



Understanding Knowledge and Perceptions of Bats Among Residents of Fort Collins, Colorado

By Natalie R. Sexton and Susan C. Stewart



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Introduction

As regional urbanization increases in Colorado, so do interactions between humans and wildlife. Where previous habitat has been reduced due to urbanization and development, a few bat species that easily adapt to new environments now roost in homes and buildings (Kunz and Reynolds, 2003). Bats frequently serve as reservoirs of disease that have potential health consequences for humans and other mammals (Messenger and others, 2003). As bat use of buildings becomes more frequent, the incidences of bat/human contact and the risk of spreading disease also increase.

In Colorado, rabies is most common in the big brown bat (*Eptesicus fuscus*) Pape and others, 1999), the most ubiquitous species of urban-dwelling bat in the United States (Barbour and Davis, 1969) and the most common species submitted for rabies testing in Colorado (Pape and others, 1999). An in-depth knowledge of the big brown bat—including its ecology, habitat and movements, and aspects of disease transmission—and of its interactions with humans is essential for making informed management decisions regarding this species. To balance the competing priorities of species preservation and public safety, natural resource managers and public health professionals must be able to accurately estimate citizens' knowledge, perceptions, and perceived risks regarding the bat species that use human dwellings and harbor diseases potentially dangerous to humans.

A recently completed five-year ecological study (2001–2005) on bats inhabiting buildings in Fort Collins, Colo., has provided much information on the basic epidemiology of rabies and on the ecology of the local bat population (Davis, Rudd, and Bowen, 2007; Ellison and others, 2007; Neubaum, Douglas, and others, in press; Neubaum, O'Shea, and Wilson, 2006; Neubaum, Wilson, and O'Shea, 2007; O'Shea, Ellison, and Stanley, 2004; Pearce and O'Shea, 2007; Pearce and others, in press; Shankar and others, 2004; Shankar and others, 2005; Wimsatt and others 2005). Research investigating the human dimensions of bats and bat/rabies relationships, however, has been very limited (Gibbins and others, 2002; Liesener and others, 2006). Herein, we report the results of a study to evaluate perceptions and knowledge of bats and rabies among residents of Fort Collins, Colo. The study resulted from collaborations between U.S. Geological Survey (USGS) bat ecologists of the Trust Species and Habitats branch, and social scientists of the Policy Analysis and Science Assistance branch, both of the USGS Fort Collins Science Center (FORT).

Study Objectives

The primary objectives of this study were to investigate public familiarity, awareness, knowledge, perception, and potential risk, as pertaining to bats and rabies, among Fort Collins residents. Specifically, this research was designed to answer the following questions:

- What is the level of familiarity with the Fort Collins bat population?
- What is the level of knowledge about bats and about the relationship between bats and rabies?
- What are the value orientations held toward wildlife in general?
- What are the attitudes and beliefs toward bats?
- What are the risks that residents perceive as they relate to encountering a bat and contracting rabies from bats?
- What are the sources of information residents use to learn about bats?
- What are the relationships between familiarity, knowledge, attitudes, and perceived risk?

It was hypothesized that answers to these questions would differ according to one's previous experience with bats.

Methods

The study area was defined as the city limits of Fort Collins, Colo. During the fall of 2004, a survey questionnaire was mailed to two sample populations of Fort Collins residents: (1) Fort Collins residents ("general resident" stratified by zip code) and (2) individuals who had reported at least one encounter with a bat to the Larimer County Humane Society ("bat encounter resident"). The general resident sample ($n = 1,294$) was randomly drawn from a household database of names and addresses of Fort Collins residents maintained by Marketing Systems Group (Fort Washington, Pa.). The bat encounter resident sample ($n = 460$) was obtained by querying the Larimer County Humane Society's database for Fort Collins residents that had reported a bat encounter between the years of 1997 and 2004. To protect resident confidentiality, we excluded cases wherein the bat was tested and found positive for rabies (usually when a bite occurred).

To ensure that the human dimensions data collected were linked with the ecological portion of this study, we developed the survey questionnaire in collaboration with FORT bat ecologists. There were two versions of the survey, one for each population sampled. The majority of the survey was the same for both samples, with some more specific questions included for the bat encounter sample. The preliminary surveys were reviewed by the research team and then peer-reviewed and pretested for readability, clarity, and conciseness. They were then approved by the U.S. Office of Management and Budget (OMB) and the Colorado State University Regulatory Compliance Office, Human Research Committee (OMB #1028-0081; CSU/HRC #04-194).

The surveys were distributed according to a step-by-step procedure based on the Total Design Method (Dillman, 2000) which maximizes the quality and quantity of responses for mail and telephone surveys:

- Survey packets included the survey questionnaire, a postage-paid return envelope, a cover letter explaining the study, and an incentive (a calendar magnet with photo of Horsetooth Rock—a local landmark).
- One survey packet was sent to each resident in the samples. Over the course of the following seven weeks, one thank you/reminder postcard and two more survey packages were sent to those who had not responded.

Response Rate

Of the 1,294 packets sent to general residents 126 were returned as undeliverable¹ and 718 completed surveys were returned, for a final response rate of 61 percent (table 1). Of the 460 packets sent to bat encounter residents, 145 were recorded as undeliverable and 220 completed surveys were returned, for a response rate of 70 percent (table 1). These response rates and associated confidence intervals exceed professional standards for this type of research (Dillman, 2000).

Table 1. Survey response rates among residents of Fort Collins, Colo., pertaining to their perceptions and knowledge of bats.

Response rate	General residents ^a	Bat encounter resident ^b
Surveys distributed	1,294	460
Respondents	718	220
Response rate (%)	61	70
Confidence interval (±)	3.5	4.8

^aRandom sample of people living within Fort Collins city limits.

^bPeople living within the Fort Collins city limits and who had reported an encounter with a bat between 1997 and 2004.

Measurement of Concepts

Familiarity

Respondent familiarity with bats in Fort Collins was assessed on the basis of answers to several questions. First, general residents were asked whether they were aware—prior to receiving the survey—that bats occurred in Fort Collins and whether they had ever seen a bat in the city. Additionally, if respondents had seen bats in Fort Collins, they were asked where these sightings occurred. Sighting locations were broken down into researcher-defined areas based on the proximity to the respondent’s residence (that is, from seeing a bat “around Fort Collins” to “using my residence or other structure in my yard”). Finally, residents were asked how often they saw bats in Fort Collins; the frequency of sightings from which respondents could choose ranged from “once or twice” to seeing bats “every summer, multiple times.”

Knowledge

Knowledge about (1) the ecology of bats and (2) bats and rabies was measured through two methods. First, on a scale from 1 to 5 (with 1 being “nothing at all” and 5 being “a great deal”), respondents were asked to gauge their level of knowledge on both subjects. Second, a combination of multiple choice and true/false statements was used to assess respondents’ actual knowledge. These questions were created in collaboration with the bat ecologists to ensure an accurate representation of general knowledge about bats and about bats and rabies. The peer-review and pretesting phase ensured that these questions were not inordinately difficult for the average respondent to answer.

¹ An undeliverable packet was defined as one that had either an incorrect or unknown address, and therefore could not be delivered by the U.S. Postal Service. Also defined as undeliverable were cases in which the resident was deceased or too ill to participate.

Perceived Risk

Perceptions of risk were measured on two categories: (1) the chances of having an encounter with a bat and (2) the chances of contracting rabies if an encounter should occur. To have relative measures of perceived risk, questions pertaining to situations unrelated to bats were included (for example, being bitten by a dog or contracting West Nile virus if bitten by a mosquito). Respondents were asked to rate each incident on a scale from 0 (no chance) to 10 (certain chance). For convenience of interpretation, averages of these scores were converted to percent probabilities.

Wildlife Value Orientations

Wildlife value orientations were introduced in the human dimensions literature by Fulton and others (1996) and are used extensively in human dimensions of wildlife research. These value orientations arose from the field of social psychology, specifically the theory of cognitive hierarchy. The theory states that values form the base of a cognition hierarchy that drives our basic beliefs and attitudes, and as a result drives our behavior as well (Homer and Kahle, 1988; fig. 1). Wildlife value orientations come into play as groupings of basic beliefs regarding wildlife specifically. They are designed to aid in the prediction of an individual's behavior regarding wildlife and wildlife-related issues. In this study, we used a subset of items originally used by Fulton and others (1996). Respondents were asked to rate their agreement with each statement on a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree), with 4 being the neutral point.

