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Coexisting with cougars: public perceptions, attitudes, and awareness of cougars on the urban-rural fringe of Calgary, Alberta, Canada

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Coexisting with cougars: public perceptions, attitudes, and awareness of cougars on the urban-rural fringe of Calgary, Alberta, Canada

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Abstract: Interactions between humans and cougars (*Puma concolor*) have been steadily increasing over the past 20 years largely due to human encroachment into cougar habitat and an increase in the human population. We determined the attitudes, knowledge, and perceptions toward cougars by residents in the urban-rural fringe of Calgary, Alberta, Canada, an area populated by both cougars and humans. We sent a survey to a stratified, random sample of 1,508 residents. Survey analysis included a potential for conflict index (PCI) to help provide quantitative direction for future cougar management. We analyzed and tested for differences among 7 variables: livestock ownership, gender, age, education, community of residence, years at residence, and experience with cougars. We found an overall positive attitude toward the presence of cougars in the area. However, residents indicated a low level of knowledge concerning regional wildlife management and wished to be more directly involved in planning and decision making. Recommendations developed from this study included: increasing the awareness of cougars through targeted education, facilitating of stakeholder involvement, developing of proactive cougar management strategies, and exploring adaptive management.

Key Words: cougar, human dimensions, human–wildlife conflicts, potential for conflict index, *Puma concolor*, risk perception

Frequency of interactions between humans and cougars (*Puma concolor*) have been increasing throughout North America (Beier 1991, McKee 2003); more cougar attacks have been reported within recent decades than over the last 100 years, a phenomenon that is largely the result of human encroachment into cougar habitat (Beier 1993, Torres et al. 1996, Weaver et al. 1996). Although cougars pose a greater potential threat to humans and livestock than wolves (*Canis lupis*) and occupy a larger extant range than grizzlies (*Ursus arctos*), public awareness of this ubiquitous felid has generally been overshadowed by other large carnivores (Kellert et al. 1996). However, the potential for cougar–human conflict will continue to rise as more people move out of cities and into rural landscapes. Managing these conflicts will require interdisciplinary approaches based on understanding cougar ecology; human dimension; and the complex relationships among people, cougars, and their shared environment. The purpose of this study was to determine the attitudes, knowledge, and perceptions toward cougars in the urban-rural fringe of Calgary, Alberta, Canada, and contribute to the management of the species.

Cougars recently have become a species of special concern in several areas of the North American West (Clark et al. 2005). Cougar populations throughout much of North America are believed to be increasing due to the removal of bounties, the development of regulated harvesting, and an increasing prey base (Decker and Chase 1998, Sweanor et al. 2000, Riley et al. 2004). Though cougars avoid human-dominated landscapes, they will travel through settled areas to access critical habitat patches and cross roads within their home range (Dickson and Beier 2002, Dickson et al. 2005). Many ranchers perceive cougars as threatening to their livelihood (Riley and Decker 2000, Teel et al. 2002). Suburban and rural residents also are increasingly experiencing threats and losses to cougar predation (Messmer 2000). For example, cougars prey on pets and pose

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a threat to humans, especially children (Beier 1991, McKee 2003). Many residents who live near cougar habitat feel general anxiety and fear due to perceived risk to their children, pets, and themselves (Riley and Decker 2000, Teel et al. 2002).

Human–cougar conflicts are increasing in frequency and will likely continue to escalate as humans increasingly compete with cougars for space and other resources (Madden 2004). Conflicts increase when stakeholders and local residents feel that their needs are being overshadowed by the needs of wildlife and that their voices and concerns are not being heard, leading to conflict between humans and wildlife, as well as conflicts among humans about wildlife (Madden 2004).

Methods

Study area

The study area was within the Municipal District 31 of Foothills (50° 19′ to 50° 55′ N; 113° 30′ to 114° 31′ E) in southern Alberta, Canada (Figure 1), encompassing an area of 1,448 km^2. The region contained numerous small to mid-sized communities, with 100 to 700 households per community and a rural population of approximately 7,065 people (Statistics Canada 2006, MADGIC 2007). The region was characterized by topography ranging from rolling grasslands to wooded foothills extending westward toward the Rocky Mountains. The northern boundary of the study area was adjacent to the city of Calgary, with a population of approximately 1 million, and the Foothills Municipal District of was one of the fastest-growing districts in Alberta (AlbertaFirst 2007). Agriculture was the predominant land use in the Foothills, with cattle ranching and cultivation constituting a large portion of the agricultural activities. Petroleum development and some forestry constitute the industrial uses of the land. However, it was the rapidly-increasing demand for rural residential subdivision that was the primary driver of significant regional landscape change. This trend was consistent with the rural migration that characterizes much of the Rocky Mountain West (Duke et al. 2003, Papouchis 2004, Southern Foothills Study 2007, White 2007) and made the study area representative and relevant to many other parts of North America.

