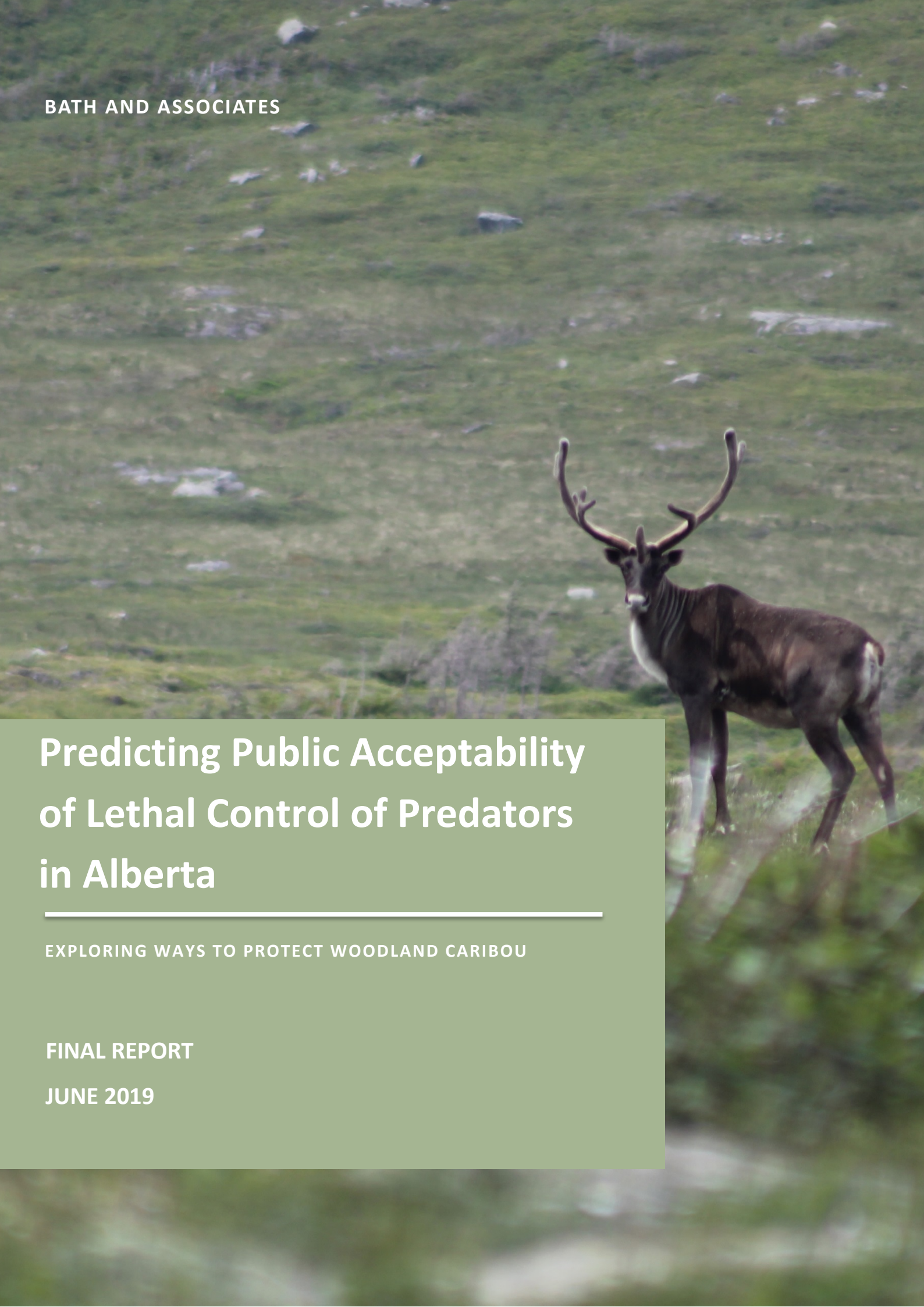

BATH AND ASSOCIATES

Predicting Public Acceptability of Lethal Control of Predators in Alberta

EXPLORING WAYS TO PROTECT WOODLAND CARIBOU

FINAL REPORT

JUNE 2019

Predicting Public Acceptability of Lethal Control of Predators in Alberta: Exploring Ways to Recover Woodland Caribou

- Final Report -

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Executive Summary

STUDY BACKGROUND

In 2019, the International Fund for Animal Welfare (IFAW) contracted Dr. Alistair Bath, President of Bath and Associates and Professor at Memorial University, to conduct a human dimensions study focused on understanding public acceptability of lethal control of predators in Alberta and explore public beliefs about the decline and recovery of the woodland caribou (*Rangifer tarandus caribou)* in the province. Dr. Bath and Bath and Associates have more than 25 years of experience in conducting objective scientific research on wildlife-related issues worldwide for governments, NGOs and international agencies; such research always is designed to give the respondents in the study a voice in resource management decision-making and aid agencies wishing to better understand the needs and views of their respective publics.

The scientific data obtained in this study can assist 1) in making recommendations about public acceptance of lethal and non-lethal measures to control predators as one approach to recover caribou populations, 2) document general views about caribou and predators, and 3) explore public views on the causes and solutions of the decline in caribou populations.

The research was conducted by Bath and Associates from May to June 2019 with a representative sample of 805 online Albertans who are members of the Angus Reid Forum. Of those respondents, 403 were urban and 402 were rural residents. The general Albertan population sample was adjusted to fit the urban/rural demography in the province. In this case, a sample of 480 was considered (84% urban and 16% rural). The sample size for the general population and for each region separately are accurate to within ± 5 percent points, 19 times out of 20, the standard for human dimensions in wildlife resource management research.

MAJOR FINDINGS

Overall, Alberta residents:

- Identified themselves as conservationists.
- Did not think there are too many predators in Alberta nor that the province would be better off without them.
    - Urban residents were slightly more positive towards wolves, bears and caribou than rural residents, who were also positive toward these species.
- Held strong intrinsic and existence values toward caribou, bears and wolves.
    - The majority believed predators are important because they are part of nature and have the right to exist as much as people do.
    - Urban residents held slightly stronger intrinsic and existence values toward wolves, bears and caribou than rural residents.
- Held positive perceptions of outcomes toward predators.
    - Most agreed that predators keep wild ecosystems healthy.

    - Did not see wolves and bears as competitors to hunters or causing the decline of caribou.
    - One in two did not believe wolves are reducing caribou numbers to unacceptable levels in the province.
    - About six in ten did not believe grizzly bears to be reducing caribou populations to unacceptable levels.
- Believed logging to be the main cause of caribou decline, followed by hunting and motorized recreation.
    - One in four residents considered hunting and recreational vehicles (e.g., ATV and snowmobile activities) important to very important as causes of the caribou decline.
- Considered bear and wolves as least important in causing the caribou decline.
- Considered reducing motorized recreation, hunting, and targeting habitat restoration as the most acceptable management approaches to recover caribou.
- Did not accept reducing bears and wolves in caribou habitat as a management option to recover caribou.
- Disapproved of any lethal management of wolves.
    - With higher consensus, 86% disapproved of the use of poison such as strychnine baits; only 4% accepted it as a management technique.
    - Seven in ten residents disapproved of the use of snares.
    - The majority agreed in trapping and relocating wolves.
    - Both urban and rural residents were against lethal management; urban residents were slightly more against lethal management than rural residents.
- Disagreed in killing wolves and bears, unless to protect property and farm animals.
    - Killing wolves to reduce predation on caribou was neither acceptable nor unacceptable.
    - Killing bears to reduce predation on caribou was slightly unacceptable.
    - Three in four disapproved of killing predators for sport.
    - Rural residents were more supportive of killing predators than urban residents.
- Were unfamiliar with the use of strychnine as a wildlife management technique.
- Did not know strychnine is a legal measure in Alberta to control wolf populations.
- Considered the use of strychnine in killing wolves as inhumane.
- Supported the ban of strychnine.
    - 3 in four agreed strychnine should be banned.
    - Urban residents were more supportive of a ban than were rural residents.
- Did not accept killing wildlife species like coyotes, owls, eagles, grizzly bears and wolves to protect caribou.
    - About one in three accept killing coyotes to protect caribou
    - With a higher degree of consensus, 83% of residents disapproved killing eagles and owls to protect caribou.

Study Context and Methodology

The Government of Alberta has undertaken various forms of predator control to protect woodland caribou since 2005. This research seeks to understand Albertan's attitudes toward certain species (specifically caribou, wolves, and grizzly bears), and the acceptability of predator control methods currently being used by the government of Alberta.

Grounded in the human dimensions of wildlife literature, the objectives of this study were to:

- assess Albertans' attitudes, beliefs and values toward predators;
- assess the acceptability of various management options involving wolves, grizzly bears and woodland caribou;
- assess whether rural and urban Albertans differ in their views about wolves, bears, and caribou;
- assess the public's opinion regarding possible reasons for caribou decline; and
- assess support/opposition for various proposed ways to recover caribou populations.

Grounded in human dimensions of wildlife literature, the concepts covered in this study represent key social and cognitive factors capable of influencing people's thoughts and actions toward a wildlife species and its management. These factors include values, beliefs, attitudes, behavioural intentions, and social affiliation to a group and political party.

The study of human behaviour and what drives people to act in a certain way, are central to the comprehension of the human dimensions of wildlife management and conservation. The cognitive hierarchy framework of human behaviour (Vaske and Donelly, 1999) offers a structured foundation to understand the drivers of behaviour and ultimately behaviour. In this study, this framework was used to guide the use of values, beliefs and attitudes towards predators and wildlife management.

Data collection

Data were collected through an online questionnaire with a representative sample of 805 (403 urban and 402 rural) online Albertans who are members of the Angus Reid Forum. The study was conducted in English. The precision of Angus Reid Forum online polls is measured using a credibility interval. In this case, the poll for general Albertans (sample size corrected to meet the population geographical distribution) and rural and urban samples are accurate to within ± 5 percentage points, 19 times out of 20. All sample surveys and polls may be subject to other sources of error, including, but not limited to coverage error, and measurement error.

The Angus Reid Forum is Canada's most well-known and trusted online public opinion community consisting of engaged residents across the country who answer surveys on topical issues that matter to all Canadians.

The questionnaire, designed by Bath and Associates, included 10 sections consisting of:

1. Attitudes toward wildlife
2. Wildlife value orientations
3. Perceptions of outcome (i.e. perceived impact of wolves and grizzly bears)
4. Beliefs associated to caribou decline
5. Acceptability of various ways to recover caribou populations
6. Acceptability of various ways to control wolf populations
7. Attitudes toward killing wolves and grizzly bears
8. Familiarity and beliefs associated to strychnine use in wolf management
9. Acceptability of killing wildlife to protect caribou
10. Participant characteristics: demographics, social affiliation, political ideology.

Results in the report do not follow the order of the questionnaire. See Appendix G for the questions asked.

Data Analysis

Descriptive statistics were used to assess the means (M), standard deviations (SD) and frequencies (%) of responses from each conceptual construct. Cronbach's Alpha reliability estimate was used to estimate the internal reliability of the items associated with each scale. An alpha above .60 is generally considered as an acceptable threshold for a scale to be reliable. Independent T-Tests were used to compare rural and urban residents. Paired T-Tests were used to test for differences between species – wolves, bears and caribou. Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) package version 25.

Major Findings

PARTICIPANT CHARACTERISTICS

Demographics

A total of 805 Albertans participated in this study (42% response rate). Of those, 403 were urban residents, and 402 were rural residents. Given that Alberta is approximately 84% urban, the sample was corrected to n=403 (84%) urban and n=77 (16%) rural to be representative of the entire province, thus totalizing a provincial sample of 480. Random sampling proportional to population was completed. When not referring to urban and rural independently, results represent the general population (n=480). For both cases, the sample sizes can be generalized to its corresponding population at a 95% confidence level with ±5% margin of error.

Rural and Urban Samples Combined

- Participants' (n=805) age ranged from 18 to 93 years, with an average age of 49 years.
- Three respondents preferred to self-describe (0.4%) their gender; 51% were women (n=411) and 48.6% were men (n=391).
- 27% resided in Calgary, 25% in Edmonton, and 48% in other parts of Alberta.
- About 26% had completed high school or less, 43% held a college or technical school diploma, and 31% a university degree.
- 0.2% (n=2) were Inuit, 5.8% (n=47) were Métis, 2.2% (n=18) identified themselves as First Nations, and 91.7% (n=738) as not an Aboriginal person.
- In relation to hunting or trapping licenses, 25% of the participants declared that at least someone in the residence held a hunting or trapping license; 75% did not have one. Of those who held a license, 72% were rural residents, and 28% were urban.

General Public Sample

- Within the general population sample (n=480), 50% were men, 49.6% were women, and 0.4% preferred to self-describe.
- 35% lived in Calgary, 34% in Edmonton and 31% in other parts of Alberta.
- 31% had completed high school or less, 33% held a college or technical school diploma, and 36% held a university of higher degree.
- One participant (0.2%) was Inuit, 4.8% (n=23) Métis, 2.1% First Nations, and 93% declared themselves as not Aboriginal person.
- 17% of participants had at least someone in the house holding a hunting or trapping license; 83% did not have one.

Social group identification

Social factors such as identification and affiliation with a group (or groups) can influence one's decision and judgement. In the context of accepting control measures for wildlife, identification with certain groups can influence a person's decision to support or oppose a given measure (Bruskotter, Vaske and Schmidt, 2009).

Albertans were asked what type of groups most represented their views – with the option to select all that applied.

The three social groups that best represented Albertans (n=480) were:

- conservationists (48%)
- animal welfare (43%),
- environmentalist (37%; Fig. 1).

Hunters (24%) and trappers (8%) were the least mentioned groups. For those who selected 'other', responses included: agricultural fieldsmen, animal scientist, fisherman, First Nation person, oil & gas, and wildlife viewer.

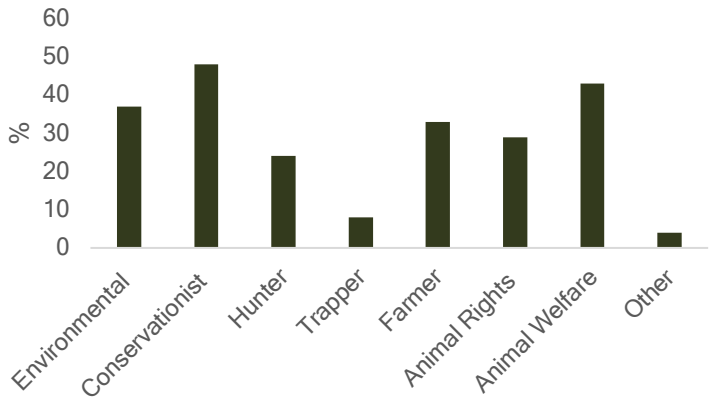

Figure 1 Albertans social group identification.

When analyzed by region (n=403 urban and n=402 rural), most of the environmentalists, conservationists, animal rights and animal welfare respondents were from urban Alberta, while most of the hunters, trappers and farmers were from rural areas (Fig. 2).