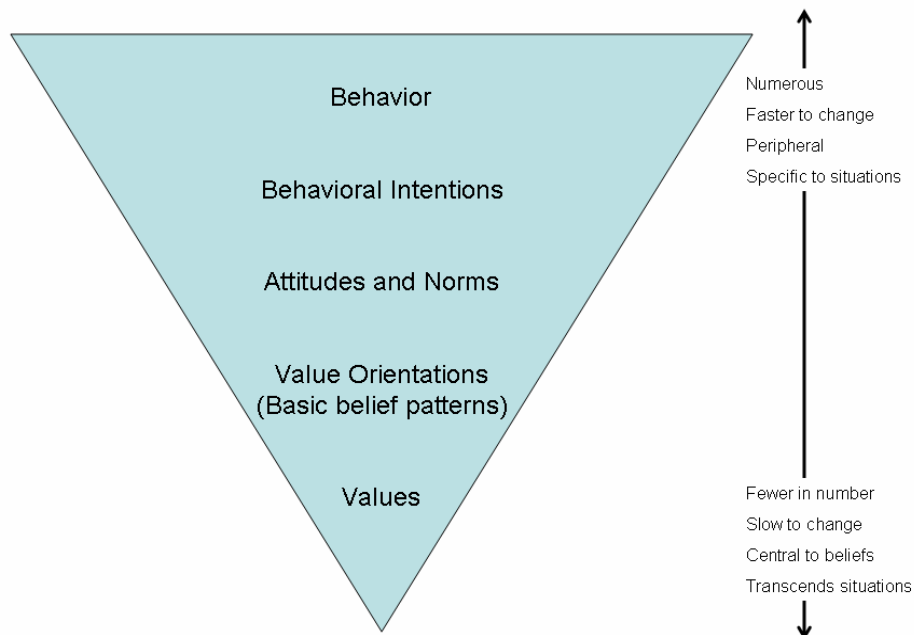


Figure 1. The cognitive hierarchy model of human behavior (Homer and Kahle, 1988).

Attitudes and Beliefs

After the cognitive hierarchy, attitudes and beliefs are the next level in predicting behaviors about the object or action in question. An attitude has been defined as a positive or negative evaluation of an object or action, and involves both a cognitive and an affective component (Pierce

and others, 2001). Within the cognitive hierarchy, beliefs exist in close conjunction with attitudes. They provide the cognitive side of attitudes, or what people think to be true of the evaluative object (Pierce and others, 2001). Attitudes and beliefs about bats were broken down into several categories of affect, in particular, general attitudes about bats, general beliefs about bats, and specific beliefs about bats in Fort Collins and at one's residence.

Behavioral Intentions and Behaviors

The intent of this study was to ascertain the perceptions and knowledge of the Fort Collins community regarding bats. Though city or county wildlife managers were not considering specific management alternatives, the goal was to obtain as much information as possible from respondents, so scenarios potentially involving a future communication or management scheme could be guided by information provided from this study. According to Ajzen and Fishbein (1980), the best predictor of an individual's behavior is his or her intention to engage in that behavior. Therefore, on a scale from 1 (not likely) to 4 (very likely), respondents were asked to rate the likelihood that they would take a particular action toward bats (1) in general and (2) in the event that a bat was using their residence for roosting. Respondents could also indicate that they were not sure about their likelihood of taking a particular action. These questions were broken into two behavior categories: bat conservation behaviors and bat mitigation behaviors. The first category included general actions and did not require that a respondent have an encounter with a bat (for example, "put up a bat box at my residence" or "join or support a bat conservation group"). The second category included behaviors they would take if they found a bat using their residence as a roost (for example, "do nothing," "allow bats to stay," or "have bats removed using lethal methods").

Communication

To assess the types of information that people had about bats and help identify the most likely places it was being sought, respondents were asked to indicate where they had obtained news and information about bats during 1999–2004. Sources common to most pursuits of information, such as newspapers, television, internet, or radio, were included as well as some sources that are more specific to the subject at hand. These specific sources included bat conservation groups, public health agencies, bat experts, and the Humane Society. In addition, respondents in the bat encounter group were asked whether they were provided with information and whether they sought information after their bat encounter. If applicable, they were then asked to specify the type of information that was provided to them and the sources from which they sought information.

Respondent Characteristics

To understand residents' characteristics, respondents were asked a series of sociodemographic questions regarding length of residency, type of residence (in relation to likelihood of encountering bats), pet ownership, gender, age, education, employment, and income. Respondents who owned dogs were asked to specify the number of dogs they had, how many spend time outdoors, and how many of their adult dogs had been vaccinated for rabies. The same questions were asked in regard to cats. To assess the potential for adult respondents' exposure to information about bats and (or) rabies through information brought home from their school-aged children, respondents were asked how many children less than 12 yrs of age were living in the home. The question regarding residence type was categorical and entailed choosing from "mobile home," "one-family house detached from any other house," "one-family house attached to one or more houses," or "a building with multiple apartments." Questions regarding residence

rental/ownership status and size were also categorical; size was “one-story,” “two-story,” and “more than two stories.” Residence age pertained to the approximate year or decade in which the building was built. Open-ended questions were used to ascertain length of residency in the current home as well as in Fort Collins. Education level was measured on a continuous scale from 1 yr to 20 or more yrs; respondents were asked to circle the highest year of formal schooling. Income was measured by asking respondents to select one of nine categories indicating their approximate household income before taxes. Respondents were advised that the demographic questions were used for statistical purposes only and would not be linked with them individually in any way.

Data Analysis

Data were analyzed using SPSS 14.0. The general resident group and bat encounter group were compared to examine the differences between the two. Few differences were found; where meaningful² statistical differences were found, they are specifically identified and addressed. Otherwise, for simplicity of reporting, all means and percentages presented are taken from the general resident group. The first phase of data analysis involved running frequencies on all variables to gain a basic understanding of the percentages of people who answered in certain ways, as well as the mean levels of knowledge, attitudes, and perceived risk. Upon completion of the frequency analyses, scales were constructed (based on original study hypotheses and values and attitudes literature—Fulton and others, 1996; Bright and Manfreda, 1996).

Respondent Characteristics

Overall, there were no meaningful differences between general residents and the bat encounter group in terms of sociodemographic variables; the one exception was gender (table 2). The general resident group included more males, while the bat encounter group had more females ($\chi^2 = 66.51, P < 0.001, \Phi = 0.27$). Regarding pet ownership, 68 percent of bat encounter respondents and 52 percent of general residents indicated that they owned a dog or cat that spends time outdoors. Of those, a little more than half indicated they own more than one dog or cat. Nearly all said their pets were vaccinated. A majority of residents (77 percent) indicated that they lived in a one-family house detached from any other building and that they owned the building in which they lived (82 percent). On average, residents had lived in their current residence for 9 yrs and in Fort Collins for 17 yrs.

² Meaningful differences were defined as follows: Statistical differences at $p < 0.05$ may exist, although in some cases the differences were not practically significant. Practical significance was defined by measures of association indicating “typical” to “substantial” statistical differences in populations as opposed to “minimal” differences due to sample size. Although statistically significant, minimal differences were not reported because they were not substantive in their application to populations.

Table 2. Demographics of Fort Collins, Colo., residents responding to a survey questionnaire.

Demographics	General residents	Bat encounter residents
Gender ^a		
Male	65%	34%
Female	35%	67%
Average age	49	49
Worked full or part-time	76%	69%
Retired	36%	20%
Highest average education level	College	College
Median household income	\$50,000–\$74,999	\$50,000–\$74,999

^a $\chi^2 = 66.51, P < 0.001, \Phi = 0.27$

Familiarity with Bats

Fort Collins residents appear to have a high familiarity with bats in Fort Collins. Before receiving the survey, approximately 80 percent were aware that bats occurred in the city and approximately 70 percent had seen a bat in Fort Collins. Over a third (36 percent) of general residents and nearly half (48 percent) of the bat encounter group saw bats regularly (every summer; fig. 2).

When asked where they have seen bats, a majority of both groups have seen bats in town and in their neighborhood at dusk, with more bat encounter respondents having seen them using their residence or other structure in their yard ($\chi^2 = 60.72, P < 0.001, \Phi = -0.25$). Because bats are nocturnal animals, they do not generally fly around during the day unless they are sick or injured. Most residents did not indicate that they had seen bats during the day; however, bat encounter respondents were much more likely to have seen bats during the day, especially in their yard (30 percent for bat encounter respondents, 10 percent for general residents; $\chi^2 = 98.53, P < 0.001, \Phi = -0.39$) or using their residence (25 percent for bat encounter respondents, 4 percent for general residents; $\chi^2 = 60.72, P < 0.001, \Phi = -0.30$).

Though familiar with bats, only approximately 13 percent ($n = 94$) of general residents had had an encounter with a bat in Fort Collins. Situations were varied, from having had a bat inside their residence to finding a bat on the ground. Only a small portion of those encounters (14 percent, $n = 13$) involved direct contact with a bat.