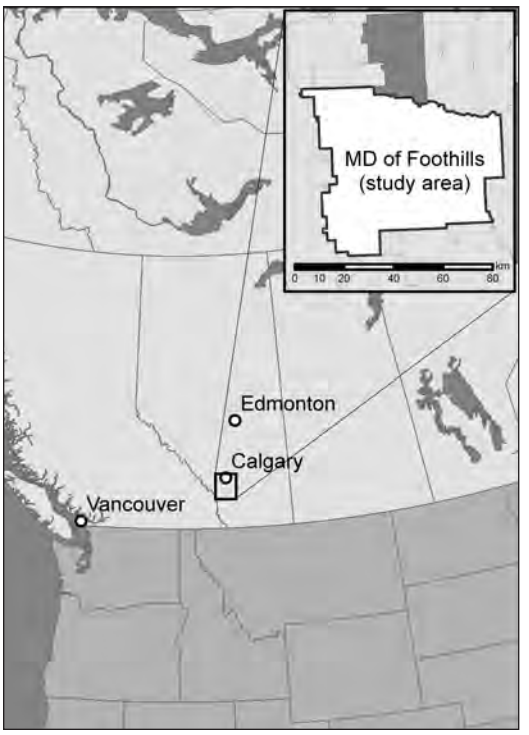

Figure 1. Study area map and boundaries, Municipal District (MD) of Foothills and Bragg Creek.

The study area provided some of the most productive cougar habitat in Alberta, with an estimated population of 68 cougars at an approximate density of 4 cougars per 100 km^2 (Jalkotzy et al. 1992; P. Young, Alberta Sustainable Resource Development (ASRD), personal communication). The cougar population is believed to be either increasing or holding steady and expanding eastwards beyond the current cougar management area boundaries (P. Young, ASRD, personal communication). Livestock depredation by cougars is uncommon in the study area. Frequency of cougar depredations reached its highest in 1997, when 22 depredations involving injury or loss of pets and livestock were reported. Subsequently, the cougar harvest quota was increased to 17 cougars (subquota, 9 females) for the following 3-year period. The quota has since been reduced to 12 cougars (subquota, 6 females), and the number of depredation occurrences stabilized at 10 or 11 annually (2003 to present) within the district (P. Young, ASRD, personal communication).

Survey design and distribution

We distributed surveys via unaddressed mail to a stratified random sample of 1,508 households within the study area, >50% of the residences. Stratum divisions were based on community mailing districts. The surveys were anonymous and followed the tailored-design method of Dillman (2007). The questionnaire was in booklet form and consisted of 37 closed-ended questions and a simple question-and-answer format to minimize misinterpretation and maximize ease of response. We used a 7-point Likert-type scale; scores ranged from -3 to +3 (-3 = strongly disagree; -2 = disagree; -1 = somewhat disagree; 0 = neutral; 1 = somewhat agree; 2 = agree; and 3 = strongly agree). The questionnaire contained 4 distinct sections: (1) a wildlife attitude section with 17 statements designed to measure acceptance of and beliefs about wildlife, hunting and wildlife rights, education and awareness, and government involvement and public participation; (2) a cougar-specific attitude section containing 20 statements designed to measure risk factors and perceived risk, cougar presence and acceptance, knowledge and beliefs about cougars, and government involvement and regulations; (3) a cougar management section containing 12 human–cougar conflict scenarios where respondents selected one of the following management strategies as most appropriate: do nothing, monitor the cougar, exercise preventative measures (i.e., hazing and aversive conditioning), relocate the problem cougar, kill the problem cougar, or other strategies; and (4) a demographic information section. We also created a web site as an electronic option for completing the survey. The University of Calgary granted ethics approval for all aspects of the research involving human subjects.

Data analysis

We entered survey responses into a statistical software package (SPSS) for analysis. We summarized frequency data for each survey variable, and all variables were either nominal or ordinal. We used an independent-samples *t*-test for response variables for both gender and livestock ownership. This included Levene's test for equality of variances and both pooled- and separate-variance *t*-tests for equality of means. We conducted 1-way ANOVAs with post-hoc tests for multiple comparisons for the following variables: age; education (number of years of formal education); community; years at present residence; and level of experience with cougars. We conducted nonparametric tests, where necessary, using the Mann-Whitney U and Kruskal-Wallis H tests.

We determined a Potential for Conflict Index (PCI) for all wildlife and cougar statements. The PCI is a technique for graphically representing information to facilitate easy assimilation of results; it simultaneously conveys central tendency, dispersion, and form (Manfredo et al. 2003, Vaske et al. 2006). To compute the PCI, a 5- or 7-point scale with a neutral center point is required, as well as the variables' frequency distribution and mean (Manfredo et al. 2003, Vaske et al. 2006).