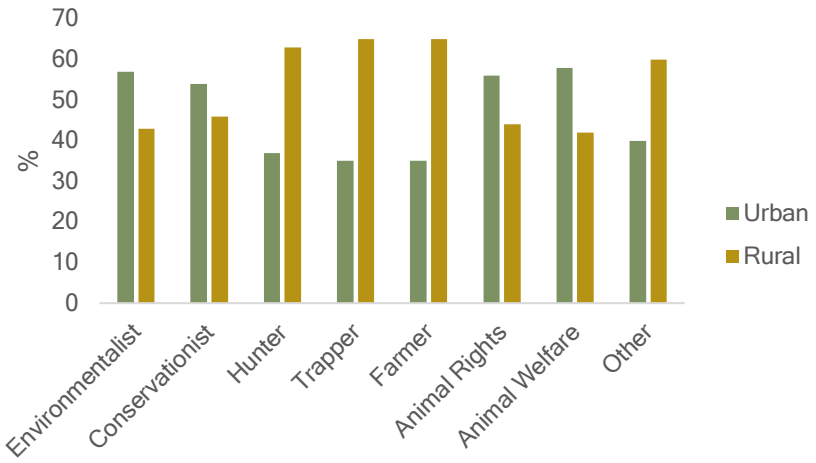

Figure 2 Albertans Social group identification by region.

Political ideology

Political ideology is another social factor that can influence a person's judgment and decisions regarding a wildlife management policy. Albertans were asked which political party they would support if a federal election were held tomorrow.

- Six in ten Albertans declared they would vote for the Conservative Party

- 12% were undecided
- 10% would vote for the Liberal Party.

Figure 3 depicts the results of political ideology by region. While more supporters of the Conservative Party were found among rural residents than urban residents, supporters of the Liberal Party and the NDP were more salient in urban areas.

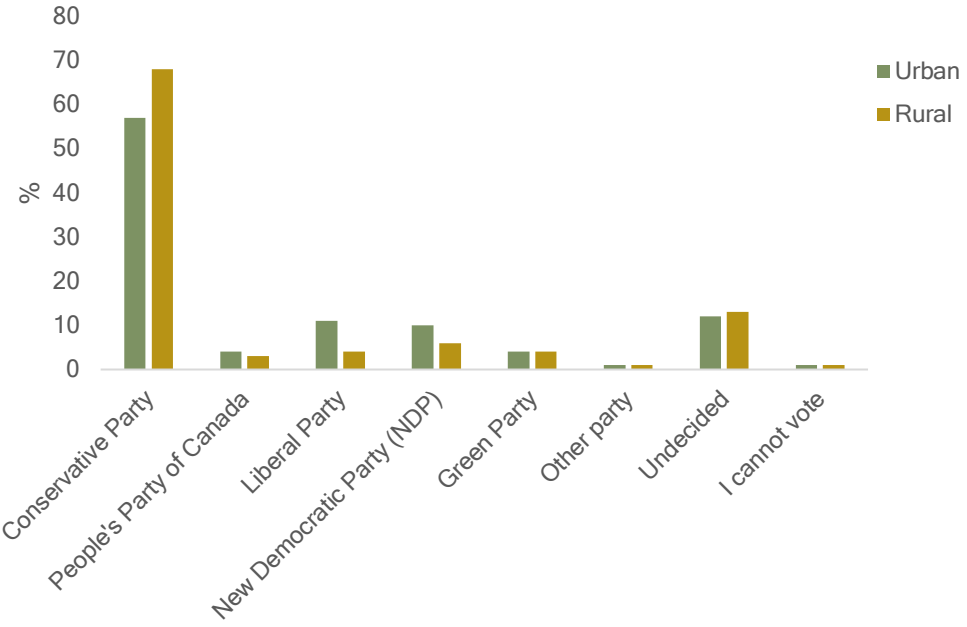

Figure 3 Political ideology by region.

ATTITUDES TOWARD WILDLIFE

General attitudes toward caribou, grizzly bears and wolves

Attitudes refer to an evaluation either favorable or unfavorable in relation to a specific object or action (Vaske and Manfredo, 2012). Assessing attitudes toward wildlife can assist in the understanding of people's behavior and behavioral intention, such as support or opposition to proposed management strategies. Attitudes tend to vary across different species, and understanding these differences is important in wildlife management.

Albertans were asked how they felt about caribou, wolves, and grizzly bears. Responses ranged from strongly dislike (=1) to strongly like (=5) with a neither like nor dislike (=3) option.

On average, Albertans (n=480) liked caribou (M = 4.21, SD ± .77), wolves (M = 4.15, SD ± .89), and bears (M = 4.09, SD ± .94; Fig. 4). Statistically significant differences in attitudes were observed between caribou and grizzly bears (t (479) = 3.16, $p < .05$), and between grizzly bears and wolves (t (479) = 2.03, $p < .05$). No significant difference was observed between wolves and caribou. Basically, Albertans like caribou and wolves the same, like wolves slightly more than grizzly bears and like caribou more than bears, but it is important to note that all mean scores are above 4.0 on a five-point scale where 5 is strongly like and 4 is like.

- 5% of respondents disliked wolves, 6% of them disliked bears (Fig. 4).
- 76% liked / strongly liked bears.
- 78% liked / strongly liked wolves
- 82% liked / strongly liked caribou.

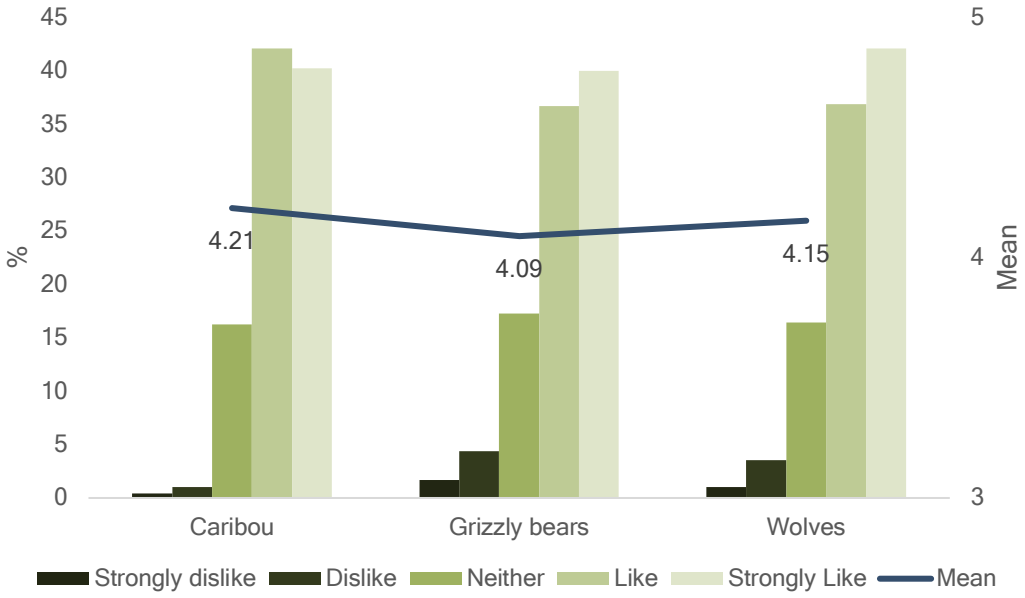

Figure 4 General attitudes toward wildlife. Frequencies (%) of responses on the primary vertical axis and Mean on the secondary vertical axis. Mean range from 1 to 5.

Rural (n=402) and urban (n=403) respondents differed on their attitudes toward wolves (t (803) = 2.26, $p < .05$, Fig. 5). Urban respondents were slightly more positive toward wolves (M = 4.16, SD ± .90) than were rural residents (M = 4.01, SD ± 1.02). No differences were found between rural and urban resident's attitudes toward bears and caribou ($p > .05$).

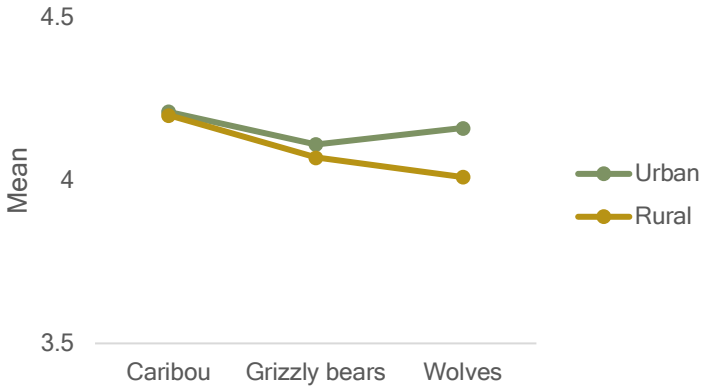

Figure 5 General attitudes toward wildlife by region. Mean responses ranged from 1 (strongly dislike) to 5 (strongly like).

Specific attitudes toward caribou, grizzly bears and wolves

Alberta residents were asked to evaluate whether they thought:

- there were too many wolves, bears and caribou in the province, and if
- Alberta would be better off without these animals.

Responses ranged from strongly disagree (=1) to strongly agree (=5), with a neutral point (=3). For each species, an attitudinal scale was created – mean scores above 3 represent negative attitudes toward wildlife and mean scores below 3 represent positive attitudes. Cronbach's alpha confirmed the internal reliability of each scale: attitudes toward wolves $\propto$=.77, attitudes toward grizzly bears $\propto$=.75, and attitudes toward caribou $\propto$=.79.

Albertans (n=480) on average, held positive attitudes toward wolves, bears and caribou (Fig. 6). The majority disagreed that there were too many wolves, bears and caribou and that Alberta would be better off without them.

Attitudes toward wolves, however, significantly differed from grizzly bears (t (479) = 3.39, p = .001), and caribou (t (479) = 4.02, p < .001).

On average, Albertans were slightly less positive of having wolves in the province than having bears and caribou. Yet,

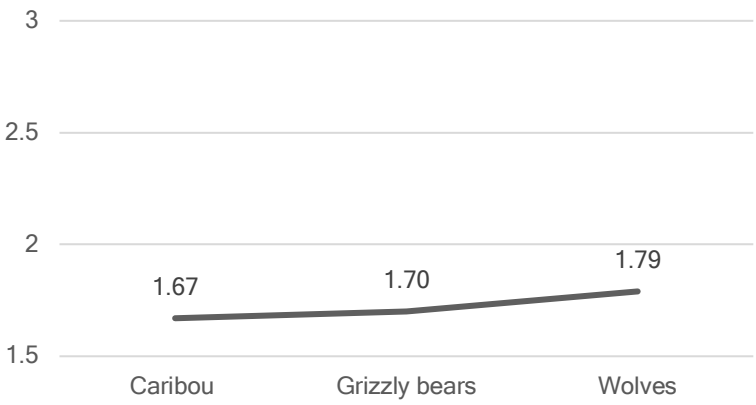

Figure 6 Specific attitudes toward wildlife. Mean based on responses ranging from 1 (strongly disagree) to 5 (strongly agree).

- Nine in ten disagreed/strongly disagreed that Alberta would be better off without wolves and bears; 2% agreed and 1% strongly agreed (Fig.7).
- 92% disagreed/strongly disagreed Alberta would be better off without caribou; 2% agreed.

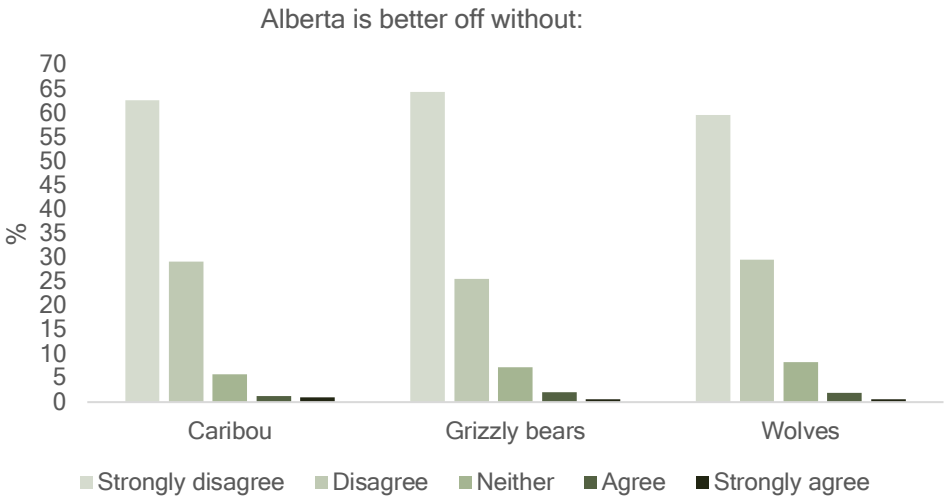

Figure 7 Frequency of agreement/disagreement (%) with eradication of wildlife in Alberta.

- About 7 in 10 Albertans do not think that there were too many wolves in the province; 8% agreed (Fig. 8).
- 76% do not think there are too many grizzly bears; 7% agreed.
- 43% strongly disagreed there are too many caribou; 34% disagreed and 20% neither agreed nor disagreed.

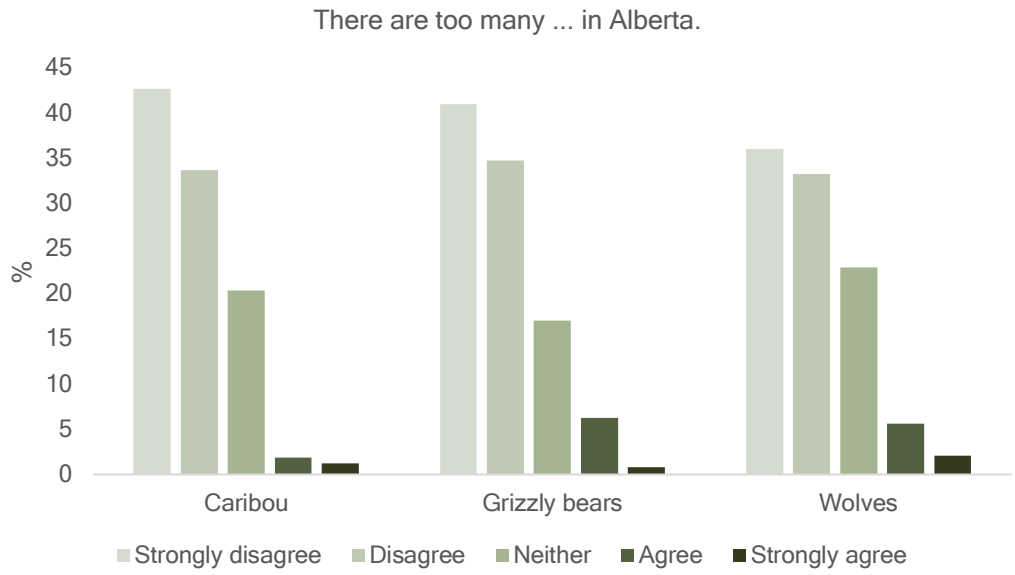

Figure 8 Frequency of agreement/disagreement (%) with wildlife abundance in Alberta.

Significant differences in attitudes were also observed between rural and urban residents for all three species (see Appendix A for statistical details). On average, rural residents (n=402) were slightly less positive towards caribou, grizzly bears and wolves than were urban residents (Fig. 9).