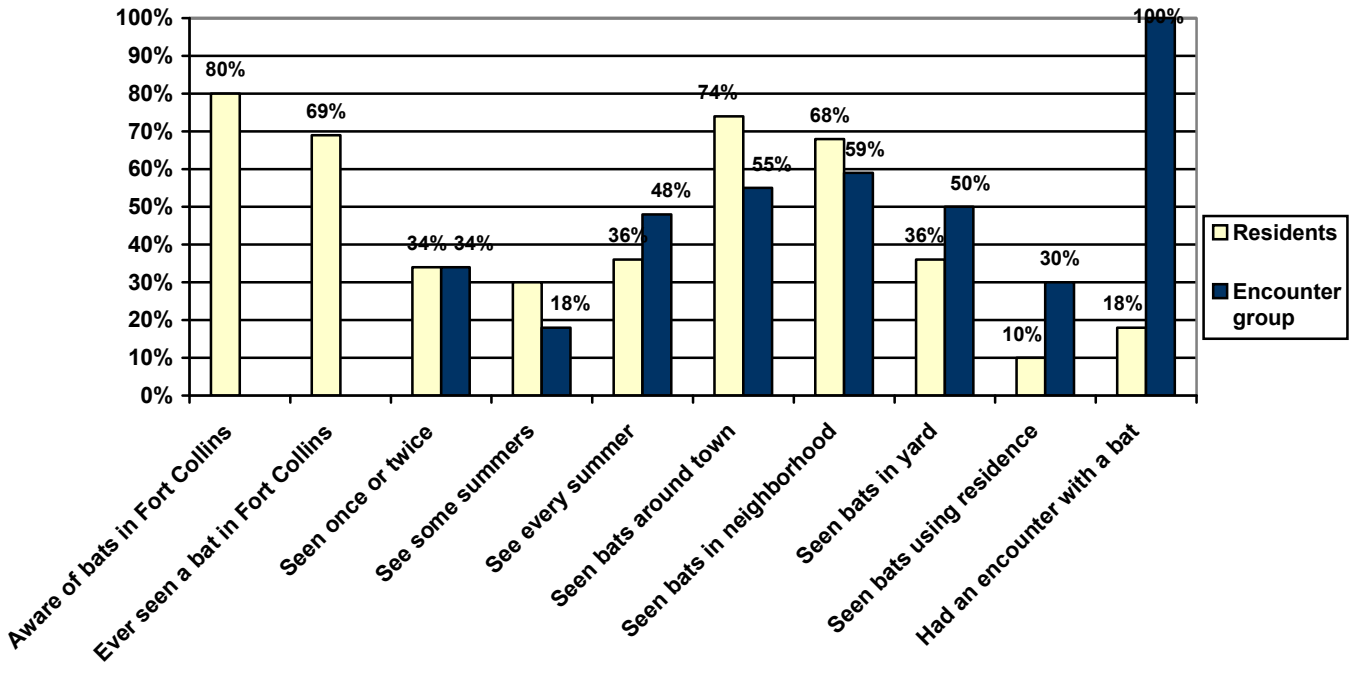


Figure 2. General residents of Fort Collins, Colo., and bat encounter group familiarity with bats.

Knowledge about Bats

When asked about their knowledge regarding bat ecology and the relationship between bats and rabies, residents felt they knew nothing to very little about bat ecology or transmission of rabies from bats (fig. 3). Overall residents’ actual knowledge about bat ecology is low (table 3, fig. 4), with average scores of 64 percent. Knowledge about the relationship between bats and rabies was somewhat higher than self-assessed knowledge (what they thought they knew), but still fairly low, with average scores of 70 percent (table 4, fig. 4). The average percent of correct responses on all questions was 67 percent.

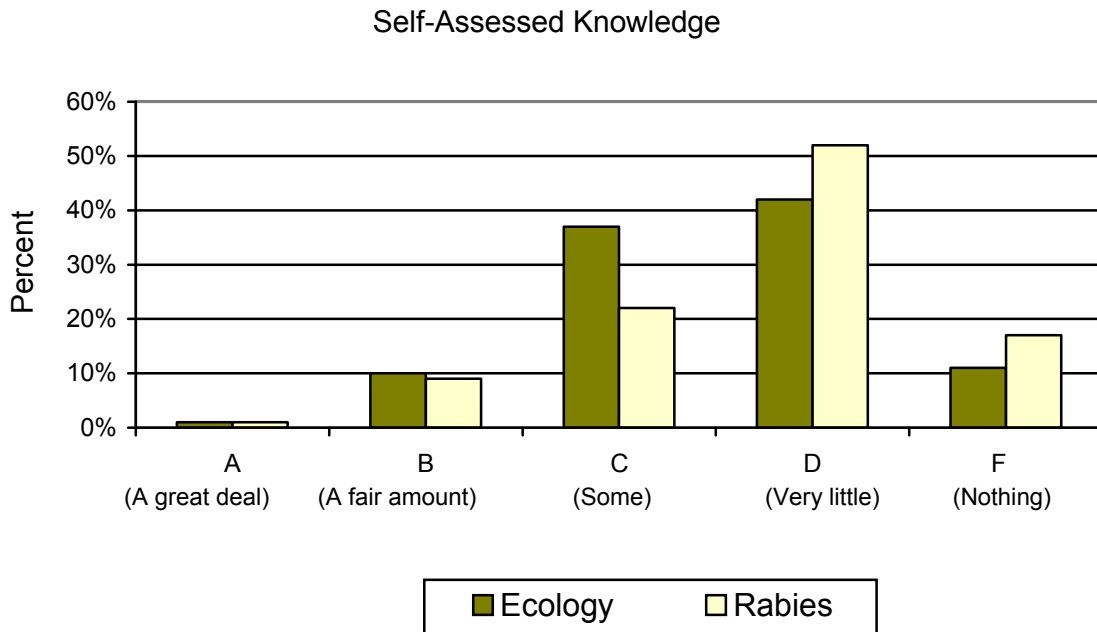


Figure 3. Self-assessed knowledge of Fort Collins, Colo., residents regarding bat ecology and bat/rabies relationship. Average scores were converted into a grade.

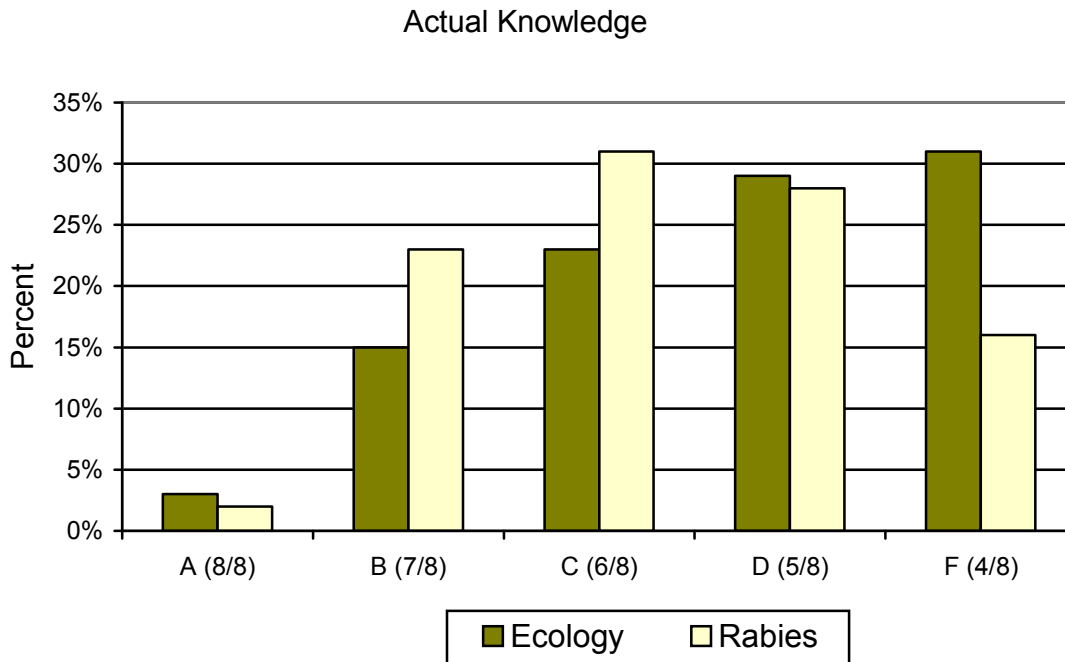


Figure 4. Actual knowledge of Fort Collins, Colo., residents regarding bat ecology and bat/rabies relationship. Average scores (number of correct answers per total number of questions) have been converted into a grade based on percent of correct answers.

Table 3. Percent correct answers by general residents of Fort Collins, Colo., on knowledge questions regarding bat ecology.

Question	Percent correct (%)
Bats are able to navigate at night because they can echolocate (use sonar). ^a	92
In the Fort Collins area, bats live in buildings, trees, and caves/abandoned mines. ^b	83
Bats are the only mammals that can truly fly. (T)	79
Bats' bodies are covered with fur, they give birth to live young, and their wings are covered with skin. Bats are <i>not</i> a type of rodent. ^c	75
Bats are blind. (F)	68
Bats in the Fort Collins area hibernate during the winter. (T)	64
A benefit of bats worldwide is that they aid in pollination of flowers, aid in seed dispersal, and eat agricultural insect pests. ^d	48
Mosquitoes are the main food source for bats in Fort Collins. (F)	30

^aThe second most frequently chosen answer was “have good night vision” (5 percent).

^bThe second most frequently chosen answer was “buildings” (10 percent).

^cThe second most frequently chosen answer was “bats’ bodies are *not* covered with fur” (16 percent).

^dThe most frequently chosen answer was “eat agricultural insect pests” (51 percent).

Table 4. Percent correct answers by general residents of Fort Collins, Colo., on knowledge questions regarding the relationship between bats and rabies.