Assumptions

Postal surveys are one of the most efficient methods of collecting data from large numbers of respondents across large geographical areas, but they suffer from low-response rates, typically less than 50% (Weisberg et al. 1996). A low response rate may suggest that the issue in question is not particularly important to the target population, and nonresponse bias can be minimized only by high-response rates; however, for the purpose of this study, we assumed that nonrespondents were not as interested or outspoken about the issue in question and would, therefore, be ambivalent about cougar management. This assumption also has been noted in similar survey studies (Tarrant et al. 1993, Loker et al. 1999, Riley and Decker 2000, Chase et al. 2002). Second, we assumed that whether respondents resided in a rural, residential community, or on a large acreage, the majority of residents considered themselves rural citizens more than urbanites; therefore, we treated the entire study area as rural. Rural sociologists have frequently subdivided rural populations into farm and nonfarm to understand attitudes in rural areas (Heberlein and Ericsson 2005). To determine attitudes between groups and as an alternative to urban-rural divide, we differentiated residents based on their ownership of livestock.

Results

The overall survey response rate was 29%,

and at a confidence level of 95%, the error estimate is 5%. Based on the study area population size and a 95% confidence level, we required only 367 returned surveys for a statistically significant sample (Dillman 2007).

The gender ratio of participants was 41% male to 59% female. Consistent with census demographics in the Foothills (AlbertaFirst 2007), age was normally distributed, with most of participants being in age groups from 40 to 49 years (26%) and 50 to 59 years (29%). Many of the participants had completed either secondary school, undergraduate or graduate studies (39%, 34%, and 25%, respectively), and only a small sample had completed primary school only (2.4%). Approximately half (48%) of the respondents lived at their residence for >10 years.

A total of 154 (36%) participants owned livestock, the majority of these owning cattle and horses. Approximately one quarter (23%) said they had experienced livestock loss due to cougars, and 48.6% were willing to accept some predation loss. Most (78%) livestock owners stated that they were willing to change their husbandry practices to minimize livestock predation.

We provided the opportunity at the end of the survey for participants to write additional comments. Many of the participants' comments addressed the belief that people should not move into the area unless they were willing to accept the presence of wildlife, and numerous residents spoke of past encounters with cougars, with both positive and negative perspectives on the occurrence.

Overall attitudes and beliefs

The level of experience that participants had with cougars was normally distributed, and 40% reported a moderate level of experience, meaning that either the participants themselves or a family member had observed a cougar in the wild. There was a general lack of consensus about the perceived status of the current cougar population in the Foothills, i.e., whether the population was increasing, decreasing, or remained the same.

Survey respondents were accepting of cougars in the Foothills (Figure 2). Many (43%) agreed that the presence of cougars increased their overall quality of life. Over half of the respondents (65%) believed that cougars are an acceptable threat to both livestock and humans (54%), with no significant difference found between livestock and non-livestock owners. Respondents also disagreed with the statements, "I would be happier if there were no cougars at all" and "There are too many cougars in Alberta' (92% and 63%, respectively).

Residents were divided on the acceptance of hunting, and their opinions toward wildlife rights. Most participants were not opposed to hunting and agreed that some hunting was acceptable, as long as the wildlife population was not jeopardized (72% and 53%, respectively). The majority of participants (87%) did not believe that cougars reduce hunting opportunities or hurt the economy.

Most residents (61%) strongly agreed that they enjoyed learning about wildlife and that it is important to learn as much as possible about wildlife issues (56%). When asked if they considered themselves well aware of current wildlife and conservation issues in their communities, only a small percentage (6 –7%) were in strong agreement. Many respondents (71%) expressed the desire to be more involved in government decision making, and there was general consensus that there was a lack public participation in wildlife management.

When residents were asked whether they believed they were personally at risk from cougars, the majority of respondents disagreed (65%). The perceived risk and fear that residents felt towards cougars varied widely (Figure 3); however, 73% of residents disagreed overall that there was currently a cougar problem in their area, and agreed or strongly agreed (36% and 41%, respectively) that though living with cougars poses certain risks, they could learn to accept these risks and co-exist with the presence of cougars in the foothills.