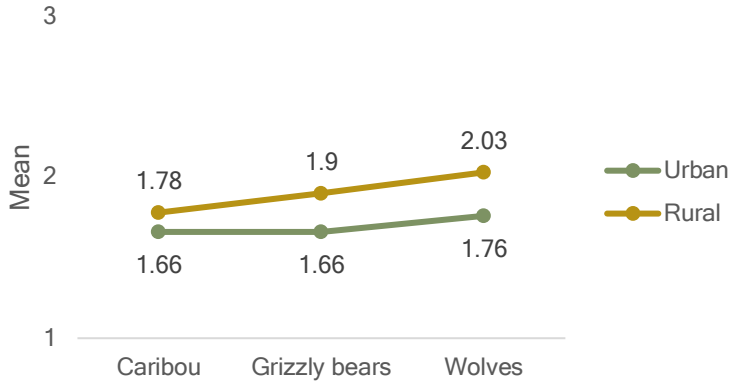

Figure 9 Specific attitudes toward wildlife by region. Mean based on responses ranging from 1 (strongly disagree) to 5 (strongly agree).

WILDLIFE VALUE ORIENTATIONS

Values became less abstract when they are oriented towards an object, like a wildlife species. Albertans were asked about their intrinsic, existence, spiritual and utilitarian values toward caribou, grizzly bears and wolves. The following items were used to assess value orientations:

- *Intrinsic:* Caribou/grizzly bears/wolves are important because they are part of nature.
- *Existence:* Caribou/grizzly bears/wolves have the right to exist in Alberta as much as we do.
- *Spiritual:* Caribou/grizzly bears/wolves are sacred to me.
- *Utilitarian:* We can continue hunting caribou/grizzly bears/wolves, as long as we protect some for future generations.

Responses ranged from strongly disagree (=1) to strongly agree (=5) with a neutral point (=3).

On average, all three species were mostly valued for their intrinsic and existence values. Albertans (n=480) agreed that caribou (M = 4.41, SD ± .68), grizzly bears (M = 4.38, SD ± .81) and wolves (M = 4.41, SD ± .70) are important because they are part of nature (Fig. 10). About 2% disagreed that both caribou and wolves had an intrinsic value; 6% did not think grizzly bears had an intrinsic value.

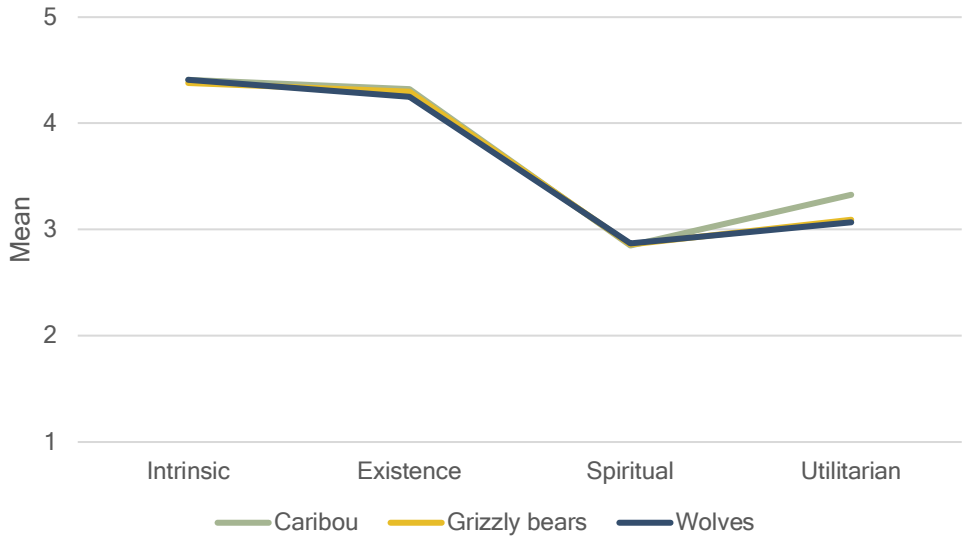

Figure 10 Wildlife value orientations. Mean responses ranging from 1 (strongly disagree) to 5 (strongly agree).

Similarly, most people believed caribou (M = 4.32, SD ± .87), grizzly bears (M = 4.30, SD ± .91) and wolves (M = 4.25, SD ± .69) have the right to exist in Alberta as much as people have (Fig. 10). Albertans in general did not hold stronger utilitarian values toward grizzly bears and wolves but were slightly more positive towards hunting caribou while protecting them for future generations (M = 3.33, SD ± 1.20). Spiritual value was the least important, with people slightly disagreeing that caribou, bears and wolves were sacred to them (i.e., mean scores were below the neutral point =3).

Except for spiritual value, all other values associated to bears, wolves and caribou differed significantly between rural and urban residents (see Appendix B for statistical details). On average, urban Albertans (M = 4.42, SD ± .77) held stronger intrinsic values toward grizzly bears than rural residents (M = 4.28, SD ± .86; Fig. 11). Utilitarian value associated to grizzly bears was more salient among rural than urban Albertans. Urban residents in general neither agreed nor disagreed that people should continue hunting as long as bears are protected for future generations (M = 3.04, SD ± 1.26). Both rural and urban residents slightly disagreed that bears were sacred to them.

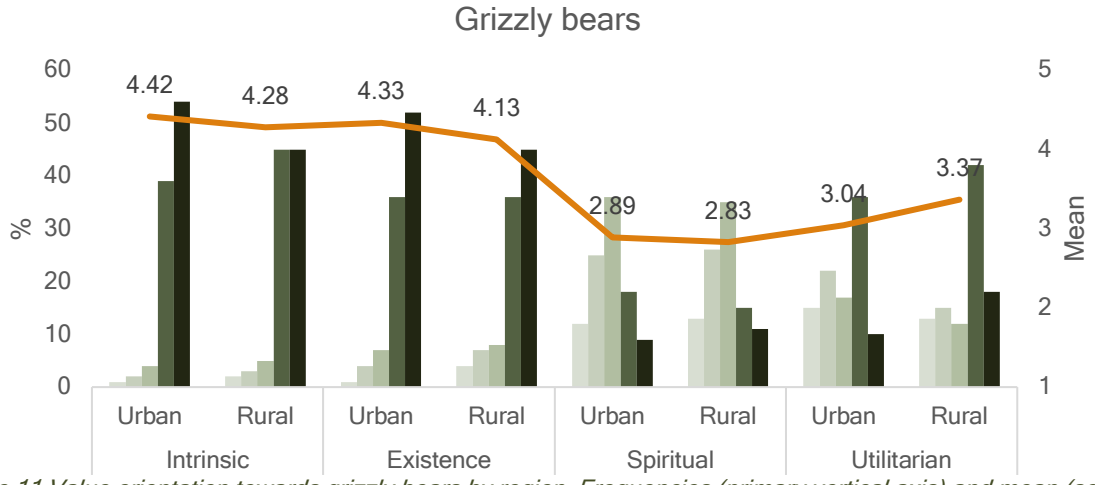

Figure 11 Value orientation towards grizzly bears by region. Frequencies (primary vertical axis) and mean (secondary vertical axis) responses based on a scale ranging from strongly disagree (1) to strongly agree (5).

Similar values within rural and urban residents were observed toward wolves (Fig. 12). Urban Albertans held stronger intrinsic (M = 4.42, SD ± .70) and existence (M = 4.29, SD ± .91) values in comparison to rural people. On the other hand, instrumental value was more salient among rural Albertans (M = 3.40, SD ± 1.27).

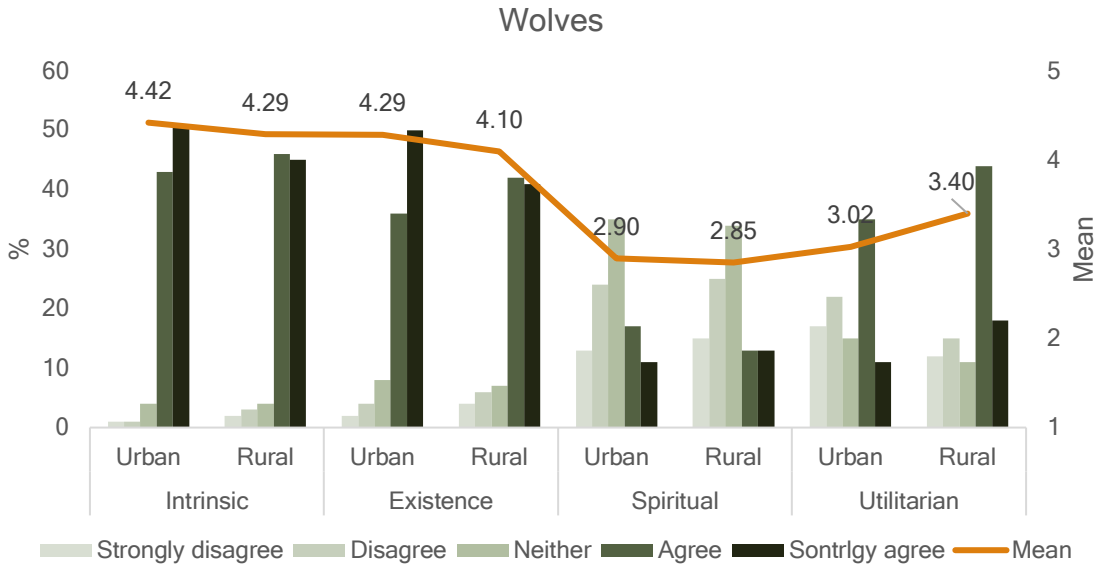

Figure 12 Value orientation toward wolves by region. Frequencies (primary vertical axis) and mean (secondary vertical axis) responses based on a scale ranging from strongly disagree (1) to strongly agree (5).

With regards to caribou (Fig. 13), intrinsic and existence values were stronger among urban residents (M = 4.43, SD ± .69 and M = 4.35, SD ± .85 respectively). Despite holding slightly less prominent instrumental values than rural Albertans (M = 3.52, SD ± 1.2), urban residents M = 3.30, SD ± 1.21) held stronger instrumental values toward caribou than wolves and bears.

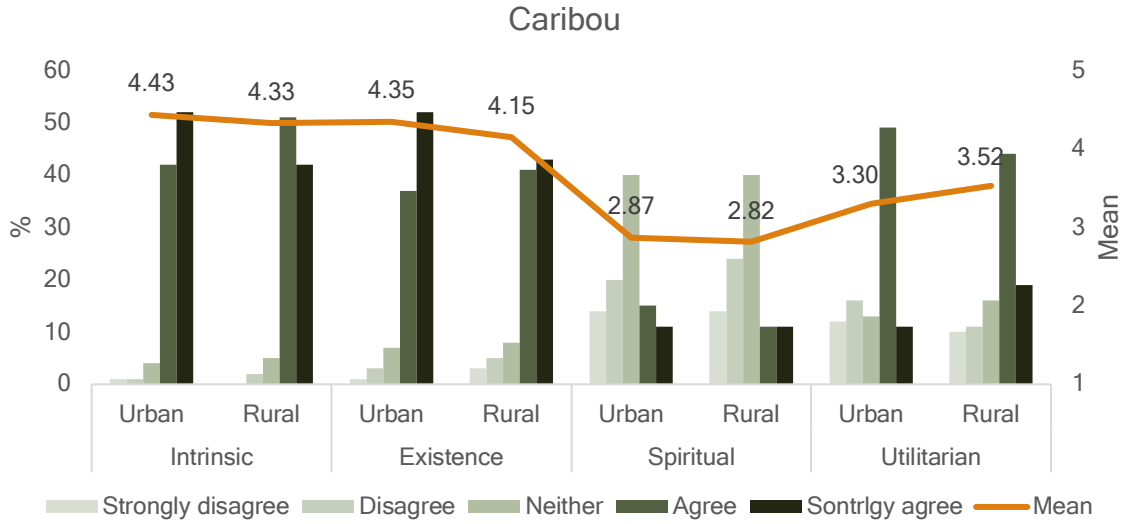

Figure 13 Value orientation toward caribou by region. Frequencies (primary vertical axis) and mean (secondary vertical axis) responses based on a scale ranging from strongly disagree (1) to strongly agree (5).

PERCEPTION OF OUTCOME

Perceptions of outcome refer to beliefs concerning the impacts associated with a particular species (Bruskotter, Vaske, & Schmidt, 2009). In the context of public acceptability of lethal control of wildlife, perceptions of outcome can directly influence one's judgment of whether to approve or disapprove of such a measure. Perceptions of outcomes associated with wolves and grizzly bears were assessed by averaging responses given to the following four items:

- Wolves/Grizzly bears compete with big game hunters for prime trophy animals.
- Wolves/Grizzly bears keep wild ecosystems healthy (*reverse code*).
- Wolves/Grizzly bears reduce caribou numbers to unacceptable levels in Alberta.
- Wolves/Grizzly bears compete with hunters for meat.

Responses ranged from strongly disagree (=1) to strongly agree (=5), with a neutral point (=3). Mean scores above 3 represent negative perceptions of outcomes, like competition with humans and ecological disturbance caused by high predation rates. The scales presented an acceptable internal reliability: ∝ = .66 for perceptions of outcomes for wolves, and ∝ = .70 for grizzly bears.

Albertans (n=480) held slightly positive beliefs associated with impacts of wolves (M = 2.37, SD ± .72) and grizzly bears (M = 2.50, SD ± .71; Fig. 14). Despite similar beliefs, however, perceptions differed significantly between wolves and grizzly bears. On average, wolves and bears did not compete with hunters for trophy animals (M = 2.44, SD ± 1.20 and M = 2.28, SD ± 1.10 respectively) nor for meat (M = 2.69, SD ± 1.22 and M = 2.47, SD ± 1.15 respectively). Results (frequency and mean) for the reverse coded item are shown in its original form in Figure 14.