Question	Correct (%)
Rabies is primarily transmitted by a bite from an infected animal. (T)	98
A bat flying erratically at dusk is typical behavior of a healthy bat. ^a	94
Bats transmit West Nile virus. (F)	92
Bat bites should be treated by immediately cleaning the wound and consulting a physician, capturing the bat for rabies testing, and having rabies shots if the bat tests positive for rabies. ^b	89
A very small proportion of bats in Colorado can infect animals or people with rabies. ^c	84
If left untreated, rabies is almost always fatal. (T)	81
Rabies transmitted by bats accounts for less than five human deaths per year in the United States. ^d	68
Guano can be a source of lung infections. (T)	53
Thousands of people die from rabies worldwide each year, mostly from bites by raccoons. (F)	56
Bats account for the most cases of rabies in Colorado wildlife. ^e	7
Bats in Fort Collins are an important control of West Nile virus because they eat mosquitoes. (F)	7

^aThe second most frequently chosen answer was “flying during daylight” (4 percent).

^bThe second most frequently chosen answer was “immediately cleaning wound and consulting physician” (9 percent).

^cThe second most frequently chosen answer was “about half” (7 percent).

^dThe second most frequently chosen answer was “50 deaths per year” (27 percent).

^eThe most frequently chosen answer was “raccoons” (62 percent).

Perceived Risks of Encountering Bats

Overall, respondents felt it was not very likely they would ever have physical contact with a bat (for example, be bitten or scratched by one, inadvertently touch one, or have one land on them), and felt it more likely that a bat would get inside their residence or use the outside of their residence for roosting (fig. 5). Bat encounter respondents perceived a greater risk of bats getting inside their residence ($F = 66.23, P < 0.001, \eta = 0.26$) and bats using their residence for roosting ($F = 76.01, P < 0.001, \eta = 0.28$) than did general residents. This result was not an expected result, as many respondents in the encounter group actually had this encounter with a bat.

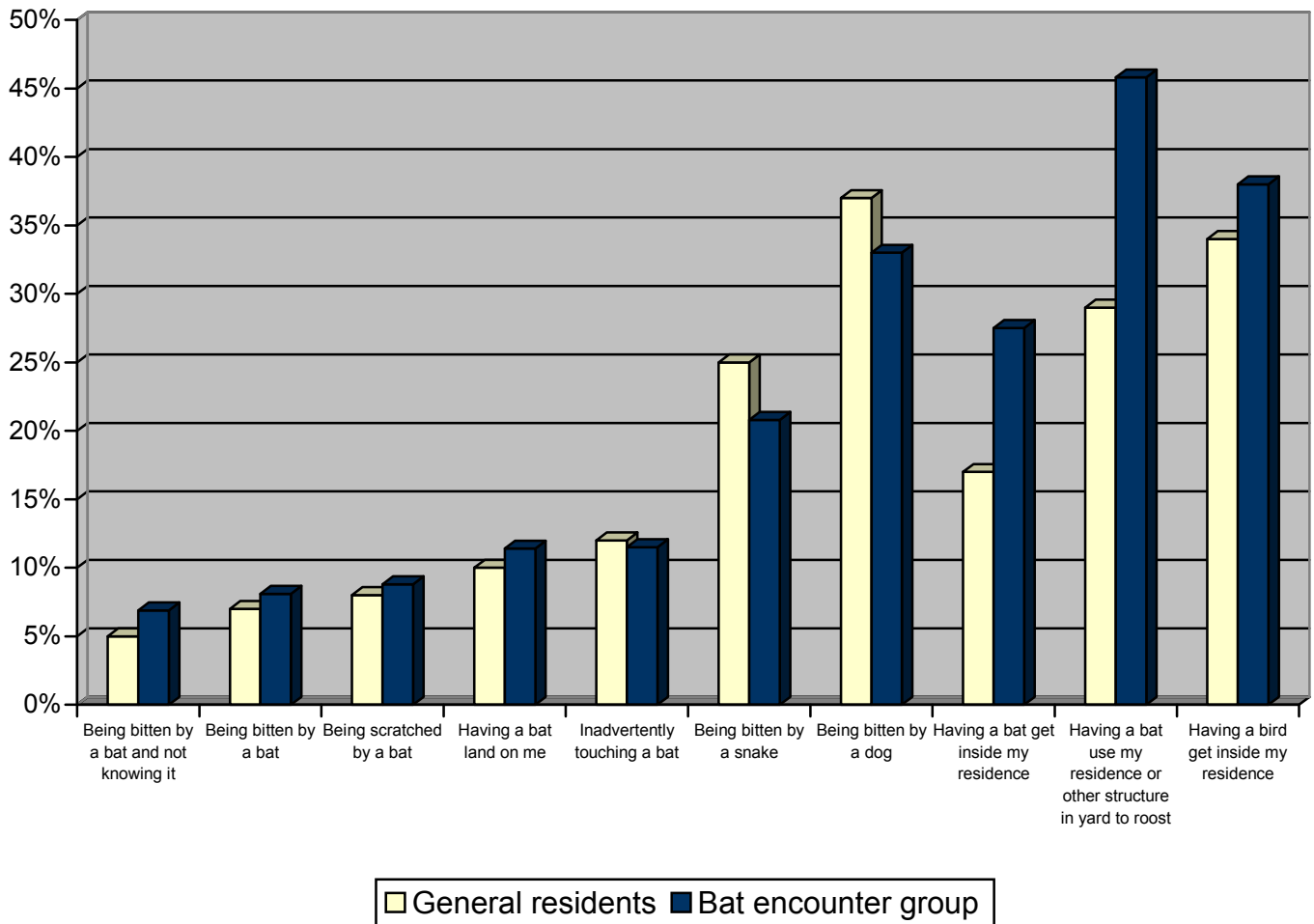


Figure 5. General residents of Fort Collins, Colo., and bat encounter group respondents' perceived likelihood of encountering a bat.

While perceived risks for bat encounters appeared fairly low, they were greater than the actual encounters that occurred in the general resident group, of which <1 percent had been bitten or scratched, had inadvertently touched a bat, or had one land on them, and approximately 7 percent had a bat inside their residence. Though there are no direct quantifications of the actual risk

of these events occurring, based on information available in the literature we would characterize respondents' perceived risks as somewhat overstated (Pape and others, 1999; Tuttle, 2000; and Gibbons and others, 2002).

Perceived Risks of Getting Rabies

When asked about their risk of contracting rabies if they came in contact with a bat, both general and bat encounter respondents perceived similar risks (fig. 6). Most general residents (70 percent) and bat encounter residents (84 percent) also agree that getting rabies is something to worry about (not shown in figure).

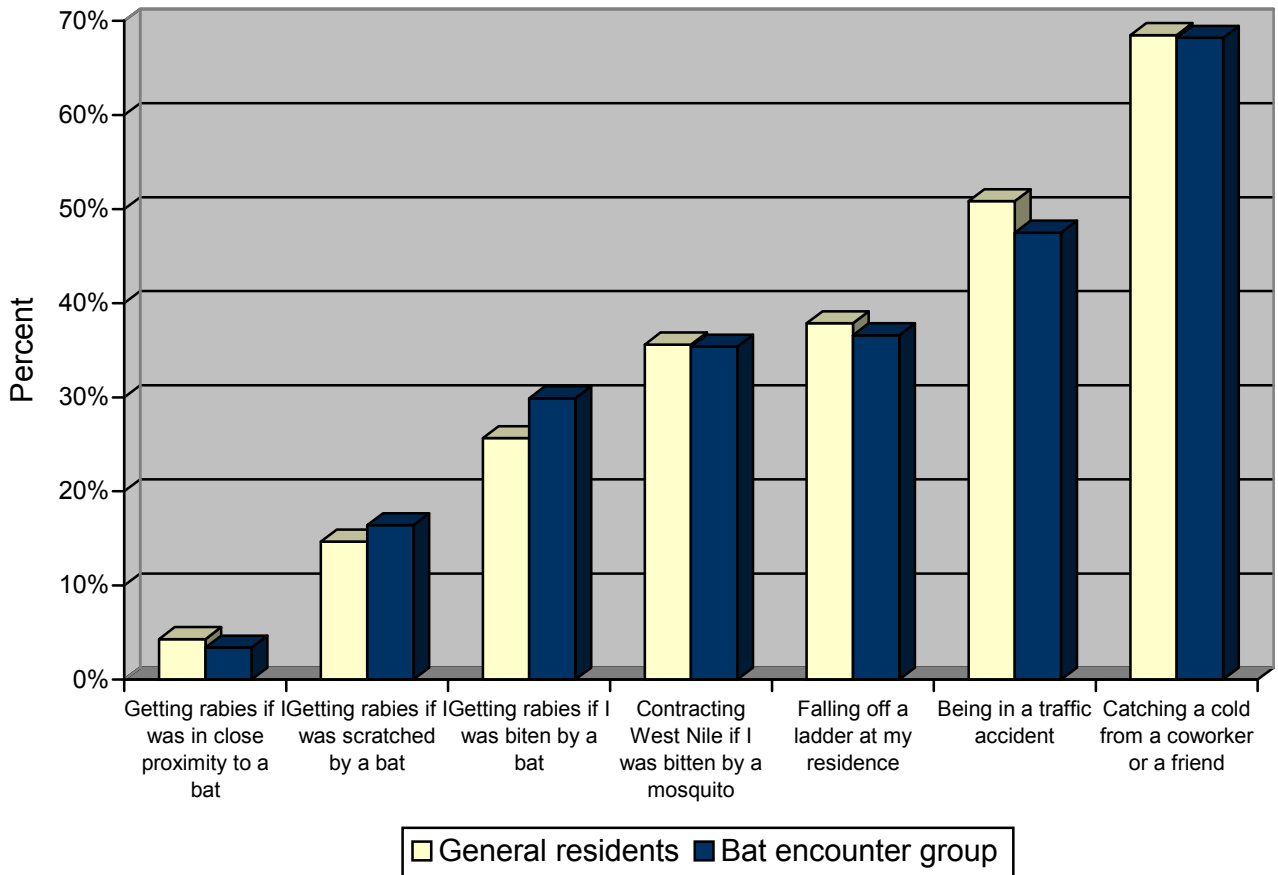


Figure 6. General residents of Fort Collins, Colo., and bat encounter group respondents' perceived risk of rabies if they were to encounter a bat.