Differences among subgroups

Gender. Males agreed more strongly that the hunting of cougars and wildlife was acceptable and that humans can cause the loss of some individual animals as long as the population is not jeopardized (Table 1). Female respondents had a more protective attitude toward cougars and had less experience with cougars than did male respondents; however, females felt more personally at risk from cougars and fearful to

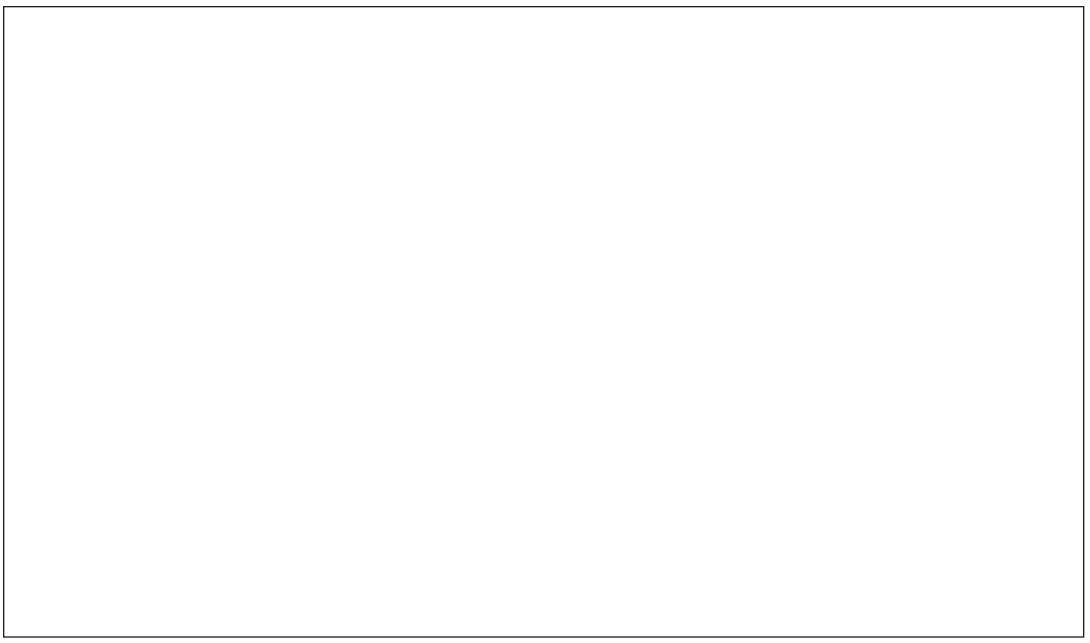

Figure 2. Potential for Conflict Index (PCI) results for cougar presence and acceptance statements. (The size of the bubble shows the PCI and indicates the degree of dispersion. The PCI ranges from 0 to 1, with 0 representing no conflict and 1 representing very high levels of conflict. The smaller the bubble, the less potential conflict or divergence exists within the population; larger bubbles reflect more potential conflict. The center of the bubble, which is plotted on the y-axis, represents the mean score [central tendency] on the variable. The neutral point on the rating scale is the x-axis, and the position of the bubble shows if, on average, respondents' beliefs lie above or below the neutral point [i.e., whether, on average, the statement is acceptable or unacceptable] on a scale from -3 [strongly disagree] to 3 [strongly agree]).

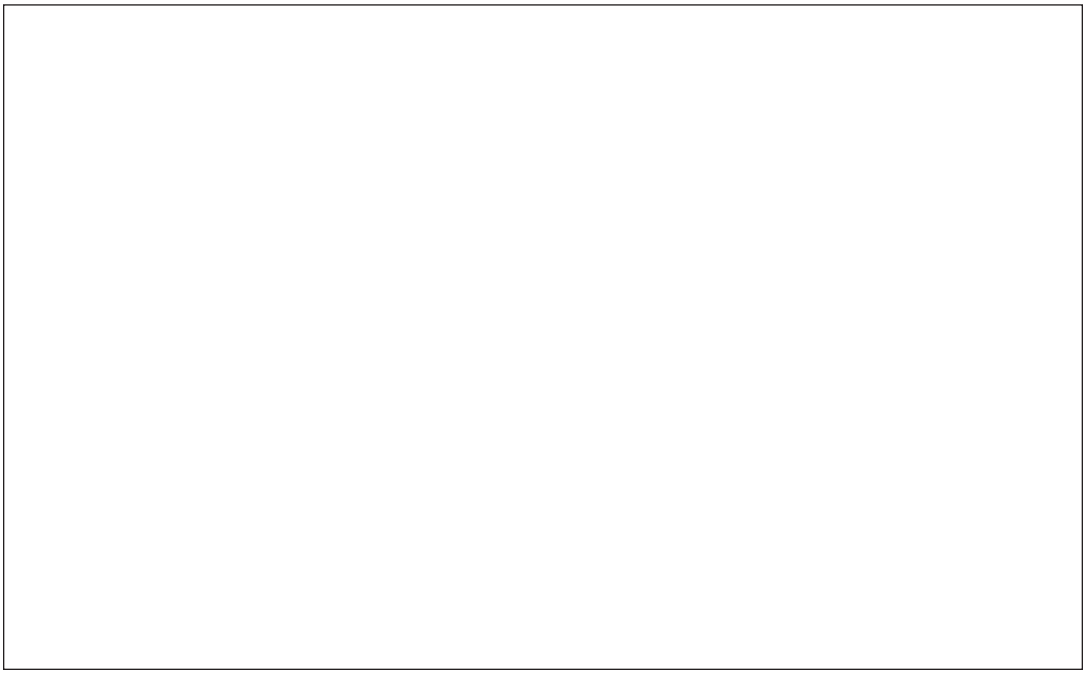

Figure 3. PCI results for risk factors and perceived risk statements.

