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Human–Carnivore Interactions: Lessons Learned from Communities in the American West

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Types, causes, and intensity of human–carnivore interactions are related to historical context, management policy, and human perception. We used four rural communities in the American West with varying histories and management policies to assess the complexities of human–carnivore interactions and to determine factors influencing individual willingness to coexist with carnivores. By analyzing focus group and interview data from 49 community members, we found that human perceptions towards carnivores and their management were influenced by self-perceived knowledge about carnivores, ability to be heard and have a voice in management decisions, and economic concerns rather than ecological factors. Willingness to coexist with carnivores and to adopt adaptive management were related to past carnivore experience and broader management policy frameworks. Our results suggest a need to better understand how different stakeholders interpret scientific information, what strategies can facilitate effective communication among stakeholders, and what makes stakeholders feel treated justly when human–carnivore conflicts occur.

Keywords human–wildlife conflict, wildlife management, coexistence, qualitative research, United States

Introduction

Real or perceived carnivore conflicts with humans often end with carnivore mortalities (Gunther et al., 2004; Ogada, Woodroffe, Oguge, & Frank, 2003; Packer, Ikanda, Kissui, & Kushnir, 2005; Patterson, Kasiki, Selempo, & Kays, 2004). This pattern has been repeated throughout the world (Jhala & Giles, 1991; Treves & Karanth, 2003). Willingness to coexist with carnivores depends not only on ecological factors, but also on the social, political, economic, and cultural contexts of human populations (Clark, Curlee, & Reading, 1996; Treves, 2009). While the general public may endorse conservation actions for large carnivores, local stakeholders tend to be less supportive because they incur the costs

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of living with carnivores (Ormerod, 2002; Muhly & Muisiani, 2009; Naughton-Treves, Grossberg, & Treves, 2003; Treves & Karanth, 2003). The presence of carnivores can impose financial costs on rural communities through competition with humans over agricultural crops, livestock, wild game, and other natural resources (Graham, Beckerman, & Thirgood, 2005; Treves & Karanth, 2003). As a result, most strategies for addressing human–carnivore conflicts in rural areas have focused on mitigating economic loss. Such strategies, however, often fail to adequately account for changing and varied perceptions of those who directly interact with carnivores on a regular basis (Montag, 2003). There remains a need to better understand how non-ecological factors, especially those beyond economics, shape human–carnivore conflicts and are linked to human–carnivore coexistence (Dickman, Macdonald, & Macdonald, 2011; Inskip & Zimmerman, 2009; Jacobson, Langin, Carlton, & Kaid, 2012; Kellert, Black, Rush, & Bath, 1996).

Research has been conducted to understand the types, causes, and intensity of human–carnivore conflicts (Treves & Karanth, 2003). Previous studies have examined to a certain extent how historical context, management policy, and human perception influence human–carnivore interactions. First, a historical context is fundamental to understanding how human perceptions and behaviors toward carnivores influence carnivore management. For example, populations of carnivores in parts of Europe persist despite high human population densities. In part, this has occurred because Europeans have had a long history of coexisting with carnivores and therefore have livestock husbandry techniques and management policies that allow for continued coexistence (Chapron et al., 2014; Linnell, Swenson, & Anderson, 2001). Such adaptations for coexistence are also prevalent in parts of highly populated Asia and Africa (Athreya, Odden, Linnell, Krishnaswamy, & Karanth, 2013; Carter Shrestha, Karki, Pradhan, & Liu, 2012; Elfström, Zedrosser, Støen, & Swenson, 2014; Woodroffe, 2000; Woodroffe & Frank, 2005). The situation differs in the American West, where most large carnivores were eradicated within a century of European settlement. Carnivore reintroductions may be perceived to contradict historical values and actions. Just as ecological baselines are subject to human recollection (Berger, 2005), it is likely that human perceptions vary by the length of time a community has lived with certain carnivores (Houston, Bruskotter, & Fan, 2010).