Although it is difficult to make direct comparisons among datasets, a few studies provide insight into the actual risk of rabies from bat encounters. In Colorado, there has not been a case of human rabies reported since 1931 (Pape and others, 1999). One study suggests that, in most of North America, only a small proportion (about 1 in 1,000) of free-flying bats may be infected with rabies (Constantine, 1988). Other authors, however, suggest that the prevalence of rabies may be greater in big brown bats (the species most common in Fort Collins), ranging from nearly 2 in 100 to 5 in 100 individuals (Dean and others, 1960; Schnurrenberger and others, 1964; Girard and others, 1965; Constantine, 1967). Finally, a study by Pape and others (1999) reveals a 20 percent

occurrence of rabies in bats submitted for testing after a bite to a human. Based on these previous studies, the perceived risks indicated by respondents in this study are likely overestimated, despite the fact that they appear relatively low, especially for the likelihood of getting rabies if in close proximity to or if scratched by a bat.

Wildlife Value Orientations

There were no meaningful differences in wildlife value orientations between general and bat encounter residents. The prevailing wildlife value orientation was utilitarian (42 percent), whereas 45 percent scored in the neutral range, and only 13 percent classified as protectionists. This breakdown could have bearing on future management actions, if any arise, because previous studies have found links between wildlife value orientations and level of support for certain management actions. Specifically, those people with more utilitarian orientations tend to support more intensive actions, whereas people on the protectionist end of the scale favor less intensive management (Zinn others, 1998; Manfredo and others, 1998).

Attitudes and Beliefs toward Bats

Because there were no meaningful differences in attitudes and beliefs about bats between general and the bat encounter residents, results for general residents only are presented below. Fort Collins residents' general attitudes toward bats can be summarized as neutral-positive (fig. 7). Sixty percent of residents feel positively toward them and over half said they like bats. Only 20 percent said they did not like bats, with 30 percent being unsure or neutral.

When asked more detailed questions about their general beliefs regarding bats, nearly 90 percent of respondents believed that they are beneficial and an important part of a healthy ecosystem, and approximately 80 percent believed that they deserve protection. Most residents, in general, do not view bats as a nuisance or threat (figs. 8 and 9).

Residents' specific attitudes about having bats among them are positive, so long as they are at a distance (figs. 10 and 11). Residents feel positively about having bats in Fort Collins and in their neighborhoods, but they are more split on having bats use a structure in their yard for roosting. Their views on bats using their residence begin to approach the negative range. They clearly do not view guano or bats inside their residence as positive experiences.

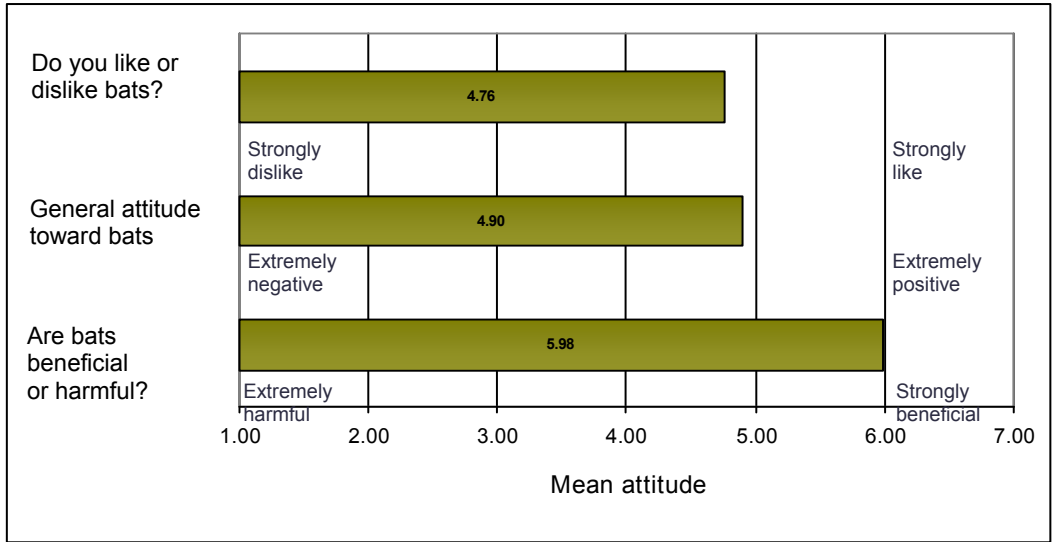


Figure 7. Fort Collins, Colo., residents' general attitudes toward bats.

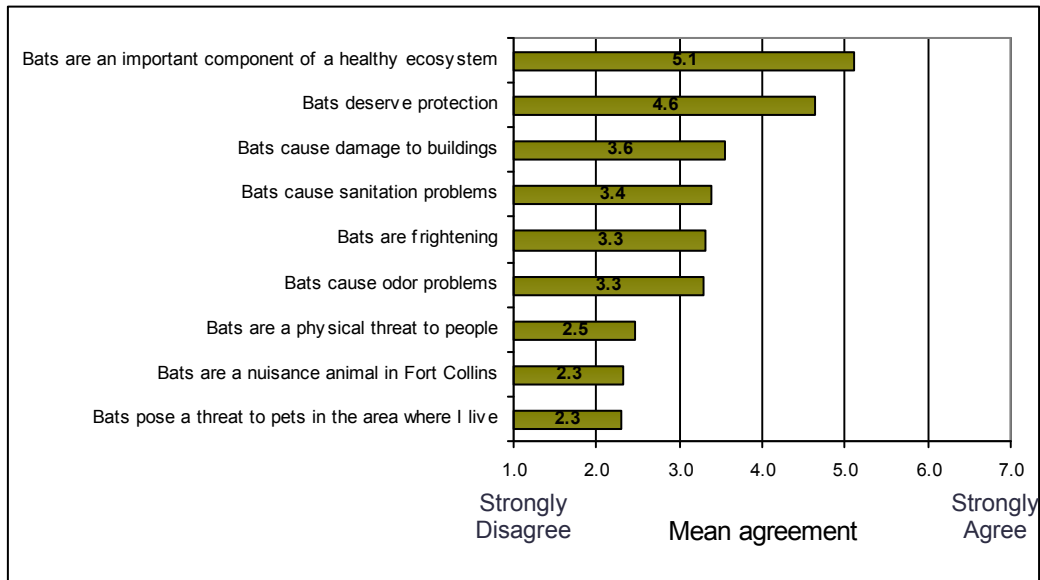


Figure 8. Fort Collins, Colo., residents' general beliefs about bats (mean scores).