Table 1. Selected gender *t*-test results.

Statements	Male			Female					
	N	Mean	SD	*N*	Mean	SD	*t* value	*df*	*P* value
Hunting helps people enjoy the outdoors and appreciate wildlife.	173	0.92	±1.96	246	-0.53	±1.95	7.51	370	<0.001
There is nothing wrong with harvesting cougars as long as it is properly regulated.	173	0.50	±1.96	248	-0.94	±1.86	7.58	358	<0.001
I would be afraid to go into the wilderness if I knew there was a cougar living in the area.	173	-1.18	±1.66	250	0.06	±1.98	-6.77	421	<0.001
I consider myself aware of conservation issues in my community.	174	1.06	±1.30	250	0.54	±1.47	3.77	422	<0.001
I feel well informed on current wildlife issues.	174	0.78	±1.46	249	0.45	±1.53	2.18	383	0.03
Cougars deserve protection	172	1.62	±1.38	249	2.06	±1.14	-3.52	419	<0.001

Table 2. Selected years at residence one-way ANOVA results.

Variable	Years at residence	*N*	Mean	SD	*F* value	*P* value
I believe that cougars would attack a human without being provoked.	<1 year	23	-0.17	±1.70	3.37	0.019
	1–5 years	93	-0.34	±1.89		
	6–10 years	98	-0.19	±1.98		
	>10 years	207	0.30	±1.77		
The government should not interfere with how a person deals with nuisance cougars on their own land.	<1 year	23	-0.83	±1.70	3.76	0.011
	1–5 years	94	-0.62	±1.93		
	6–10 years	98	-0.67	±1.84		
	>10 years	206	-0.02	±2.08		
Landowners should be compensated for any financial loss that is caused by cougars.	<1 year	23	0.22	±1.76	4.38	0.005
	1–5 years	94	-0.20	±1.69		
	6-10 years	98	-0.22	±1.92		
	>10 years	206	0.45	±1.83		
I consider myself aware of conservation issues in my community.	<1 year	23	0.13	±1.55	10.12	<0.001
	1–5 years	94	0.34	±1.34		
	6–10 years	99	0.51	±1.52		
	>10 years	207	1.12	±1.32		

enter the wilderness where cougar populations were known to exist. Females also did not consider themselves as aware of wildlife and conservation issues within their communities as did male respondents.

Age and education. The youngest age group (18–29 years) were the least interested in learning about wildlife ($F_{6, 427} = 3.18$, $P = 0.008$) and agreed least that the presence of wildlife was an important part of their community

Table 3. Selected level of experience with cougars one-way ANOVA results.

Variable	Level of Experience	*N*	Mean	SD	*F* value	*P* value
The presence of cougars near my home increases my overall quality of life.	Very high	23	0.57	±2.09	2.83	0.024
	High	92	0.50	±1.84		
	Moderate	171	0.51	±1.65		
	Low	100	-0.13	±1.57		
	None	39	0.15	±1.46		
There is nothing wrong with harvesting cougars as long as it is properly regulated.	Very high	23	1.52	±1.73	9.03	<0.001
	High	92	0.05	±2.09		
	Moderate	172	-0.42	±1.02		
	Low	99	-0.88	±1.77		
	None	38	-0.92	±1.75		
I believe I am personally at risk from cougars.	Very high	22	-0.41	±2.02	4.60	0.001
	High	93	-0.60	±2.02		
	Moderate	172	-1.21	±1.62		
	Low	99	-1.52	±1.40		
	None	39	-1.15	±1.63		
I would be afraid to go into the wilderness if I knew there was a cougar living in the area.	Very high	23	-0.91	±2.11	6.57	<0.001
	High	93	-0.88	±2.18		
	Moderate	172	-0.65	±1.86		
	Low	100	0.03	±1.77		
	None	39	0.59	±1.68		

($F_{6, 425} = 2.71$, $P = 0.02$). The respondents' personal beliefs as to their level of awareness of current wildlife and conservation issues increased as age increased ($F_{6, 426} = 4.41$, $P = 0.001$). We found no significant differences with regards to the level of education attained by participants.