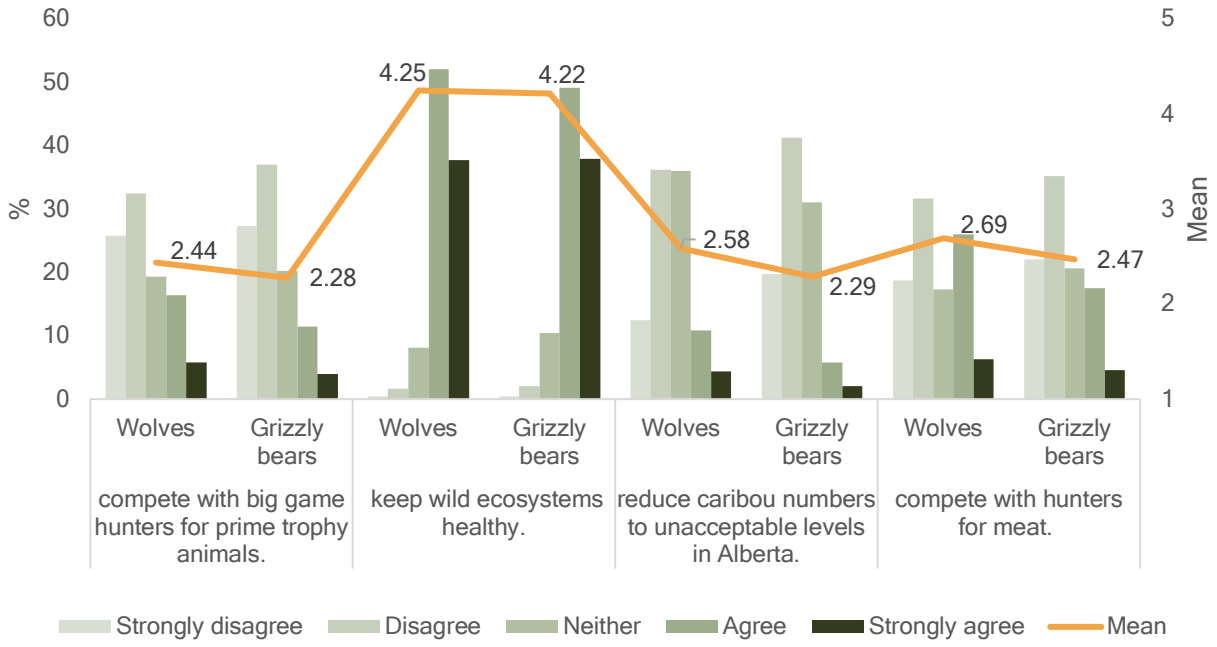

Figure 14 Perception of outcomes toward wolves and grizzly bears. Frequency of responses on primary vertical axis, and mean responses on secondary vertical axis based on a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

- Most people did not see these animals as competitors or causing ecological disturbances (Fig. 14).
- Nine in 10 Albertans believed wolves keep wild ecosystems healthy.

- About 1 in 2 people did not believe wolves reduce caribou numbers to unacceptable levels; 36% were neutral and 15% agreed.
- Similarly, 87% of Albertans believed grizzly bears keep wild ecosystems healthy, and 61% disagreed that bears are reducing caribou to unacceptable levels.

No statistically significant difference was observed between rural and urban residents about their beliefs associated with impacts of grizzly bears. However, perceptions of outcome about wolves differed between rural and urban residents (t (803) = 3.02, p = .003). Despite both being positive (i.e., mean scores bellow 3), rural residents were slightly less positive on their perceptions (M = 2.5, SD ± .80) than were urban residents (M = 2.34, SD ± .72).

BELIEFS ASSOCIATED WITH THE DECLINE AND RECOVERY OF CARIBOU

Woodland caribou are in decline in Alberta and designated as Threatened under Alberta's Wildlife Act and Canada's Species at Risk Act. In October of 2012, the Federal Government released the Recovery Strategy for the Woodland Caribou - Boreal population, and in 2014 this plan was adopted for the Southern Mountain population. In 2017, the provincial government released the Draft Woodland Caribou Range Plan. According to these plans, a combination of human and natural disturbances is causing the decline of caribou. For instance, habitat loss (anthropogenic) and increased predators (natural) have been suggested. To recover caribou populations, Alberta government is committed to work with industries in integrated land management actions to restore pipelines and historic seismic lines found in caribou habitat and manage wolf populations (Draft Woodland Caribou Range Plan).

Albertans were asked about their beliefs associated with the causes of caribou decline, and acceptability of various management options to recover caribou in the province.

Beliefs about the decline in woodland caribou populations

Residents of Alberta were asked to rate the importance of the following factors that may cause caribou decline:

- Hunting[1]
- Climate change
- Oil and Gas exploration
- Logging
- Seismic lines
- Grizzly bears
- Wolves
- Motorized recreation (e.g., ATV, snowmobile)

Responses were along a 4-point scale from 0 to 3, ranging from not at all important (=0), not very important (=1), somewhat important (=2) and very important (=3). "*Do not know"* answers were considered as missing values.

On average, Albertans believed logging to be the main cause of caribou decline (M = 1.96, SD ± .91), followed by hunting (M = 1.78, SD ± .95), and motorized recreation vehicles (M = 1.75, SD ± .99; Fig.

[1]Caribou has not been hunted in Alberta since 1980. This item was used to assess a general idea that hunting (not specifically caribou, but any hunting), could be causing caribou numbers to decline.

15). Predators like grizzly bears and wolves were rated as not very important in causing the caribou decline (M = 1.11, SD ± .84 and M = 1.29, SD ± .84 respectively).

Figure 15 Public beliefs about the causes of woodland caribou decline. Mean responses ranging from 0 (not at all important) to 3 (very important).

- Three in ten Albertans believed logging to be a very important factor attributed to caribou decline; about 45% believed it to be somewhat important (Fig. 16).
- Approximately one in four Albertans believed hunting and motorized recreation to be very important causes of caribou decline, and grizzly bears as not at all important.
- 8% of Albertans thought wolves to be a very important reason for caribou decline.
- Roughly 13% did not know how important bears and wolves were in causing caribou decline.

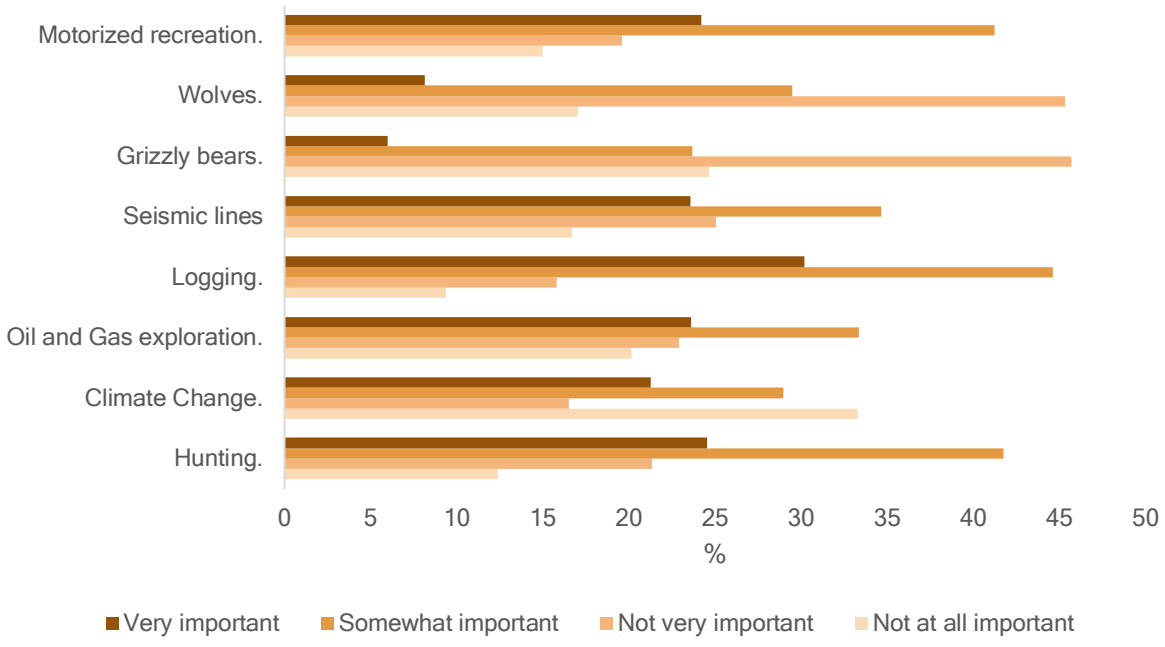

Figure 16 Importance levels (%) of various factors contributing to caribou decline.

Rural and urban residents held significantly different beliefs about the causes of caribou decline for most of the factors (see Appendix C for statistical details). No differences were observed on their opinions about grizzly bears (t (704) = .08, p = .93) and wolves (t (704) = .92, p = .36) as factors impacting caribou populations. Both rural and urban residents believed grizzly bears and wolves to be not very important (Fig. 17). Overall, urban residents held slightly stronger beliefs than rural residents.

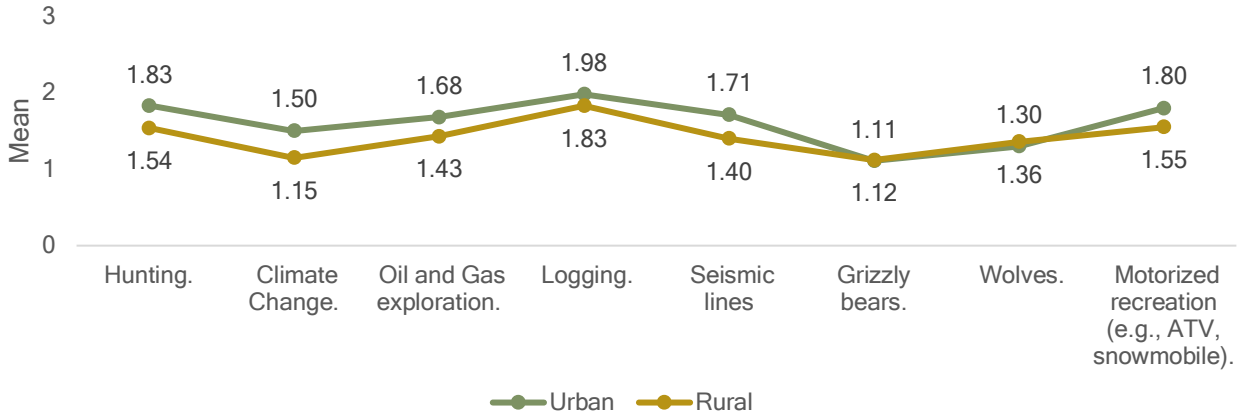

Figure 17 Public beliefs about the causes of woodland caribou decline by region. Mean responses ranging from 0 (not at all important) to 3 (very important). Values below the line are rural responses, and values above the line are urban responses.

Beliefs about management options to recover woodland caribou populations

Many management options have been suggested to recover caribou populations. Albertans were asked to rate how acceptable/unacceptable they believed the following management options to be to recover caribou:

- Reduce hunting
- Reduce climate change
- Reduce oil and gas exploration
- Reduce logging
- Reduce seismic lines
- Reduce grizzly bears in caribou habitat
- Reduce wolves in caribou habitat
- Reduce motorized recreation (e.g., ATV, snowmobile) in caribou habitat
- Reduce moose populations[2]
- Target habitat restoration to reduce wolf predation on caribou
- Penning caribou to reduce predation (e.g., fencing)

Responses were given on a five-point scale ranging from strongly unacceptable (=1) to strongly acceptable (=5), with a neutral point (=3). Reducing motorized recreation was the most acceptable management approach to recover woodland caribou (M = 3.69, SD $\pm$ 1.16; Fig. 18). Reducing

[2] Reducing moose is considered as a prey reduction strategy, where moose reduction would lower wolf density (see Serrouya et al., 2017 for details).

hunting (M = 3.60, SD ± 1.14) and targeting habitat restoration to reduce wolf predation on caribou (M = 3.49, SD ± 1.06) were the other two most acceptable options.

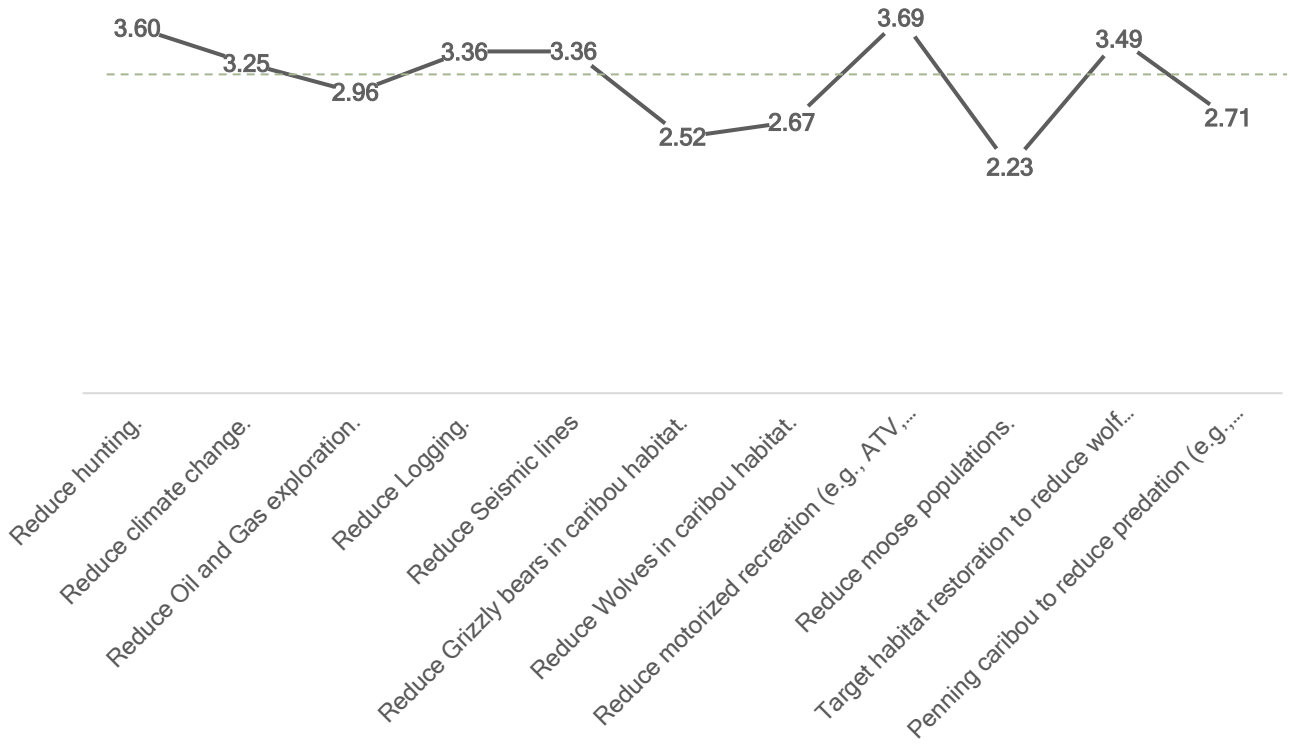

Figure 18 Public beliefs about management options to recover woodland caribou. Mean responses ranged from 1 (strongly unacceptable) to 5 (strongly acceptable).

Options targeting the reduction of other wildlife species to recover caribou were, on average, unacceptable. The least acceptable of these approaches was to reduce moose populations (M = 2.23, SD ± .84). Reducing bears (M = 2.52, SD ± 1.0) and wolves (M = 2.67, SD ± 1.1) were slightly unacceptable. Penning caribou to reduce predation (M = 2.71 SD ± 1.05) was also slightly unacceptable by Albertans.

Residents were neutral with targeting reduction of oil and gas exploration (M = 2.96, SD ± 1.26), and slightly positive with reducing climate change (M = 3.25, SD ± 1.40), logging (M = 3.36, SD ± 1.12) and seismic lines (M = 3.36, SD ± 1.14).

- One in four Albertans strongly accepted reducing motorized recreation and climate change to recover caribou (Fig. 19).
- About 42% accepted targeting habitat restoration and reducing recreation vehicles and hunting.
- Measures to reduce wolves and bears were acceptable/strongly acceptable by 26% and 18% of respondents, respectively.