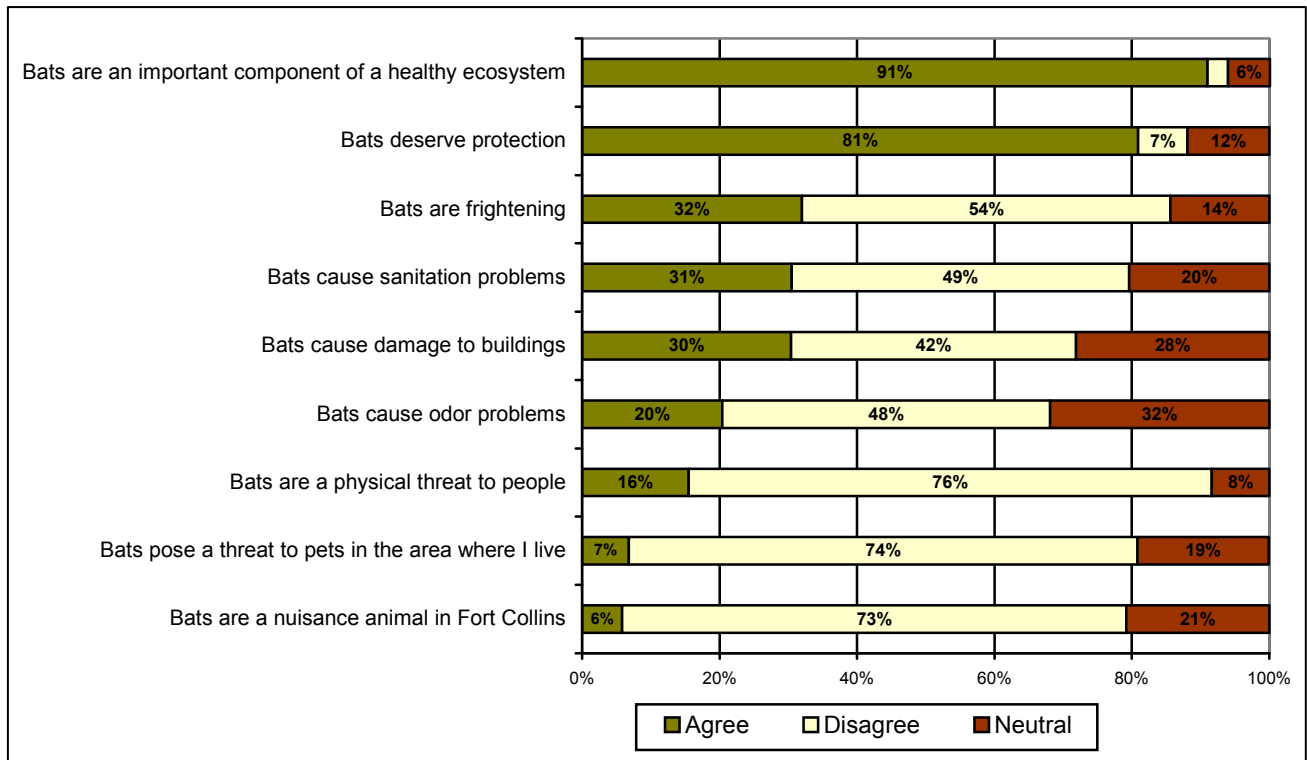


Figure 9. Fort Collins, Colo., residents' general beliefs about bats (percents).

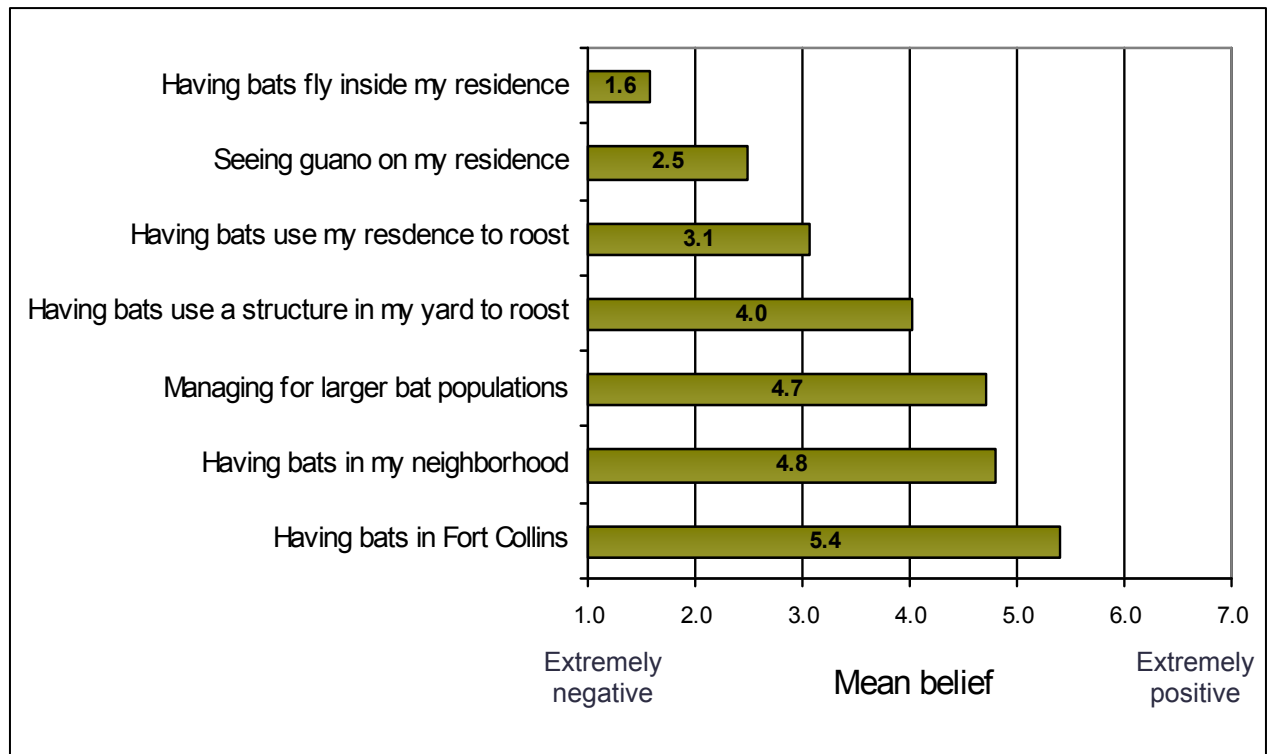


Figure 10. Fort Collins, Colo., residents' specific attitudes about bats (mean scores).

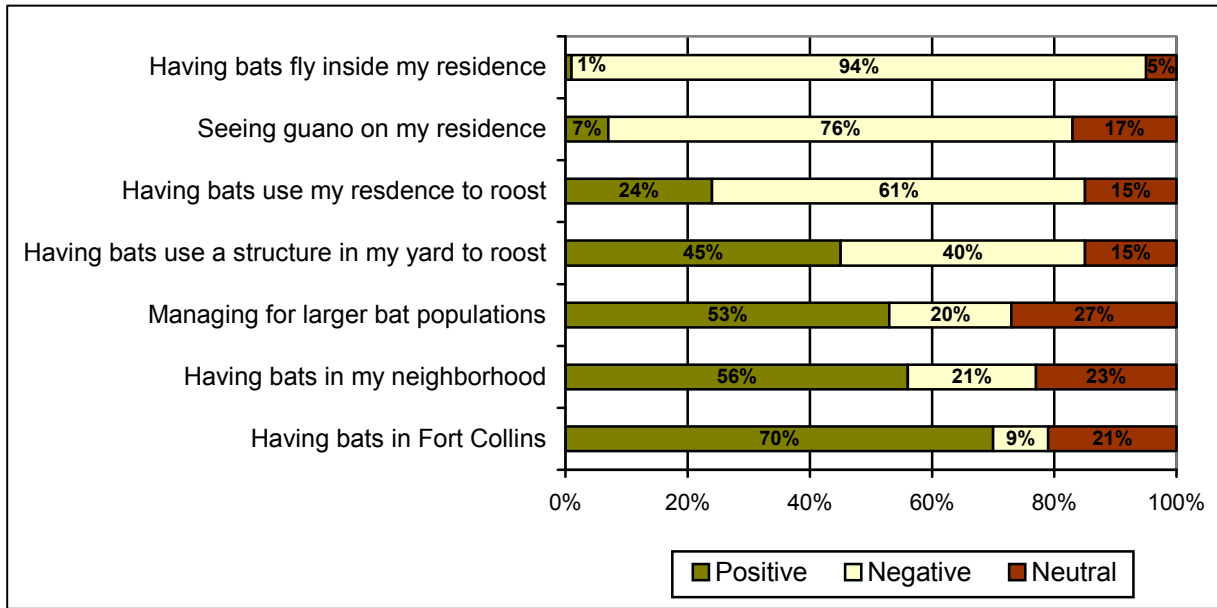


Figure 11. Fort Collins, Colo., residents’ specific attitudes about bats (percents).

Likely Behaviors toward Bats

Fort Collins residents had mixed reactions on their likelihood of taking various actions related to bat conservation (figs. 12 and 13). While residents indicated they would be likely to learn more about bats (either bats and disease or the potential benefits of bats), it was less likely they would attend a presentation about bats and unlikely they would join or support a bat conservation group. They were only somewhat likely to take actions that would encourage interactions with bats, such as putting up a bat box (29 percent) or allowing bats to use the outside of their residence (24 percent).

