimate of damage for several reasons. First, these data represent estimates from producers, not wildlife damage professionals. Second, producers may have attributed damage by other species to the coyote. Third, coyotes may have been scavenging on livestock that died from natural causes. However, these economic estimates do provide a relative measure of perceived coyote damage and thus warrant consideration.

### Knowledge

Agricultural producers in Alabama lacked basic knowledge about coyotes, which is understandable because coyotes have not been a nuisance species in the state for very long. Most respondents believed coyotes to be recent inhabitants of the state, arriving within the last 20 years. Coyotes have been in Alabama since the 1920s; however, in the last 20 years coyotes have become established in the Southeast.

## Management Implications

There were several items perceived to be damaged by coyotes in Alabama. This variety may be attributed to the diverse number of agricultural (livestock and crops) products generated within the state and the opportunistic feeding style of the coyote. Although relatively few respondents reported coyote damage and average economic losses were not high, there appeared to be an intolerance to any losses associated with coyote depredation.

Methods of effective and targeted coyote control need to be emphasized. It was disturbing that 51 respondents stated that they were using poisons as a means to control coyote damage, even though poisoning is illegal in Alabama. An emphasis on legal control methods should be stressed by all wildlife professionals within Alabama and throughout the United States.

Our survey also indicates that an increase in education about coyotes is needed in the state. Approximately 30% of the respondents asked to receive results from our study and others asked for educational material about coyotes. Educational materials are available; it is just a matter of distributing them to the people. Research is needed to evaluate educational materials and to acquire an actual economic assessment of losses due to coyotes.

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