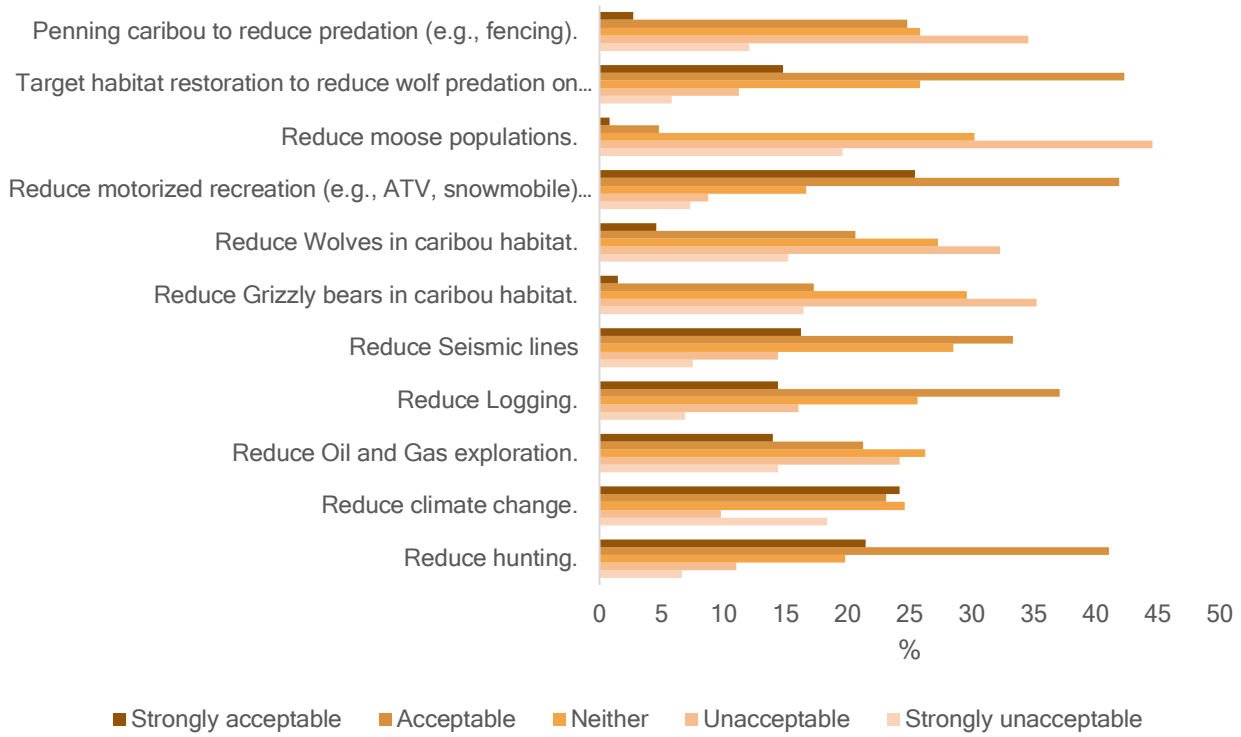

Figure 19 Acceptability levels (%) to different management options to recover caribou populations.

Rural and urban residents differed in their opinions toward most of the management options (see Appendix D for statistical details). No difference was observed for reducing moose populations and targeting habitat restoration ($p > .05$). For both groups it was unacceptable to reduce moose and slightly acceptable to target habitat restoration (Fig. 20).

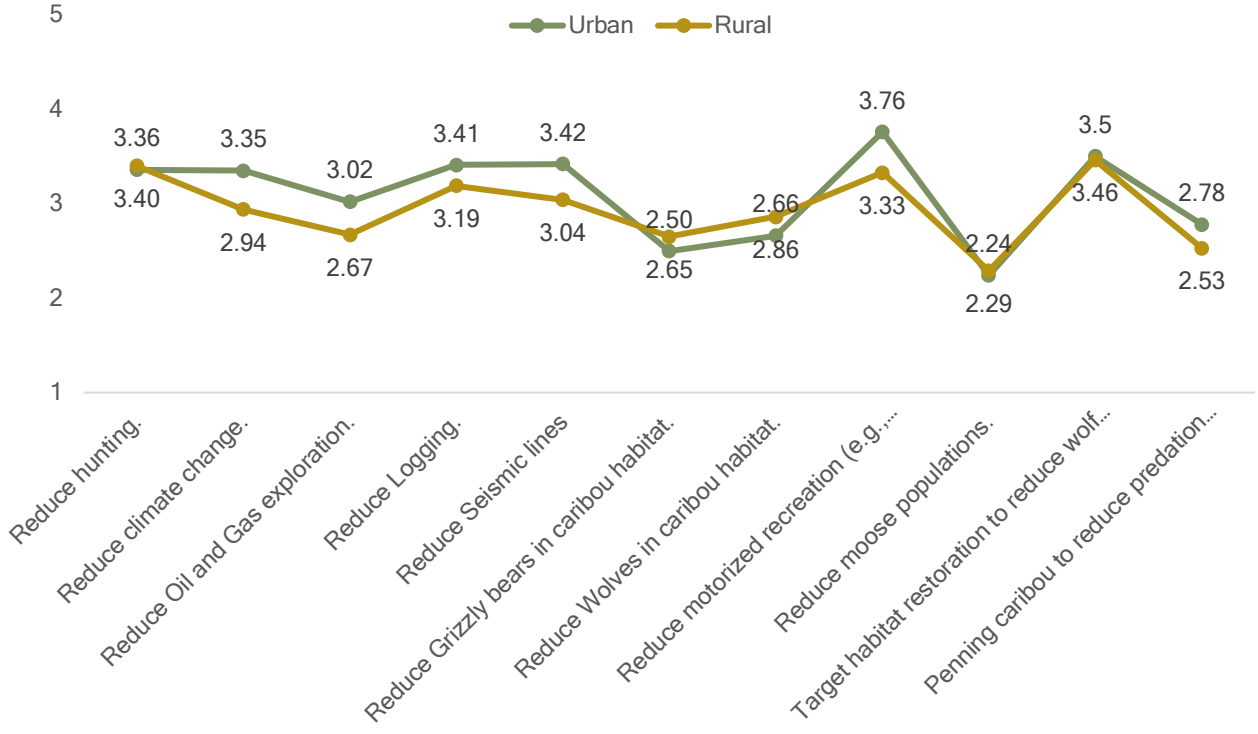

Figure 20 Public beliefs about management options to recover woodland caribou by region. Mean responses ranged from 1 (strongly unacceptable) to 5 (strongly acceptable).

Urban Albertans were slightly more supportive in reducing climate change (M = 3.35, SD ± 1.40), logging (M = 3.41, SD ± 1.15) and seismic lines (M = 3.42, SD ± 1.14) than were rural residents. Rural Albertans were neutral about reducing climate change (M = 2.94, SD ± 1.30) and seismic lines (M = 3.04, SD ± 1.16) to recover caribou, and slightly supportive of reducing logging (M = 3.19, SD ± 1.14).

Stronger support to reduce motorized recreation was found among urban residents. In relation to reducing wolves and grizzly bears, stronger support was observed among rural residents; yet, for both groups reducing wolves and grizzly bears was considered unacceptable.

MANAGING WILDLIFE TO PROTECT CARIBOU

Wolf Management

Lethal management approaches are employed with the objective to reduce wolf numbers and consequently predation rates on caribou. This approach is supported by Alberta's Woodland Caribou Recovery Program, Woodland Policy for Alberta (2011), and the Management Plan for Wolves in Alberta (1991). According to the *draft* Provincial Woodland Caribou Range Plan (Government of Alberta, 2017), efforts target to reduce wolf numbers has been conducted in west-central Alberta since 2005/2006, and in the northeast of the province since 2016/2017. Controversies around this approach, however, persist among residents and experts.

Albertans were asked to rate how acceptable/unacceptable the following management methods were:

- Live trap and shoot wolves
- Live trap and lethal injection
- Shoot wolves from airplane or helicopter
- Use of poison (e.g., strychnine baits)
- Trap and relocate the wolf
- Use of snares
- Do nothing

Responses were recorded on a five-point scale ranging from strongly unacceptable (-2), unacceptable (-1), neither (=0), acceptable (+1) and strongly acceptable (+2). The Potential for Conflict Index – PCI (Vaske, Beaman, Barreto, & Shelby, 2010) was used to assess levels of consensus between rural and urban Albertans about the different ways to manage wolves. The spheres on the graph simultaneously describe a variable's mean (centre of the circle), dispersion (i.e., standard deviation), and the potential for conflict in a given population. The PCI value ranges from 0 (maximum consensus) to 1 (maximum potential for conflict). Maximum conflict occurs when responses are equally divided between the two extremes of a scale. For example, when 50% of respondents strongly agree with a management strategy and 50% strongly disagree with it. Maximum consensus occurs when the distribution reaches 100% at any point of the scale.

Albertans, on average, disapproved of any lethal management approach to control wolf populations. Using poison to reduce wolf numbers was considered the most unacceptable measure (M = -1.37, SD ± .86). Trapping and relocating wolves, on the other hand, was approved by the majority (M = .73, SD ± 1.02). Doing nothing was neither acceptable nor unacceptable (M = .15, SD ± 1.1).

- 4% considered poisoning acceptable; 86% disapproved of it (Fig. 21).
- three in four Albertans approved the relocation of wolves; 14% disapproved.
- Seven in ten disapproved of the use of snares; 16% approved.
- Shooting wolves from an aircraft was strongly unacceptable by 44% of Albertans;
- About 40% strongly opposed the use of live traps followed by death of the animal.

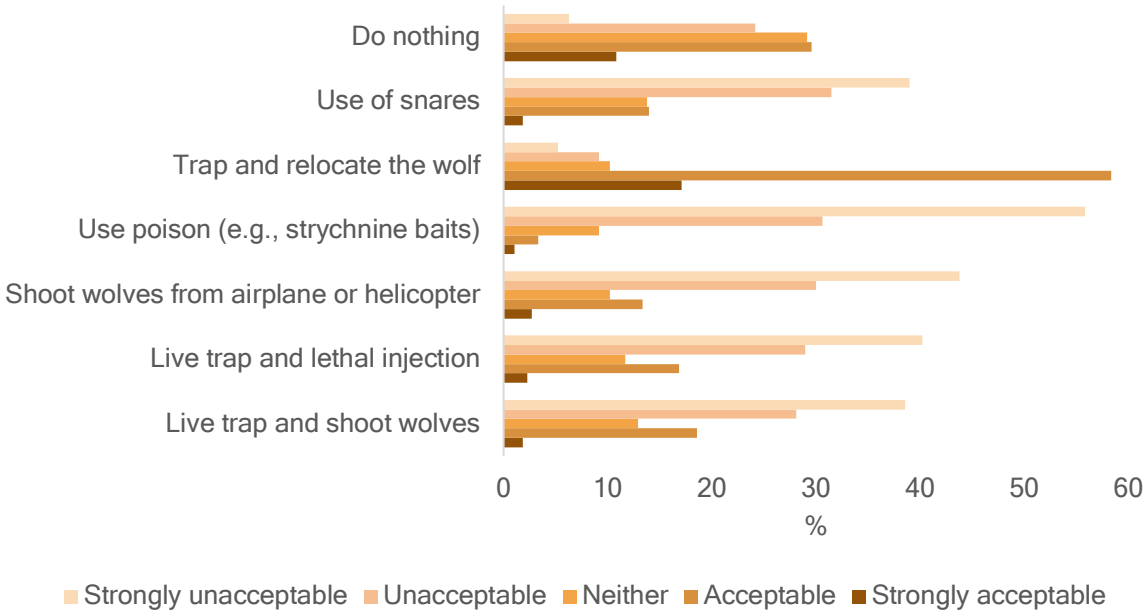

Figure 21 Acceptability (%) of lethal and non-lethal ways to manage wolf populations.

Statistically significant differences were observed between rural and urban residents for all management options, apart from 'doing nothing' (Appendix E for statistical details). On average, urban residents were less supportive of lethal management than rural residents; yet both regions disapproved of these approaches (Fig. 22). Basically, urban and rural residents hold similar attitudes toward all management approaches in contrast to what wildlife managers may have perceived prior to having this scientific data representative of the Albertan public viewpoint.

Higher consensus was observed among urban residents (i.e., lower PCI values), especially regarding the use of poison (PCI = .08 for urban and .18 for rural residents). The use of poison had the highest level of consensus among both regional groups suggesting wildlife resource managers could ban the use of poison almost immediately understanding there would be strong support and minimal backlash from rural and urban residents for this management decision. Less consensus was observed for 'live trap and shoot wolves' option, mostly among rural residents (PCI = .42). Trap and relocate the wolf was an acceptable option for both regions, with moderate levels of consensus. Most residents had neutral opinions about the possibility of doing nothing.

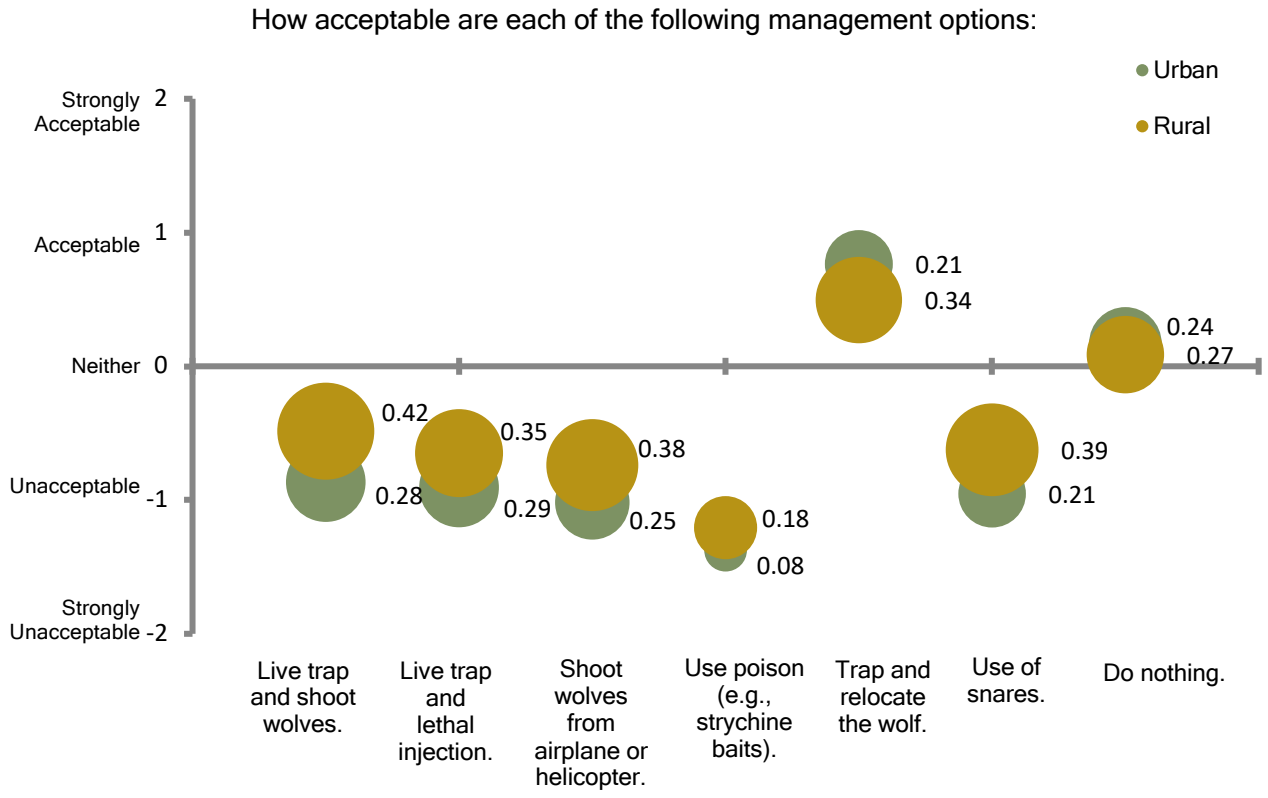

Figure 22 Acceptability of wolf management by region, and the Potential for Conflict Index.