Livestock ownership. Livestock owners believed more strongly than non-livestock owners that the government should not interfere when dealing with nuisance wildlife and cougars on their own land ($t_{429} = 3.26$, $P = 0.001$) and that there should be financial compensation for any loss caused by cougars ($t_{427} = 4.87$, $P < 0.001$). Livestock owners had more experience with cougars and felt somewhat more personally at risk ($t_{426} = 2.31$, $P = 0.02$), whereas non-owners of livestock had less experience with cougars and did not feel as well-informed or aware of current wildlife and conservation issues ($t_{429} = 3.88$, $P < 0.001$).

Years at residence. Residents who lived in the study area for >10 years had the largest amount of experience with cougars ($\chi^2 = 24.67$, $P < 0.001$) and agreed most that cougars would attack without being provoked (Table 2). They believed most strongly that the government should not interfere with how residents deal with nuisance cougars on their own land and that financial compensation should be provided for financial loss caused by cougars. Participants who have lived in the foothills for <5 years felt least informed of wildlife issues, and the level of perceived awareness of current wildlife issues in their communities increased as the years living at their residence increased (Table 2).

Level of experience with cougars. Respondents in the very high category of experience with cougars (i.e., they or their livestock and pets

Table 4. Frequency results for preferred management actions for cougar interaction scenarios. Results shown in percent (%) each management action was preferred for the scenario.

Scenarios	Preferred management actions (%)						
	Do nothing	Monitor	Exercise preventative neasures	Relocate	Kill	Other	No response
A cougar is seen feeding on a deer carcass on a trail.	**47.7***	30.9	10.0	2.3	0.2	7.4	1.4
A cougar is repeatedly seen on a popular trail.	4.7	**40.7**	27.9	16.0	0.9	8.4	1.4
A cougar stalks a cross-country skier on a trail.	0.2	8.8	32.6	**41.2**	10.2	5.8	1.2
A cougar injures a hiker on a trail.	0.2	2.8	11.2	**47.4**	29.8	6.0	2.6
A cougar is repeatedly seen entering and wandering around the neighborhood.	1.6	12.1	24.0	**54.0**	3.0	4.2	1.2
A cougar attacks and kills a pet in the neighborhood	5.6	11.2	28.1	**40.0**	8.8	4.4	1.9
A cougar kills several pets in the neighborhood.	2.6	3.0	13.7	**54.0**	20.5	4.4	1.9
A cougar attacks and kills a person in the neighborhood.	0.2	0.2	1.2	17.7	**75.1**	4.4	1.2
A cougar charges and knocks down a person on a trail, then leaves.	1.9	14.4	22.1	**40.9**	12.6	6.7	1.4
A cougar kills a person on a trail, but the cougar is a mother with cubs.	2.1	9.3	9.3	**42.6**	26.5	8.6	1.6
A cougar kills a person on a trail and the cougar has a history of aggression.	0.2	0.2	0.5	11.6	**80.9**	5.3	1.2
A cougar kills a person on a trail (no other details).	0.5	3.0	3.5	21.2	**58.6**	10.7	2.6

* Bold face percentages represent preferred management action for each scenario.

were threatened by a cougar) agreed most strongly that regulated harvesting of cougars should be implemented and that presence of cougars near their homes increased their overall quality of life (Table 3). Awareness of conservation and wildlife issues throughout the Foothills increased as the level of experience with cougars increased ($F_{5, 427} = 7.90$, $P < 0.001$). Survey participants with very high levels of experience felt the most personally at risk; nevertheless, these participants also comprised the group that was least afraid to go into the wilderness where there was known to be a cougar present (Table 3). Overall, all groups agreed that though living with cougars poses a risk, they were willing to accept this risk and co-exist with cougars in the Foothills ($F_{5, 426} = 4.21$, $P = 0.002$).

Cougar management scenarios

The most preferable management action for 7 of the 12 cougar management scenarios provided in the survey was to relocate the cougar (Table 4). Relocation was the preferable action for all scenarios where a human was injured or pets were killed. For all scenarios involving a human being killed, the preferred action was to kill the offending cougar; the only exception to this was to relocate the animal when the offending cougar was a mother with kittens (Table 4).

Discussion

The presence of cougars in the Foothills appears to be both accepted and enjoyed by most residents. Protecting and maintaining wildlife and cougar populations for future generations was highly valued by respondents, and this attitude should be considered in local land-use planning. This would include consideration of wildlife requirements when constructing new developments (e.g., placement of new roads), industrial and agricultural uses, and planning new subdivision in the Foothills.