Second, management policy and how it addresses ecological and social concerns, shape the types, causes, and intensity of human–carnivore interactions. Current policy efforts to address human–carnivore conflicts often entail regulatory approaches (e.g., Endangered Species Act), non-lethal tools (Gehring, VerCauteren, & Landry, 2010; Shivik, Treves, & Callahan, 2003), lethal tools (including hunting; Linnell, Odden, Smith, Aanes, & Swenson, 1996; Treves & Naughton-Treves, 2005), financial and technical assistance (Bangs et al., 2004; Rondinini & Boitani, 2007; Wagner, Schmidt, & Conover, 1997), and public education and outreach programs (Boitani, 2000; Chavez & Gese, 2006; Graham et al., 2005; Meriggi & Lovari, 1996; Ormerod, 2002; Woodroffe & Frank, 2005). The assessment of such efforts has been limited and findings are often inconclusive (Harper, William, Mech, & Weisberg, 2008) or lack comprehensiveness (Musiani et al., 2004). For example, although wildlife damage has been widely cited as a reason for antagonism, subsequent management policies and programs aimed at reducing such damage has not resulted in long-term conflict resolution (Naughton-Treves et al., 2003; Sillero-Zubiri & Laurenson, 2001). In addition, wildlife managers share a common frustration that opinions and politics override conservation science in management decisions (Mallonee, 2011). Researchers have argued that many obstacles to effective conservation and management of carnivores are rooted in less visible, more complex social conflicts between people and groups (Madden & McQuinn, 2014). Thus, the extent to which carnivore policy can reconcile social conflicts

will determine the social receptivity to carnivore conservation and management goals and the level of social carrying capacity for the carnivore species of concern (Madden & McQuinn, 2014). Empirical biological and ecological sciences, however, only address ecological carrying capacity and cannot answer questions about social carrying capacity (Bruskotter, 2013). More effort is needed to better understand the complex social conflicts that underlie human–carnivore interactions and to develop effective policy strategies to address these social conflicts that impact the outcomes of carnivore conservation and management actions.

Third, human perceptions also shape human–carnivore interactions. The perceived losses and risks associated with carnivores are often greater than actual losses and risks. In East Africa, for example, economic damage to livestock from African wild dogs (*Lycaon pictus*) is minimal despite commonly held opinions to the contrary (Woodroffe & Frank, 2005). Ranchers in Finland worry about domestic sheep losses to gray wolves (*Canis lupus*) even though depredation by wolves is minor (Kaartinen, Luoto, & Kojola, 2009). In the United States, where wolves are often the focus of negative perceptions, costs associated with actual livestock depredation by wolves are less than 0.01% of the total income generated from livestock production (Muhly & Musiani, 2009). While overall costs are negligible, costs to individuals who lose livestock to predators can be significant and cause negative feelings toward predators within the broader ranching community (Gangaas, Kaltenborn, & Andreassen, 2013).

The negative feelings humans hold toward carnivores can extend beyond economic loss and be heightened by human perceptions of personal safety. In the United States, carnivore attacks on humans are rare and typically limited to mesocarnivores (e.g., Carbyn, 1989; Poessel et al., 2013; White & Gehrt, 2009), especially when compared to human attacks by carnivores in other countries (e.g., Inskip & Zimmerman, 2009; Nyhus & Tilson, 2004; Packer et al., 2005). These rare incidents, however, often result in heightened media attention and retaliatory killings. Nonetheless, the emotional stress on rural residents who experience economic loss via depredation or perceive threats to personal safety is real (Kaartinen et al., 2009; Naughton-Treves et al., 2003). Perception, not fact, often determines people's tolerance in conflict resolution (Dickman, 2010), and affects their behavioral intention, which is considered the most proximal predictor of human behavior (Fishbein & Ajzen, 2010; Oreg & Katz-Gerro, 2006).

Here, we build on the existing literature and use a case study approach to examine the complexities of human–carnivore conflicts considering all three factors (i.e., historical context, management policy, human perception). Our case study focuses on four rural communities in the American West. These four communities were selected for their varying historical and policy contexts. The objective was to use human–large carnivore conflicts in the American West to identify and assess factors influencing human perceptions towards and willingness to coexist with carnivores. While the results may not be directly translated into different geographical, sociopolitical, and ecological contexts, our findings draw generalizable lessons on how attention to non-ecological factors may help identify opportunties for promoting coexistence and reducing conflicts between carnivore populations and rural communities beyond specific carnivore species or geographical areas.

Methods

The study was conducted in the summer of 2011 in four rural communities across three states in the western United States. These communities included Blaine County (Ketchum) Idaho, Madison Valley (Ennis) Montana, Confederated *Salish* and *Kootenai* Tribes (Polson)

Montana, and Okanogan Valley (Omak) Washington (Figure 1). Communities were selected based on differences in state policies toward large carnivores and differences in time since wolves returned due to reintroduction or natural range expansion (Table 1). The communities exhibited similar ecological and geographic topographies, including the presence of other large carnivores, a rural demographic, and proximity to protected areas.