Attitudes toward killing wolves and grizzly bears

Despite disapproving of lethal management of wildlife in general, people can still approve the killing of species under different conditions. Albertans were asked how much they agreed/disagreed in killing wolves and grizzly bears under five distinctive circumstances:

- Hunting wolves/grizzly bears in general
- To defend property and farm animals
- To obtain the pelt or head of the animal to sell
- For sport
- To reduce predation on caribou

Responses were given on a five-point scale ranging from strongly disagree (-2), disagree (-1), neither (=0), agree (+1), and strongly agree (+2). The PCI was used to assess level of consensus among rural and urban residents.

On average, Albertans disagreed with killing wolves and grizzly bears, unless to defend property and farm animals (wolves: M = .74, SD ± 1.13; grizzly bears: M = .69, SD ± 1.20). People in general were neutral about killing wolves (M = -.15, SD ± 1.13) to reduce predation on caribou, and slightly negative of killing bears (M = -.41, SD ± 1.06) to reduce predation on caribou. Albertans were less supportive of killing these animals for sport (wolves: M = -1.13, SD ± 1.17; grizzly bears: M = -1.26, SD ± 1.07).

- About 33% approved of killing wolves to reduce predation on caribou; 22% approved killing bears for caribou (Fig. 23).

- 15% strongly disagreed and 23% disagreed in killing wolves to reduce predation on caribou; 18% strongly disagreed and 30% disagreed in killing bears for caribou.
- About three in four people disapproved killing wolves and bears for sport.
- Roughly one in four Albertans strongly agreed in killing bears (25%) and wolves (23%) to defend property and animal farms.

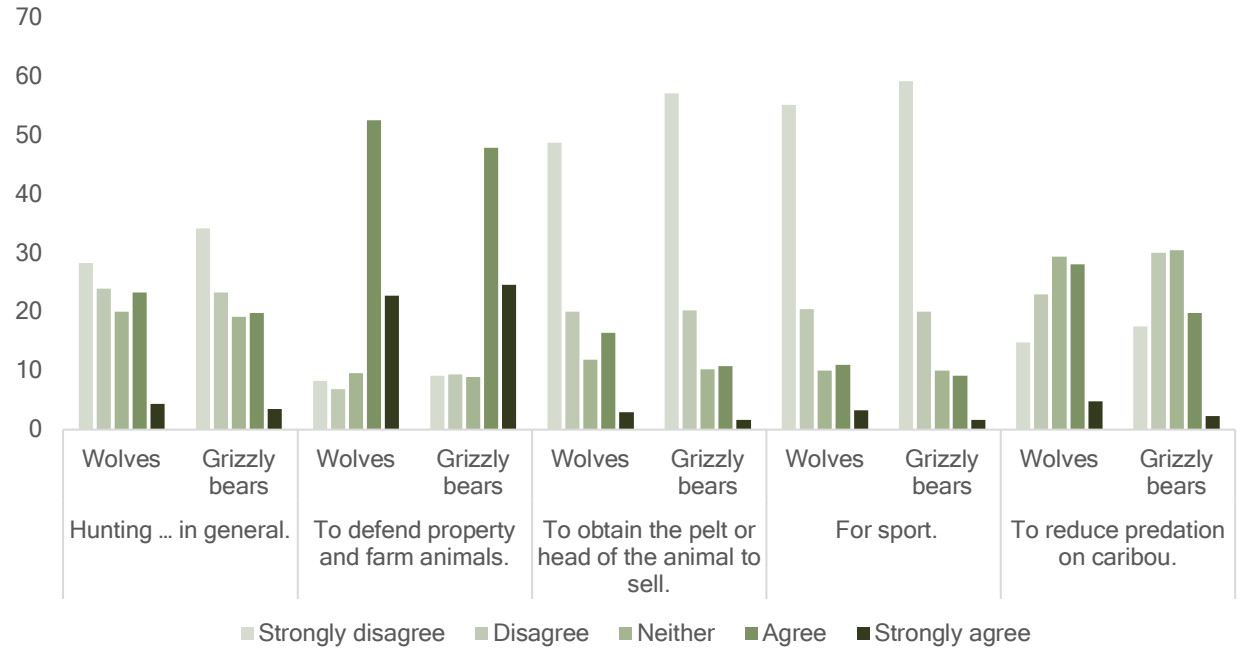

Figure 23 Attitudes (%) toward killing wolves and grizzly bears under different circumstances.

Statistically significant differences were found between rural and urban residents (see Appendix F for statistical details). On average, rural residents were more supportive of killing wolves and grizzly bears (Fig. 24). While rural Albertans were neutral about killing wolves in general (M = -.09, SD ± 1.32), urban Albertans slightly disagreed with it (M = -.58, SD ± 1.22). Rural and urban residents were, in general, neutral about killing wolves to protect caribou (rural: M = 0, SD ± 1.18; urban: M = -.18, SD ± 1.12).

Urban residents tended to agree more amongst themselves than rural residents (i.e., lower PCIs for urban population). Higher consensus levels among urban Albertans were found in disapproving killing bears for sport (PCI = .19) and to reduce predation on caribou (PCI = .21). As for rural Albertans, higher consensus was observed when approving killing wolves (PCI = .23) and bears (PCI = .27) to defend property and farm animals and killing bears to reduce predation on caribou (PCI = .27).

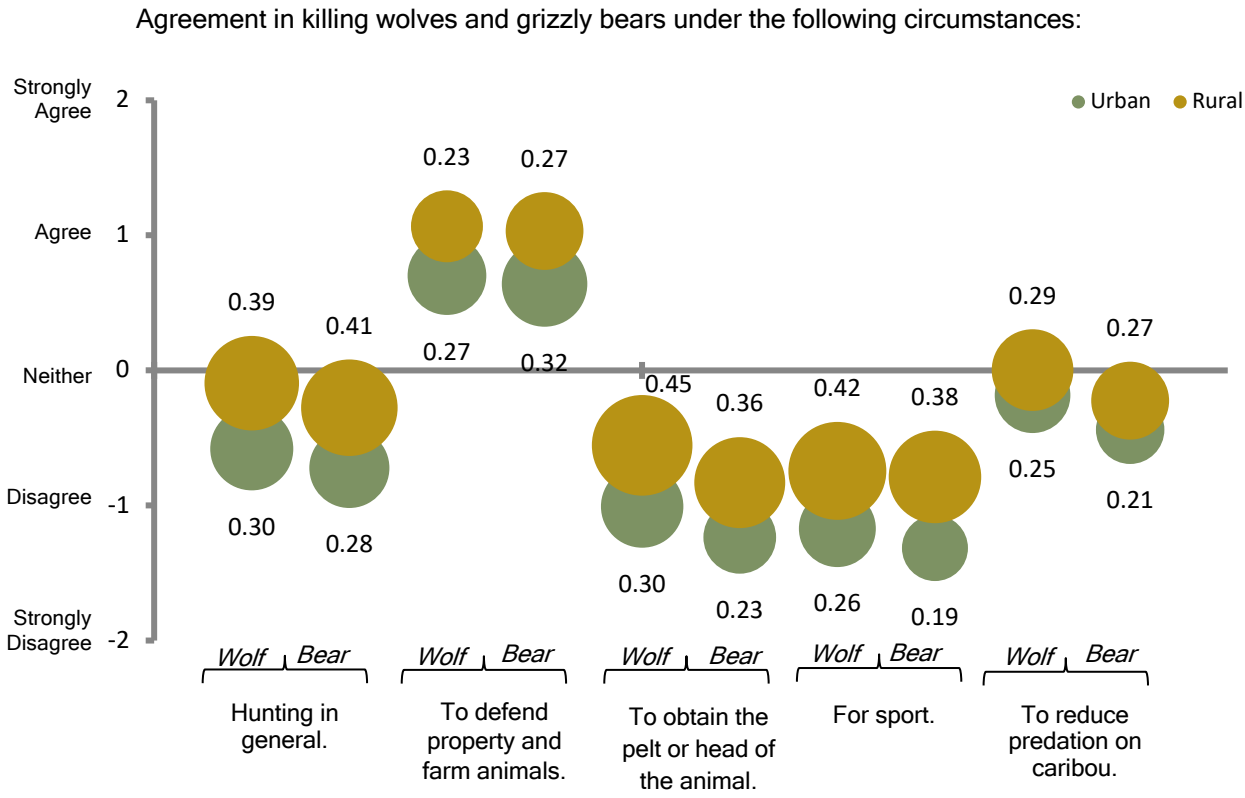

Figure 24 Attitudes toward killing wolves and grizzly bears under various circumstances by region, and the Potential for Conflict among rural and urban Albertans.

Attitudes and beliefs about the use of strychnine in wildlife management

The use of poison, like strychnine baits, is permitted in Alberta. To better understand the public's opinion of this management tool, Albertans were asked about their familiarity with the use of strychnine in controlling wolf populations. If familiar with the use of this poison, respondents were asked about their beliefs toward strychnine.

- Most Albertans (64%) were *not at all familiar* with the use of strychnine as a wildlife management tool; 3% were *very familiar* with its use (Fig. 25).
- About 8 in 10 Albertans (81%) did not know that the use of strychnine is a legal measure to control wolf populations; 19% knew about it.

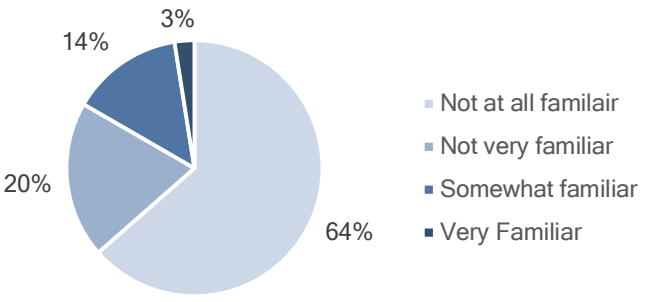

Figure 25 Familiarity (%) with the use of strychnine in wildlife management.

Only people who were somehow familiar with the use strychnine were asked about their beliefs toward this poison (n = 175). Various beliefs items were used with responses ranging from strongly disagree (=1) to strongly agree (=5) with a neutral point (=3).

On average, people agreed death by strychnine ingestion is inhumane (M = 4.01, SD ± 1.01; Fig. 26). There was a strong belief that other wildlife species, such as grizzly bears, coyotes, eagles and owls, are killed from the use of strychnine during the effort to control wolf populations (M = 3.98, SD ± 1.06). Most people disagreed that strychnine is a fast way to kill a wolf (M = 2.59, SD ± 1.05).

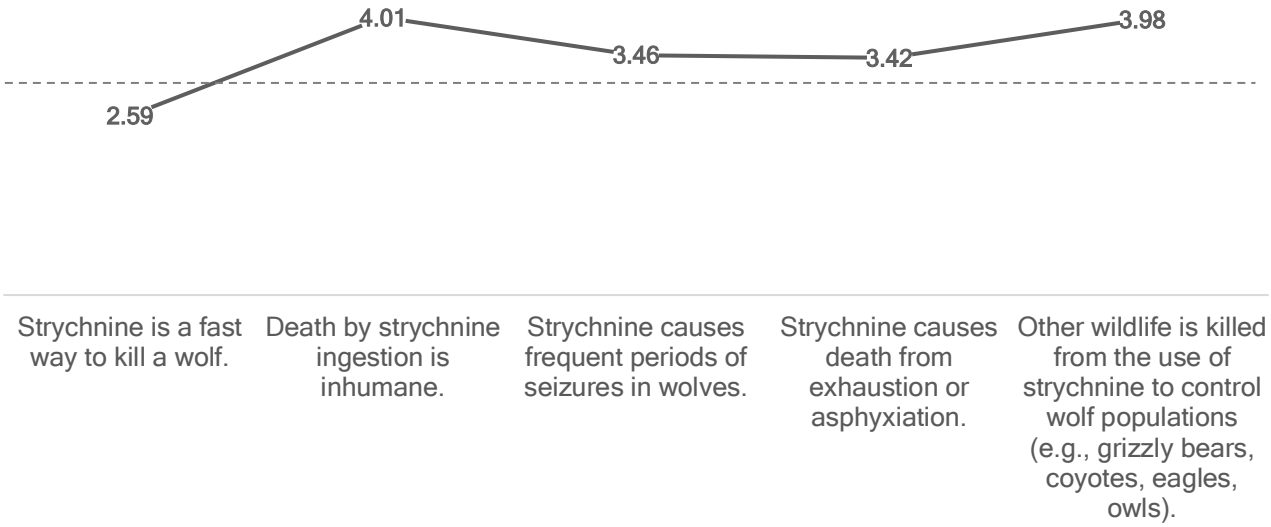

Figure 26 Public beliefs about the use of strychnine. Mean responses range from 1 (strongly disagree) to 5 (strongly agree).

- For approximately 45% of respondents, use of strychnine is perceived as not a fast way to kill a wolf (Fig. 27).
- 76% believe that death by strychnine is inhumane; 12% disagreed.
- One in four respondents believe other wildlife species are killed from the use of strychnine to control wolf populations; 10% somehow disagreed.
- The majority neither agreed nor disagreed strychnine causes death from exhaustion (41%) and causes frequent periods of seizures in wolves (49%).