We found that male and female attitudes and beliefs also diverged greatly for many of the statements. Females had less experience with cougars, were more fearful of them, and did not feel as aware of wildlife or conservation issues as did males. This fear is likely correlated positively with knowledge of wildlife species, and results from this study suggest that women did not feel as well-informed or knowledgeable about wildlife and the wilderness. Even though females were more fearful, they were still more supportive of protecting wildlife from suffering and the equality of wildlife rights than were males. These gender findings are consistent with Zinn and Pierce's (2002) findings that gender values differed regarding the environment and that women tended to express more concern over human-caused environmental risks than did men.

Age and level of education were weakly related to attitudes in the study area. The most notable difference was the apparent lack of desire of younger respondents to learn about wildlife. The youngest age group had a smaller sample size (N = 18, 4.2%) than did the other age groups, which may account in part for the level of distinctness found. A larger sample size of individuals under the age of 30 would be needed to develop any solid conclusions about this difference and demographic, including dependent children. This should be the focus of further human dimensions research.

We found that communities that were located within close proximity of urban centers (e.g., the city of Calgary) were the most fearful of cougars, yet, had the least amount of experience with them. Newer residents who had lived in the Foothills for <10 years also had less experience with cougars and felt least informed about wildlife and conservation issues. These findings are important due to the rapid growth and population change of the Foothills region. This rapidly changing demographic can lead to a division between long-time residents and new urbanites, resulting in differences in attitudes and values toward wildlife and wildlife management. This culture clash can lead to conflicts in local communities (Kellert 1996, Manfredo and Zinn 1996, Decker et al. 2001, Teel et al. 2002, Clendenning et al. 2005). For example, people living in rural areas tend to have more trust in local sources than people in urban areas, who have more trust in institutional sources (Skogan and Thrane 2008). In this study, the proximity to Calgary and years of rural residency appear to be leading factors resulting in residents' differences of perceived risk, knowledge, and awareness of cougars. Newer residents tended to be from a more urban background and not as familiar with the risks and costs of living with wildlife, resulting in their heightened fear of cougars. Areas experiencing rapid growth and population change should be targeted for wildlife educational programs. By increasing the awareness of these new residents, the values of old and new residents may be less divergent and contribute to a common goal of ecological protection, less perceived risk, and positive attitudes toward wildlife.

Rural residents tend to be particularly sensitive to the costs of living with wildlife because they bear a disproportionate share of those costs. Livestock loss is the greatest source of conflict between humans and large felids (Mazzolli et al. 2002). Previous studies have shown that rural residents and livestock owners tend to hold more negative attitudes toward carnivores than do others (Bjerke and Kaltenborn 1999). We found that most respondents, including livestock owners, have overall positive attitudes towards cougars and are very tolerant of small amounts of depredation; however, attitudes in an area can change quickly if depredation increases. A study by Bagchi and Mishra (2006) on livestock depredation by snow leopards (*Uncia uncia*) found that the community experiencing the largest amount of livestock loss were actually the most tolerant of snow leopards due to the presence of a conservation incentive program at the site. Therefore, if conflict does increase

and attitudes appear to be shifting toward more negative values on cougars, then compensation programs, incentives, and education should all be considered as tools for mitigating potential negative effects.

Level of experience with cougars and risk factors

Attitudes held toward cougars were closely related to the level of direct experience individuals had with cougars. Those having high or very high levels of experience felt most at risk and were more accepting of cougar harvesting. However, while this group also was the most aware of the potential risks that cougars pose, they still highly valued cougar presence.

Risks with a low probability but severe consequences tend to increase fear and elevate perceived risks (Decker et al. 2002). Similarly, risk perceptions are increased when the risk factor is perceived as uncontrollable and involuntary (Slovic 1987). For example, while skiing or driving a car both pose certain risks, these are voluntary risks that individuals have chosen to accept. The actual risk of a cougar attack is extremely low; however, a cougar encounter is neither controllable nor voluntary, thus, the dread towards this type of occurrence. Riley (1998) found that the public's perceived risks are much higher than actual risks in regards to cougars, a finding that is consistent with our study. A survey of acceptance of cougars in Montana also found that individuals with negative attitudes toward cougars were those who believed the cougar population was increasing, had risk beliefs that implied fear of cougars, and perceived a disparity among people who felt cougars were beneficial to them and those who felt they were at risk (Riley and Decker 2000). The current study found that Foothills residents were uncertain of current cougar population trends and risk beliefs were high in some areas. High levels of fear toward large carnivores can be partly attributed to a lack of knowledge about the ecology and behavior of the species (Kleiven et al. 2004). Under current conditions, the attitudes toward cougars in the Foothills are generally positive. As the human population in the Foothills continues to grow, however, the current conditions and cougar population may not remain static for long, and if residents lack proper understanding and awareness of cougars, tolerance toward the species may quickly diminish (Figure 4).

Figure 4. A cougar image captured by a remote camera deployed in the study area.