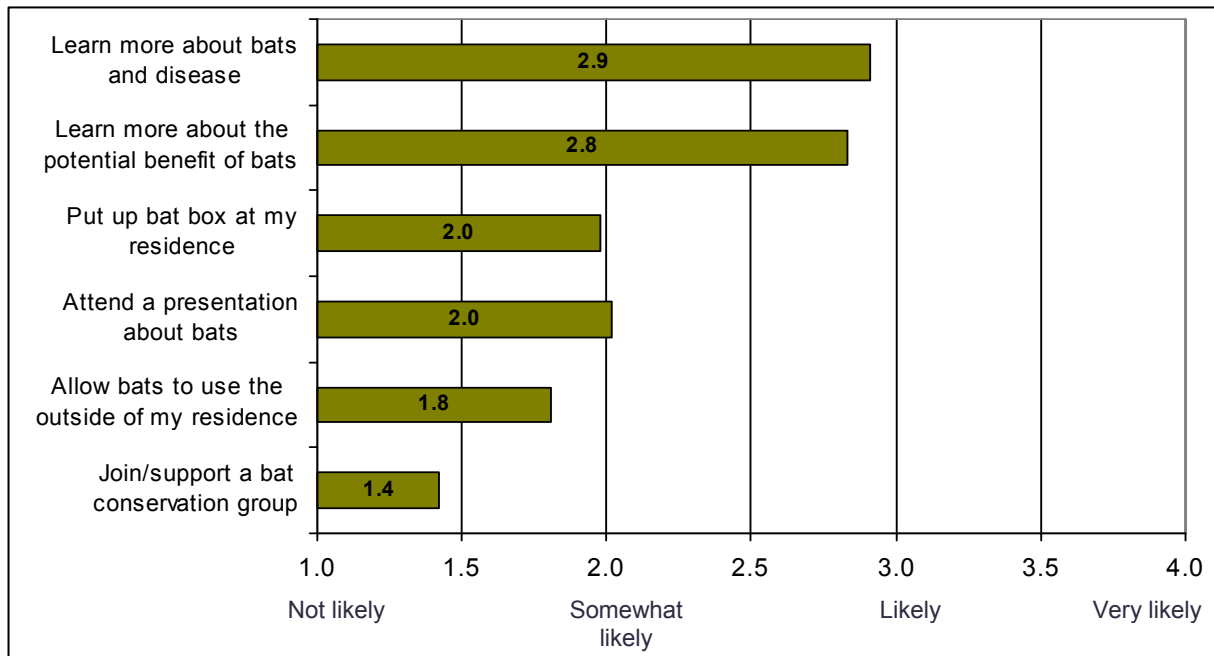


Figure 12. Fort Collins, Colo., residents’ likelihood of engaging in conservation behaviors regarding bats (mean scores).

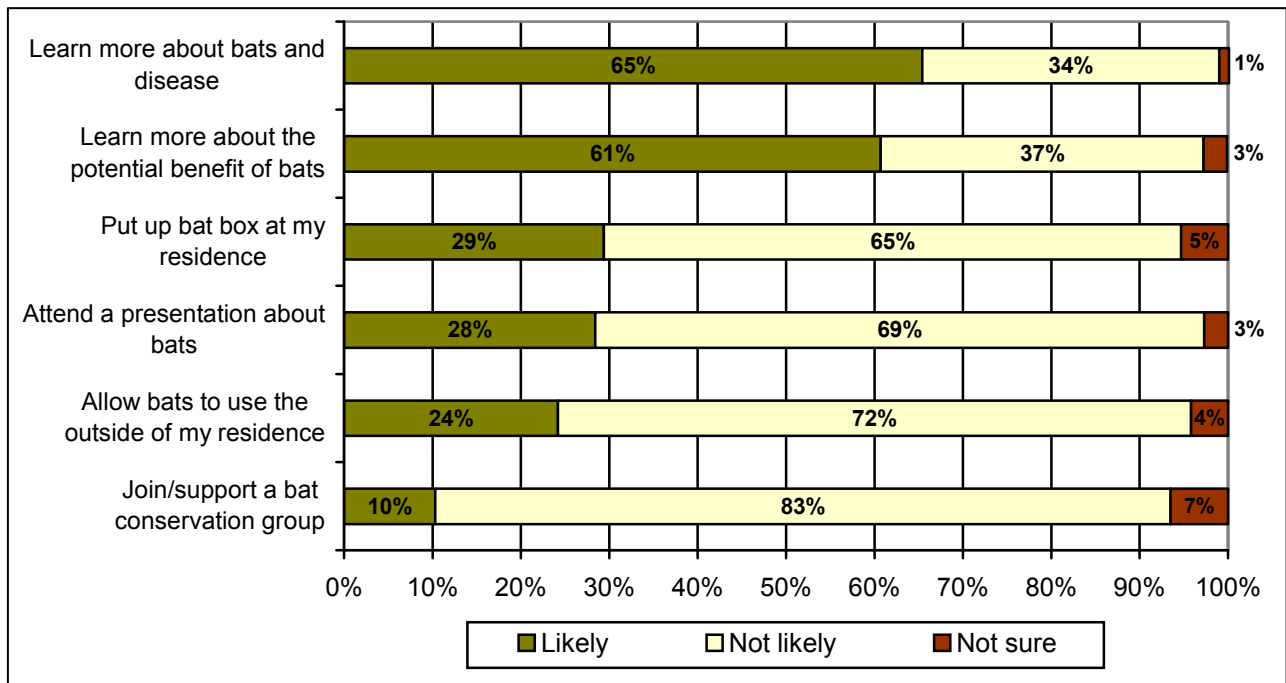


Figure 13. Fort Collins, Colo., residents' likelihood of engaging in conservation behaviors regarding bats (percents).

When asked about the likelihood of taking particular actions if bats were to use their residences for roosting, residents were likely to allow bats to stay but would obtain information about risks and safety precautions, or they would close off the entry and exit points of the building in winter when the bats are gone (figs. 14 and 15). Residents were less likely to have them removed via live trapping or simply allow them to stay, and they were not likely to have them removed via lethal methods.

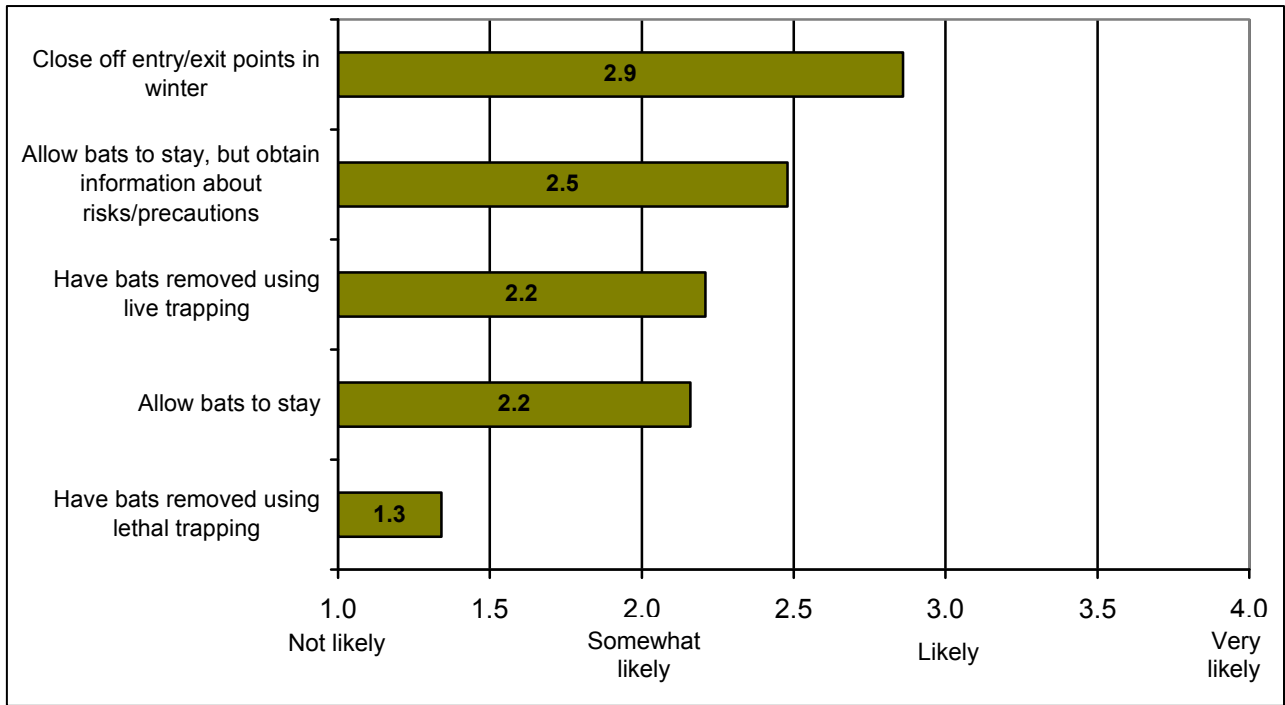


Figure 14. Fort Collins, Colo., residents' likelihood of mitigating bats in their residences (mean scores).