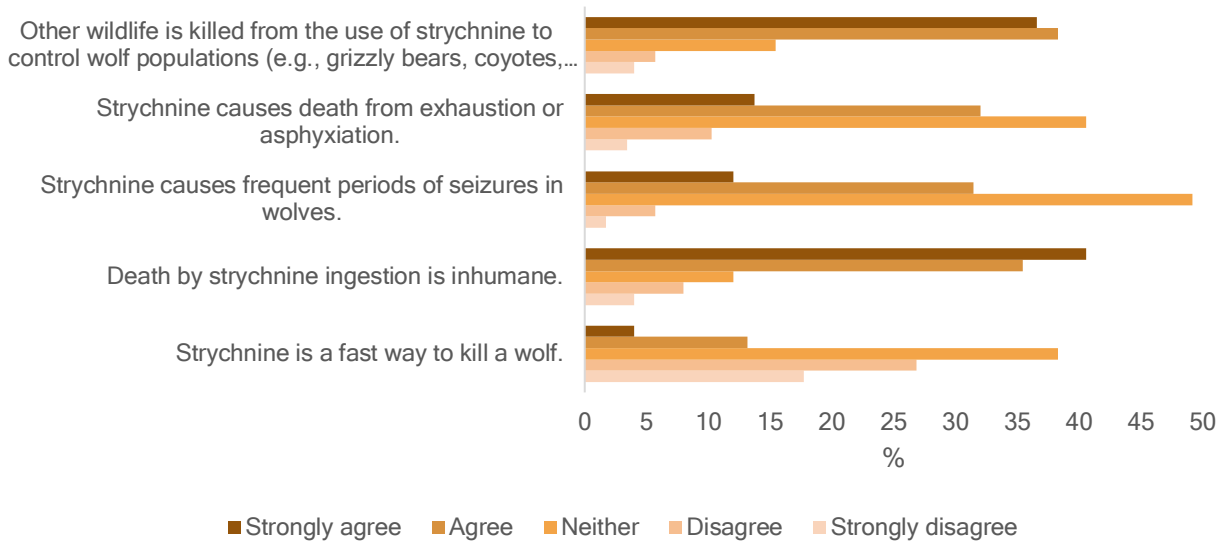

Figure 27 Beliefs (%) about the use of strychnine.

Albertans who were familiar with strychnine were also asked if its use to control predators such as wolves and grizzly bears should be banned or not. In general, Albertans believed that the use of strychnine should be banned (M = 4.05, SD ±1.11).

- One in ten people disagreed in some way with banning the use of strychnine; 16% neither agreed nor disagreed (Fig. 28).
- Approximately three in four Albertans supported a ban on strychnine.

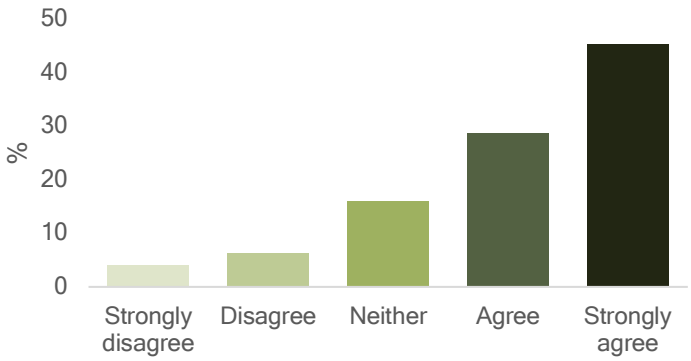

Figure 28 Levels of agreement (%) in banning the use of strychnine to kill predators.

Significant differences were observed between rural and urban residents and their beliefs associated with the use of strychnine as being inhumane (t (316) = 2.46, p = .01). Urban respondents (M = 4.01, SD ± 1.08) held a slightly stronger belief that strychnine is inhumane in comparison to rural respondents (M = 3.72, SD ± 1.23).

- 41% of urban Albertans strongly agreed death by strychnine is inhumane, 32% of rural residents strongly agreed.
- 11% of urban and 16% of rural residents disagreed strychnine is inhumane.

Opinions between rural and urban Albertans also differed significantly to banning the use of strychnine to control wildlife (t (315) = 2.11, p = .04). Urban residents (M = 4.02, SD ± 1.08) were slightly more supportive of a ban in strychnine than rural residents (M = 3.78, SD ± 1.22), although both do support a ban.

- About 16% of rural and 10% of urban residents disagreed with a ban.
- Approximately three in four rural and urban residents agreed in banning strychnine to kill predators.

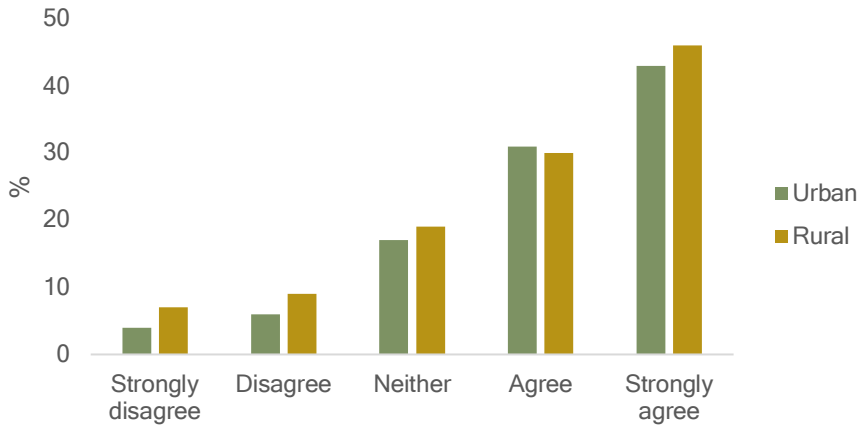

Figure 29 Levels of agreement (%) in banning the use of strychnine to kill predators by region.

Acceptability of killing wildlife to protect caribou

Albertans were asked how acceptable/unacceptable it is to kill wolves, grizzly bears, coyotes, eagles and owls to protect caribou. Eagles, owls and coyotes were chosen as examples of species that could eventually get killed in the process of protecting caribou. It is known that poison baits can eventually cause the death of non-target species, hence respondents were asked if it would be acceptable to kill other wildlife species to protect caribou. Responses ranged from strongly

unacceptable (-2) to strongly acceptable (+2). The PCI was used to assess potential for conflict among rural and urban residents.

Overall, Albertans considered it unacceptable to kill any other wildlife in order to protect caribou. Killing coyotes was the least unacceptable (M = -.32, SD ± 1.25), followed by wolves (M = -.54, SD ± 1.16), and grizzly bears (M = -.76, SD ± 1.04; Fig. 30).

- 33% accepted killing coyotes to protect caribou.
- 23% accepted the killing of wolves, and 14% of grizzly bears to protect caribou.
- 83% disapproved the killing of eagles or owls to protect caribou.

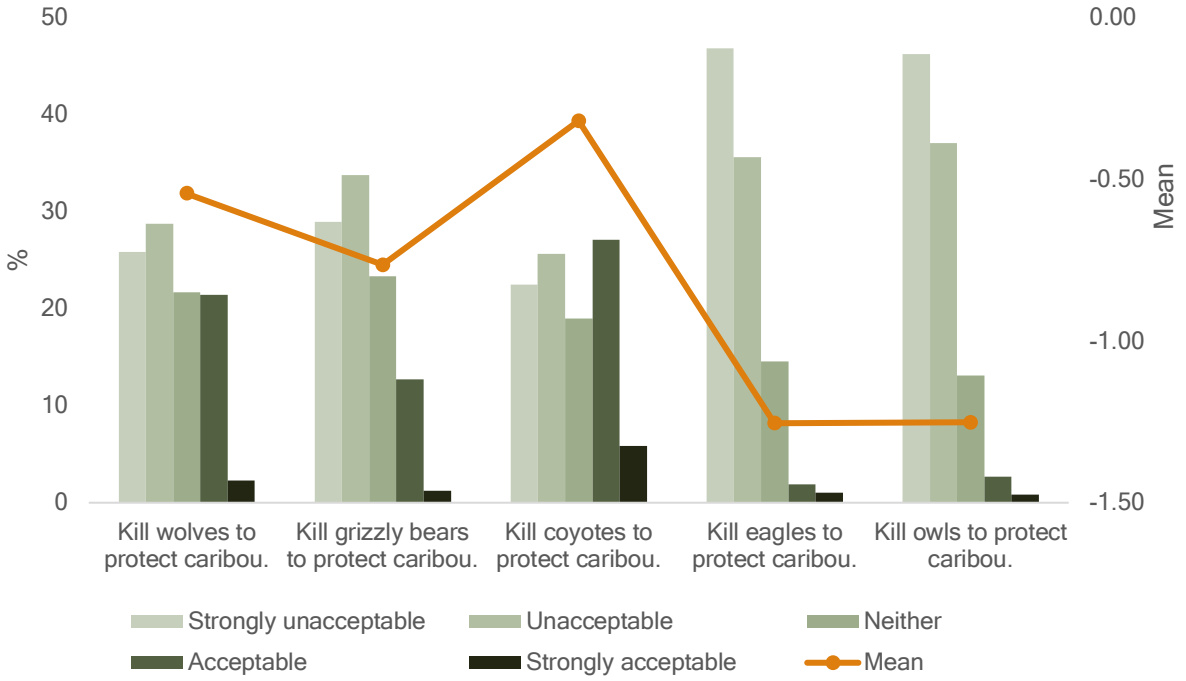

Figure 30 Acceptability of killing wildlife to protect caribou. Frequencies (primary vertical) and mean (secondary vertical) responses.

Statistically significant differences were observed between rural and urban residents regarding acceptability of killing wolves (t (788) = 3.05, p = .002), grizzly bears (t (792) = 2.43, p = .01) and coyotes (t (803) = 2.95, p = .003) to protect caribou. Rural residents were slightly more supportive of killing wolves (M = -.30, SD ± 1.13), bears (M = -.57, SD ± 1.17) and coyotes (M = -.07, SD ± 1.31) than were urban residents (Fig. 31), although still not in favor overall of killing these species.

Less potential for conflict was found among urban residents, i.e., PCI values closer to zero. High levels of consensus were found among rural and urban residents in their lack of acceptability of killing eagles (PCI = .10 and .06 respectively) and owls (PCI = .07 and .08). On the other hand, higher divergence in responses were found regarding killing coyotes (PCI = .39 for rural and .33 for urban). Less consensus also occurred among rural residents with their acceptability of killing wolves (PCI = .38).

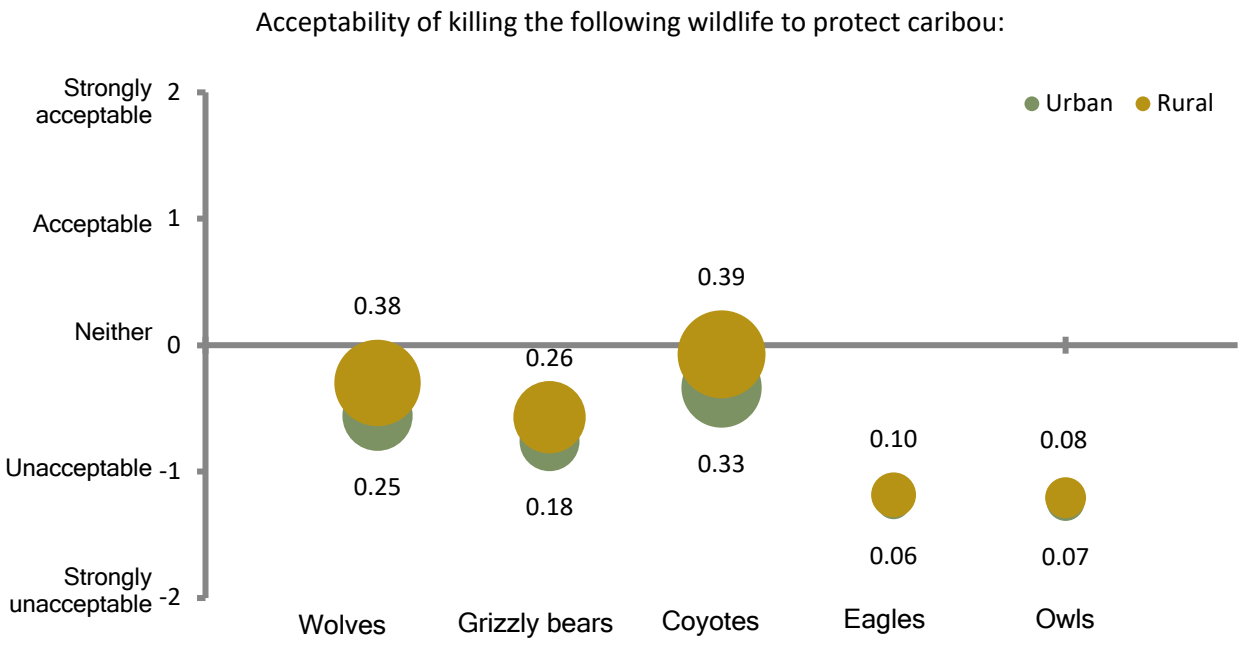

Figure 31 Acceptability of killing wildlife to protect caribou by region, and the Potential for Conflict Index.

Final Considerations

Public perception of lethal management of predators in attempt to ensure the recovery of caribou populations in Alberta is a complex issue as illustrated by our results. Specific words in communication messages to the Albertan public will be incredibly important in this issue. Most of the Albertan public, whether rural or urban, feel it is generally unacceptable to reduce wolves and grizzly bears in caribou habitat. Most people do not see wolves and grizzly bears as important factors causing the decline of caribou; instead looking for managers to tackle issues of motorized recreational use, logging and seismic lines. Such issues are difficult to address by wildlife managers, who to date have relied on managing what they can manage, which are the predators.

Among several possibilities for wolf management, trapping and relocating wolves was the only acceptable approach from a public's viewpoint. Relocating wildlife is often an expensive and challenging management tool to use, however, and can cause serious implications to wolves and their social territorial dynamic. Residents in general were neutral about doing nothing, which may in fact suggest that this could be the best approach. Lethal forms of controlling wolf populations were not accepted by the majority, with a higher degree of consensus regarding against specifically the use of strychnine. Most people were not familiar with the use of strychnine and believed it to be an inhumane approach that should be banned.

The challenge for wildlife managers and organizations wishing to communicate messages about caribou recovery and predator control is in the choice of the words to use. For example, 23% of Albertans accept killing wolves to "protect" caribou, however, 33% agree to killing wolves "to reduce predation on caribou". In the latter, our results suggest 38% disagree with killing wolves to reduce predation on caribou but a large third (29%) are neutral; this segment of society could be swayed in either direction based on messages that reveal predation is a key factor, something that most Albertans don't believe really is the cause of the caribou decline.

The predator control-caribou recovery debate is seen by the Albertan public as much more complex. The public perceives that the decline is a result of factors other than predators (e.g., motorized recreational access, logging, seismic lines, oil and gas, etc.) and managers may wish to work across disciplinary boundaries with their respective counterparts to use a much more integrated approach to caribou recovery. The public clearly holds a positive attitude toward caribou but also seems to understand and value the role of wolves, grizzly bears and other predators in the Albertan ecosystem.

Wolf control is often the management decision used worldwide as it seems it can be the least difficult option to implement and gain public support for. In Canada, at a time with increased environmental awareness among a growing general public, our data suggests such focus on only the predators as the source of the problem and reducing them as the solution is no longer acceptable. In fact, Albertans in general were more supportive of non-lethal control of predators, or any control at all. The preference for *letting nature takes its course* is somehow reflected in the acceptability of doing nothing about wolf issues with caribou.

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Appendix A – Specific Attitudes Toward Grizzly Bears, Wolves and Caribou by Region

Independent T-Test was used to assess differences in specific attitudes toward grizzly bears, wolves and caribou between rural and urban residents.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in their attitudes toward all three species, thus supporting the alternative hypotheses.

Table 1 Specific attitudes toward grizzly bears, wolves and caribou by region.