In addition to increased risk, an indirect and important issue that may arise in expanding rural communities is the habituation of wildlife toward humans. Habituation is common in areas where human development borders on wildlands (Whittaker and Knight 1998, Baron 2004). Urban migrants may move to rural areas for a slower pace of life and for closeness to nature. Some residents enjoyed seeing deer in their backyards or even encouraged them. The presence of human settlement, however, can change the behaviors of ungulates. Deer may graze in urban areas during the day and gain some protection from predators. Predators have been known to adapt their own behaviors in response to adaptation of their prey (Whittaker and Knight 1998, Peine 2001). The idea of cougars habituating to human environments is one of increasing concern in some areas, as demonstrated in Boulder County, Colorado, where cougars are increasingly being encountered during daylight hours and closer to human-inhabited areas (Halfpenny et al. 1991, Baron 2004). Wildlife populations should be monitored closely in urban areas to track this phenomenon. Proactive education is important to make residents aware of the potentially harmful situations that may arise from habituation of wildlife and how to take steps to avoid it actively.

Cougar management scenarios

Relocation was the most acceptable management action for most (7 of 12) of the cougar management scenarios we provided in

the survey. This finding is consistent with other cougar survey studies (Casey et al. 2005) where residents preferred that cougars be relocated or removed when they caused problems affecting humans, such as pet and livestock depredation and human injury. Though most residents enjoy and accept the presence of cougars in the Foothills, this preference for relocation suggests a not-in-my-backyard mentality, which may, in turn, suggest that residents are actually not as tolerant of cougars as they consider themselves to be. Moreover, relocation is not always the best option, due to many factors, such as its very high costs and the need to relocate the cougar long distances to ensure it does not return. Furthermore, when a cougar is relocated, a new cougar, such as a young dispersing male, will likely move in and occupy the relocated cougar's territory. These young dispersers tend to cause more problems than older resident cougars. Relocation of carnivores into new habitat already occupied by conspecifics can also lead to social disruption of the animals and even carnivore deaths (Treves and Karanth 2003). Though there are sometimes losses, relocation may be an effective alternative in some situations, particularly with dispersing and sub-adult males, because it can duplicate the traits of natural dispersal (Ross and Jalkotzy 1995). Because of issues such as these, education and research about relocations should be an issue of priority and an important topic of consideration during decision making on managing cougars.

Public acceptance of cougar management actions is typically dependent on the type of conflict and, to a lesser extent, the location where the encounter occurred (Manfredo et al. 1998). In all scenarios where a human was killed, the preferred action was to kill the cougar. The only exception to this was when the offending cougar was a mother with kittens; then the preferred action was relocation, while killing the cougar was the next most preferred action. Riley (1998) found that people were generally intolerant of cougars near human habitation, meaning that altered landscapes and new subdivisions represents not only a loss of physical habitat, but could also lessen the overall acceptance capacity toward cougars and lead to more intolerance and negative attitudes toward the species. Therefore, it is important to keep in mind that cougar management should be considered adaptive and may need to be changed to accommodate new value orientations and land uses with the ability to balance the needs of both wildlife and humans.

Management implications

Calgary has the highest growth rate of any major city in Canada (currently 3% per annum; Duke et al. 2003, Southern Foothills Study 2007), and the second highest ranked construction pace in North America (Toneguzzi 2007). As Calgary continues to grow, the cougars' need for land will continue to be in conflict with humans' need for land. There is a strong negative association between high human density and the loss of carnivore populations from a region (Woodroffe 2000). However, where favorable legislation and effective wildlife management policies are present, carnivore populations can persist or increase, and potential human–wildlife conflicts can be reduced, despite increases in human density (Linnell et al. 2001). It has been suggested that the main factors involved in the recent increase in human–cougar conflict are habitat loss, habitat fragmentation, and human encroachment by increased urban and rural housing densities (Beier 1993, Torres et al. 1996, Weaver et al. 1996). Such pressures are unlikely to disappear; therefore, human–cougar interactions and conflicts will likely continue to increase and must be addressed in a proactive rather than reactive way. By employing precautionary practices and preparing communities for dealing with the presence of cougars, conflicts may be reduced or avoided altogether.

Managing cougars is largely about managing people. Wildlife managers must increasingly consider the cultural, economic, political, and ecological components of wildlife management (Decker et al. 2001). By determining public perceptions towards large carnivores such as cougars, management and educational programs can be developed that meet the specific needs and concerns of both wildlife managers and communities, as well as maintain cougar populations, increase public safety, and sustain ecological integrity. Finding solutions to such a wide-ranging and confounding problem, such as human–cougar interaction and conflict

is a very difficult task, but the more proactive solutions are developed and implemented, the closer we may come to the possibility of coexisting with cougars.

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