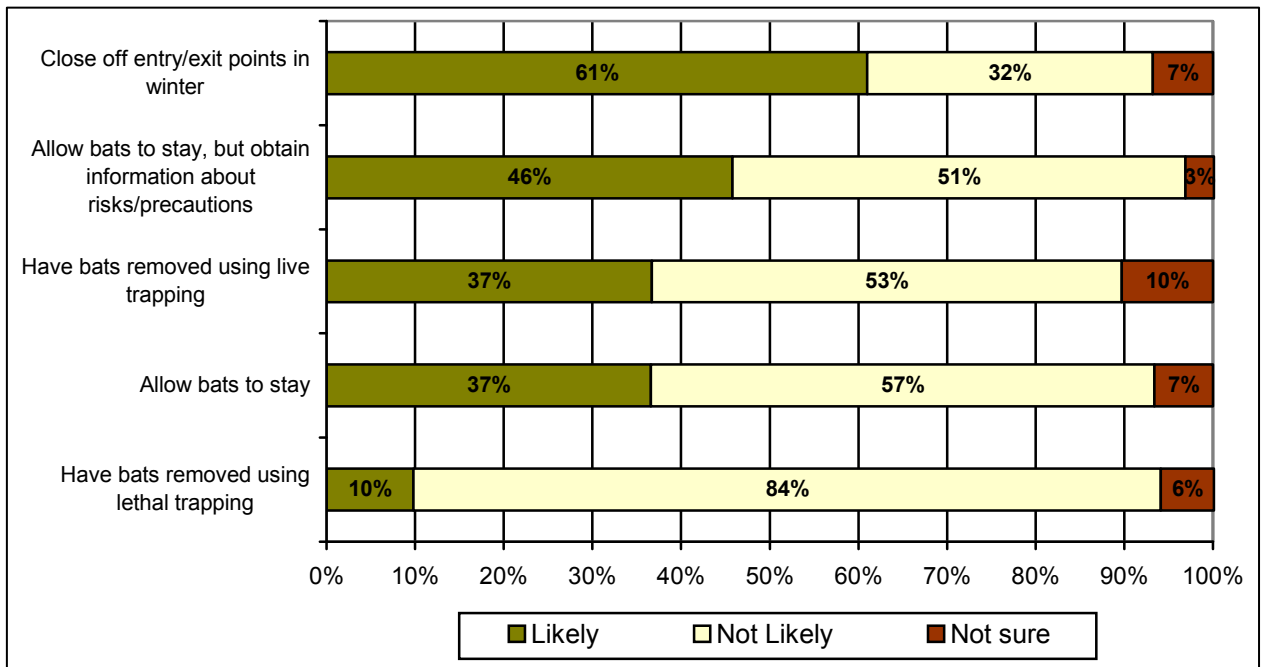


Figure 15. Fort Collins, Colo., residents' likelihood of mitigating bats in their residences (percents).

Communication

In all, 43 percent of bat encounter residents indicated that they were provided with information when they reported their encounter with a bat, and 25 percent sought information after the encounter. The type of information they received varied from verbal explanations about rabies risks and dangers and safe handling procedures to brochures and other written information. Most people who sought more information did so from public health officials (38 percent) or via the Internet (21 percent).

We asked both groups where they had obtained their news and information about bats in the past “5 years” (1999–2004; fig. 16). Nearly half of respondents in both groups have relied on newspapers and magazines, approximately 40 percent have relied on television, and approximately 30 percent have relied on friends, neighbors, and family members for their news and information about bats. In addition, many bat encounter residents have relied heavily on the Humane Society (40 percent of respondents) and public health agencies (18 percent) for information.

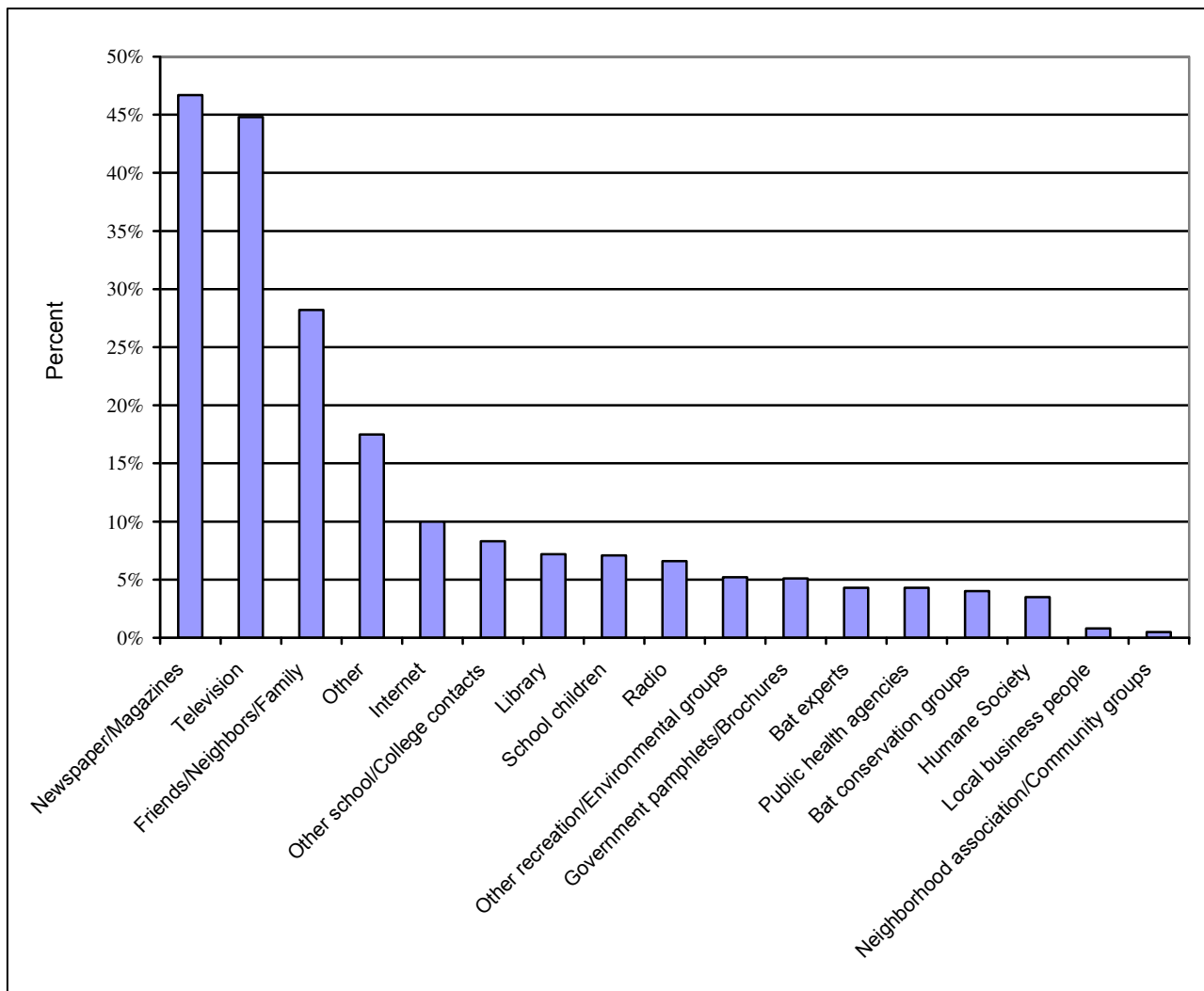


Figure 16. Sources that Fort Collins, Colo., residents have used for news and information about bats in the years 1999–2004.

Conclusions

There were few meaningful differences between general resident respondents and encounter group respondents in Fort Collins.

We hypothesized that having an encounter with a bat would likely affect attitudes, knowledge, and perceptions of risk among residents. We found, however, no meaningful differences in these variables between general and bat encounter residents. The only exception to this finding was that the bat encounter group perceived a greater risk of a bat using their residence for roosting or of getting inside their residence. This response was not unexpected, given that this had actually happened to most people in the bat encounter group. Further analysis is needed to gain more insight into the reasons as to why this encounter did not affect attitudes, knowledge, or perceived risk.

Residents had a high familiarity with bats but were not knowledgeable about them.

Nearly all residents (80 percent) were aware of bats in Fort Collins, and nearly three quarters of them have seen a bat in town. Their knowledge scores, however, were low on both bat ecology and rabies. Residents indicated that they were likely to learn more about the potential benefits of bats and the relationship between bats and disease. Residents primarily relied on newspapers, magazines, and television for their news and information about bats. The opportunity may exist for residents to learn more about bats through such sources, beyond the public service announcements and coverage of isolated incidents of a citizen being exposed to a bat. This learning opportunity may improve and prove positive given the lack of a prevailing negative attitude toward bats and the residents' interest in learning more about them.

Residents had positive attitudes and beliefs toward bats.

Overall, residents had neutral to positive attitudes toward bats. They did not see them as a threat or a nuisance and recognized them as beneficial and as an important component of a healthy ecosystem. While they liked having bats in Fort Collins, they were more neutral to negative regarding bats roosting in close proximity to their residence. It appeared that they tolerated being in close proximity to bats. In addition, residents' attitudes and beliefs about bats were positively correlated to their level of knowledge: those with greater knowledge had more positive attitudes toward bats.

Residents' behaviors toward bats were more likely to benefit than to harm bats.

Residents were likely to learn more about bats and the relationship between bats and rabies. Conversely, residents were unlikely to take measures to harm bats if they were using their residence. Again, this seemed to support residents' tolerance of a species that has traditionally been portrayed as threatening and a nuisance.

Residents had relatively low perceived risk of encountering a bat or contracting rabies from bats.

While possibly overstated, when compared to the literature on risk of bat encounters and contracting rabies from bats, residents' perceived risks were relatively low. Their perceptions of risks also were inversely correlated with their attitudes. Those with positive attitudes may have

more realistic perceptions of the risk of disease transmission and be more likely to engage in conservation behaviors and mitigation behaviors less harmful to bats. Conversely, those with inflated risk perceptions had more negative attitudes and may be less likely to engage in bat conservation behaviors and more likely to take intensive actions to be rid of bats.

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