Species / Attitudinal item	Mean[a]		*t*-value	df	Sig.
	Rural	Urban			
Attitudes toward Caribou	1.78	1.66	2.15	803	.032
Alberta is better off without caribou.	1.62	1.48	2.39	798	.017
There are too many caribou in Alberta.	1.94	1.83	1.57	803	.018
Attitudes toward Grizzly Bear	1.90	1.66	4.10	781	<.001
Alberta is better off without grizzly bears.	1.62	1.47	2.63	803	.009
There are too many grizzly bears in Alberta.	2.18	1.18	4.54	773	<.001
Attitudes toward Wolf	2.03	1.76	4.24	803	<.001
Alberta is better off without wolves.	1.71	1.53	3.02	779	.003
There are too many wolves in Alberta.	2.34	2.00	4.5	766	<.001

[a] Mean value derived from a five-point scale ranging from strongly disagree (1), disagree (2), neither (3), agree (4) and strongly agree (5).

Appendix B – Wildlife Value Orientation by Region

Independent T-Test was used to assess differences in wildlife value orientations toward grizzly bears, wolves and caribou between rural and urban residents.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in their intrinsic, existence and utilitarian value orientations toward all three species. No significant difference for spiritual values was detected.

Table 2 Wildlife Value Orientation toward grizzly bears, wolves and caribou by region.

Species / Value Orientation item	Mean[a]		*t*-value	df	Sig.
	Rural	Urban			
Caribou					
Intrinsic - Caribou are important because they are part of nature.	4.33	4.43	2.13	803	.034
Existence - Caribou have the right to exist in Alberta as much as we do.	4.15	4.45	3.01	803	.003
Spiritual - Caribou are sacred to me.	2.82	2.87	.64	803	.517
Utilitarian - We can continue hunting caribou, as long as we protect it for future generations.	3.52	3.30	2.65	803	.008
Grizzly Bear					
Intrinsic - Caribou are important because they are part of nature.	4.28	4.42	2.39	803	.017
Existence - Caribou have the right to exist in Alberta as much as we do.	4.13	4.33	3.04	775	.002
Spiritual - Caribou are sacred to me.	2.83	2.89	.713	803	.476
Utilitarian - We can continue hunting caribou, as long as we protect it for future generations.	3.37	3.04	3.63	803	<.001
Wolf					
Intrinsic - Caribou are important because they are part of nature.	4.29	4.42	2.32	803	.021
Existence - Caribou have the right to exist in Alberta as much as we do.	4.10	4.29	2.75	778	.006
Spiritual - Caribou are sacred to me.	2.85	2.90	.54	803	.592
Utilitarian - We can continue hunting caribou, as long as we protect it for future generations.	3.40	3.02	4.16	803	<.001

[a] Mean value derived from a five-point scale ranging from strongly disagree (1), disagree (2), neither (3), agree (4) and strongly agree (5).

Appendix C – Beliefs About the Decline in Caribou Populations by Region

Independent T-Test was used to assess differences in beliefs associated to the factors contributing to caribou decline between rural and urban residents.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in most of their beliefs about the factors that can be contributing to caribou decline. No significant difference for beliefs associated to grizzly bears and wolves.

Table 3 Beliefs associated with the decline in caribou population.

Belief items	Mean[a]		*t*-value	df	Sig.
	Rural	Urban			
How important are the following to be causing caribou decline?					
Hunting.	1.54	1.83	4.09	738	<.001
Climate change.	1.15	1.50	4.19	738	<.001
Oil and gas exploration.	1.43	1.68	3.27	728	.001
Logging.	1.83	1.98	2.23	734	.026
Seismic lines.	1.40	1.71	4.02	692	<.001
Grizzly bears.	1.12	1.11	.08	704	.935
Wolves.	1.36	1.30	.92	702	.359
Motorized recreation (e.g., ATV, snowmobile).	1.55	1.80	3.41	732	.001

[a] Mean value derived from a five-point scale ranging from not at all important (=0), not very important (=1), somewhat important (=2), and very important (=3).

Appendix D – Acceptability for Management Options to Recover Caribou by Region

Independent T-Test was used to assess differences in rural and urban residents and their acceptability of various management approaches to recover woodland caribou populations.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in most of their acceptability levels towards the suggested management approaches to recover caribou. No significant (p >.05) difference was observed for reducing moose populations and targeting habitat restoration.

Table 4 Beliefs associated to management options to recover woodland caribou by region.

Belief items associated to caribou recovery.	Mean[a]		*t*-value	df	Sig.
	Rural	Urban			
Reduce hunting.	3.40	3.66	3.24	800	.001
Reduce climate change.	2.94	3.35	4.39	803	<.001
Reduce oil and gas exploration.	2.67	3.02	4.03	803	<.001
Reduce logging.	3.19	3.41	2.71	803	.007
Reduce seismic lines.	3.04	3.42	4.75	803	<.001
Reduce grizzly bears in caribou habitat.	2.65	2.50	1.99	797	.047
Reduce wolves in caribou habitat.	2.86	2.66	2.45	794	.014
Reduce motorized recreation (e.g., ATV, snowmobile).	3.33	3.76	5.15	792	<.001
Reduce moose populations.	2.29	2.24	.71	794	.479
Target habitat restoration to reduce wolf predation on caribou.	3.46	3.50	.58	798	.564
Penning caribou to reduce predation (e.g., fencing).	2.53	2.78	3.30	803	.001

[a] Mean value derived from a five-point scale ranging from strongly unacceptable (1), unacceptable (2), neither (3), acceptable (4) and strongly acceptable (5).

Appendix E – Acceptability of Wolf Management Options by Region

Independent T-Test was used to assess differences in rural and urban residents and their acceptability of various management approaches manage wolf populations.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in most of their acceptability levels towards the suggested wolf management approaches. No significant (p >.05) difference was observed for the *doing nothing* option.

Table 5 Acceptability of wolf management approaches by region.

Belief items associated to wolf management.	Mean[a]		*t*-value	df	Sig.
	Rural	Urban			
Live trap and shoot wolves.	-.49	-.87	4.36	803	<.001
Live trap and lethal injection.	-.65	-.91	3.04	799	.002
Shoot wolves from airplane or helicopter.	-.74	-1.02	3.29	785	.001
Use poison (e.g., strychnine baits).	-1.21	-1.37	2.56	803	.011
Trap and relocated the wolf.	.50	.76	3.53	779	<.001
Use of snares.	-.62	-.95	3.94	772	<.001
Do nothing.	.09	.17	1.07	803	.285

[a] Mean value derived from a five-point scale ranging from strongly unacceptable (-2), unacceptable (-1), neither (0), acceptable (1) and strongly acceptable (2).

Appendix F – Attitudes Toward Killing Wolves and Grizzly Bears by Region

Independent T-Test was used to assess differences in rural and urban residents and their attitudes toward killing wolves and grizzly bears under different circumstances.

We hypothesized:

H_0: rural = urban
H_1: rural ≠ urban

Rural and urban residents differed in their attitudes toward killing wolves in grizzle bears under all circumstances at $p < .05$ significant level.

Table 6 Attitudes toward killing wolves and grizzly bears by region.

Species / Circumstances in which wolves and bears could be killed		Mean[a]		*t*-value	df	Sig.
		Rural	Urban			
Hunting in general.	Wolf	-.09	-.58	5.43	803	<.001
	Grizzly Bear	-.28	-.72	4.95	792	<.001
To defend property and farm animals.	Wolf	1.07	.70	4.70	803	<.001
	Grizzly Bear	1.03	.64	4.78	802	<.001
To obtain the pelt of head of the animal.	Wolf	-.55	-1.01	4.94	784	<.001
	Grizzly Bear	-.83	-1.24	4.80	778	<.001
Fort sport.	Wolf	-.74	-1.17	4.81	778	<.001
	Grizzly Bear	-.79	-1.32	6.34	759	<.001
To reduce predation on caribou.	Wolf	.00	-.18	2.29	803	.022
	Grizzly Bear	-.22	-.44	2.73	803	.006

[a] Mean value derived from a five-point scale ranging from strongly disagree (-2), disagree (-1), neither (0), agree (1) and strongly agree (2)

Appendix G – Research Questionnaire

PUBLIC OPINION ABOUT CARIBOU, GRIZZLY BEARS AND WOLF MANAGEMENT IN ALBERTA

Dear Resident,

We would like to learn more about your opinion of caribou, grizzly bears and wolf management in Alberta. Your participation is an important component for the understanding of management approaches to protect woodland caribou. You are one of a small number of people chosen at random and invited to participate. Please take 10 minutes or less to share your views by completing the questionnaire.

We thank you for taking the time to fill out this questionnaire. Your input is very important.

[SECTION1_A]
How do you feel about the following animals?
For each item, please check the box that best represents your opinion.

[COLUMNS]
Strongly Dislike
Dislike
Neither
Like
Strongly Like

[ROWS] [RANDOMIZE]
Caribou
Grizzly Bear
Wolf

[SECTION1_B]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Alberta is better off without **wolves.**
There are too many **wolves** in Alberta.
Alberta is better off without **grizzly bears.**
There are too many **grizzly bears** in Alberta.
Alberta is better off without **caribou.**
There are too many **caribou** in Alberta.

[SECTION2]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Grizzly bears are important because they are part of nature.
Grizzly bears have the right to exist in Alberta as much as we do.
Grizzly bears are sacred to me.
We can continue hunting grizzly bears, as long as we protect some for future generations.

[SECTION3]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Wolves are important because they are part of nature.
Wolves have the right to exist in Alberta as much as we do.
Wolves are sacred to me.
We can continue hunting wolves, as long as we protect some for future generations.

[SECTION4]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Caribou are important because they are part of nature.
Caribou have the right to exist in Alberta as much as we do.
Caribou are sacred to me.
We can continue hunting caribou, as long as we protect some for future generations.

[SECTION5]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Wolves compete with big game hunters for prime trophy animals.
Wolves keep wild ecosystems healthy.
Wolves reduce caribou numbers to unacceptable levels in Alberta.
Wolves compete with hunters for meat.

[SECTION6]
To what extent do you agree or disagree with each of the following?

[COLUMNS]
Strongly Disagree
Disagree

Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Grizzly bears compete with big game hunters for prime trophy animals.
Grizzly bears keep wild ecosystems healthy.
Grizzly bears reduce caribou numbers to unacceptable levels in Alberta.
Grizzly bears compete with hunters for meat.

[SECTION7_A]
Many factors may be causing a decline in woodland caribou in Alberta.
How important do you believe the following are to be causing the caribou decline?

[COLUMNS]
Very important
Somewhat important
Not very important
Not at all important
Don't know

[ROWS] [RANDOMIZE]
Hunting.
Climate Change.
Oil and Gas exploration.
Logging.
Seismic lines (long linear corridors in the forest used to set off explosive charges to locate oil and gas deposits).
Grizzly bears.
Wolves.
Motorized recreation (e.g., ATV, snowmobile).

[SECTION7_B]
Many management options have been suggested to recover caribou populations.
How acceptable are each of the following to recover caribou?

[COLUMNS]
Strongly Unacceptable
Unacceptable
Neither
Acceptable
Strongly Acceptable

[ROWS] [RANDOMIZE]
Reduce hunting.
Reduce climate change.
Reduce Oil and Gas exploration.
Reduce Logging.
Reduce Seismic lines (long linear corridors in the forest used to set off explosive charges to locate oil and gas deposits).
Reduce Grizzly bears in caribou habitat.
Reduce Wolves in caribou habitat.
Reduce motorized recreation (e.g., ATV, snowmobile) in caribou habitat.
Reduce moose populations.
Target habitat restoration to reduce wolf predation on caribou.
Penning caribou to reduce predation (e.g., fencing).

[SECTION8_A]
Since 2005, wolf management efforts have been conducted as part of the Woodland Caribou Recovery Plan in Alberta. Managing wolf populations can occur in various ways.

How acceptable are each of the following management methods?

[COLUMNS]
Strongly Unacceptable
Unacceptable
Neither
Acceptable
Strongly Acceptable

[ROWS] [RANDOMIZE]
Live trap and shoot wolves.
Live trap and lethal injection.
Shoot wolves from airplane or helicopter.
Use poison (e.g., strychnine baits).
Trap and relocate the wolf.
Use of snares.
Do nothing.

[SECTION8_B]
How much do you agree with killing wolves under the following circumstances?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Hunting wolves in general.
To defend property and farm animals.
To obtain the pelt or head of the animal to sell.
For sport.
To reduce predation on caribou.

[SECTION8_C]
How much do you agree with killing grizzly bear under the following circumstances?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Hunting grizzly bears in general.
To defend property and farm animals.
To obtain the pelt or head of the animal to sell.
For sport.
To reduce predation on caribou.

[SECTION9_A]
Did you know that the use of the poison strychnine is a legal measure to control wolf populations in Alberta?

Yes
No

[SECTION9_B]
How familiar are you with the use of strychnine poison as a wildlife management technique?

Very familiar
Somewhat familiar
Not very familiar
Not at all familiar

[IF NOT AT ALL FAMILIAR SKIP QUESTION 9_C]

[SECTION9_C]
How much do you agree or disagree with the following statements on the use of strychnine poison?

[COLUMNS]
Strongly Disagree
Disagree
Neither
Agree
Strongly Agree

[ROWS] [RANDOMIZE]
Strychnine is a fast way to kill a wolf.
Death by strychnine ingestion is inhumane.
Strychnine causes frequent periods of seizures in wolves.
Strychnine causes death from exhaustion or asphyxiation.
Other wildlife is killed from the use of strychnine to control wolf populations (e.g., grizzly bears, coyotes, eagles, owls).
The use of strychnine to kill wildlife such as wolves and bears should be banned.

[ASK ALL]

[SECTION10]
How acceptable are each of the following?

[COLUMNS]
Strongly Unacceptable
Unacceptable
Neither
Acceptable
Strongly Acceptable

[ROWS] [RANDOMIZE]
Kill wolves to protect caribou.
Kill grizzly bears to protect caribou.
Kill coyotes to protect caribou.
Kill eagles to protect caribou.
Kill owls to protect caribou.

[SECTION11_A]
What types of groups most represent your views? Please mark all that apply:

Environmental
Conservationist
Hunter
Trapper
Farmer
Animal Rights
Animal Welfare
Other **[ANCHOR] [SPECIFY]**
None of the above **[ANCHOR] [EXLUSIVE]**

[SESSION11_B]

Does anyone at your house have a hunting or trapping license?

Yes
No

[SECTION11_C]
Are you an Aboriginal person, that is, First Nations, Métis or Inuk (Inuit)?

No, not an Aboriginal person.
Yes, First Nations.
Yes, Métis.
Yes, Inuk (Inuit)

[SECTION11_D]
If a federal election were held tomorrow in Canada, which of the following parties would you be most likely to support in your constituency?

Conservative Party
People's Party of Canada
Liberal Party
New Democratic Party (NDP)
Green Party
Other party **[ANCHOR]**
Undecided **[ANCHOR] [ANCHOR]**
I cannot vote **[ANCHOR]**

Thank you very much for sharing your views and participating!