The data were collected from six focus groups and three semi-structured interviews. We intended to conduct focus groups with members of all four communities. However, in three occasions (see Table 2), only one participant came to our focus group despite more having confirmed their attendance via phone; therefore, we proceeded with a semi-structured interview using the same set of focus group questions. We used a qualitative approach to examine human–large carnivore interactions because it provides a mechanism for gathering information not likely to surface in a blanket survey (Prokopy, 2011) like those previously employed in other human–carnivore interaction studies (e.g., Kaltenborn, Bjerke. & Vittersø, 1999; Koval & Mertig, 2004; Manfredo, Zinn, Sikorowski, & Jones, 1998). A qualitative approach provides participants opportunities to explain their responses in detail, which facilitates the understanding of complex human–carnivore interactions (Sandelowski, 2000). Although our case study does not provide statistical generalizability, it contributes to generalizing theories and developing nuanced understanding of reality (Flyvbjerg, 2006; Yin, 2009). It also leaves room for future researchers and practitioners

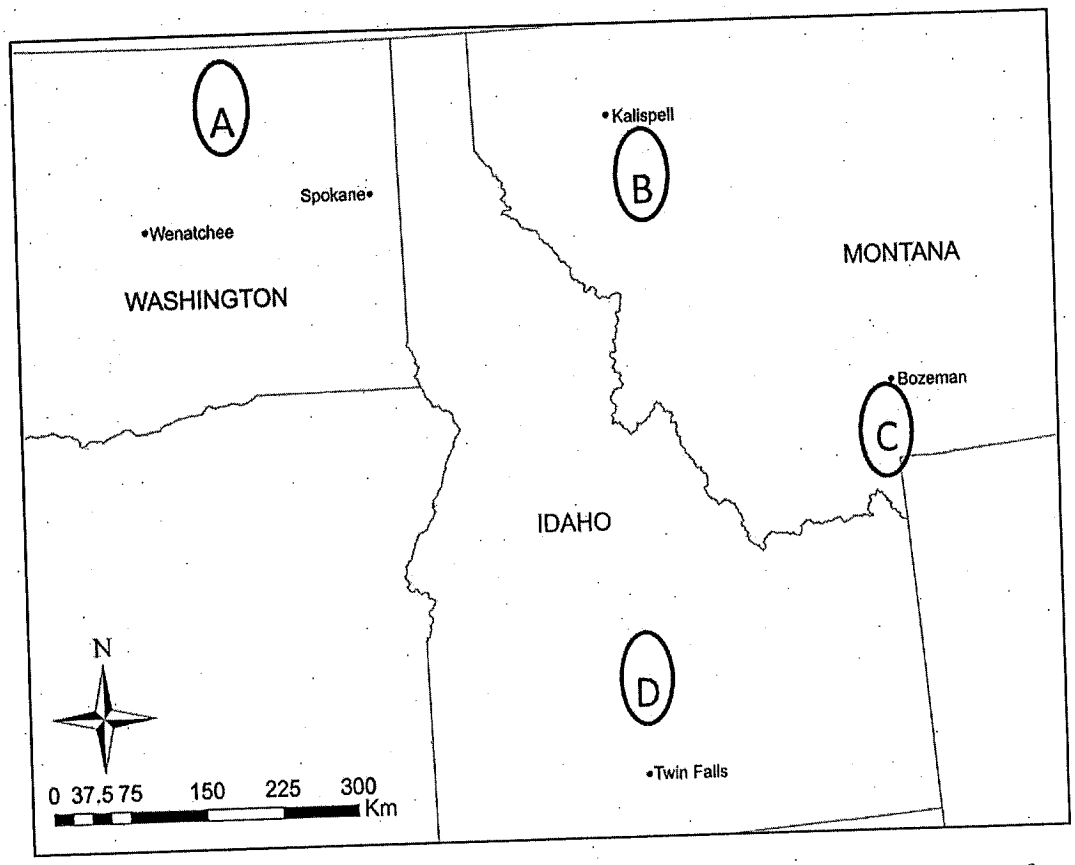

Figure 1. A map of the study sites in the American West. The general area participants came from are shown as ovals. A: Okanogan Valley (Omak) Washington; B: Confederated *Salish* and *Kootenai* Tribes (Polson) Montana; C: Madison Valley (Ennis) Montana; D: Blaine County (Ketchum) Idaho.

Table 1
Historical and Policy Contexts of Wolves and Wolf Management at the Four Study Sites

Community	Historical context regarding wolf presence	Wolf management policy context
Ketchum (Sun Valley, ID)	Wolf reintroduced in the mid-1990s; wolf packs firmly re-established by 1999	ID Wolf Population Management Plan (Big game species; hunting/trapping allowed)
Ennis (Madison Valley, MT)	Wolf reintroduced nearby in the mid-1990s; wolf packs firmly re-established by 1999	MT Montana Wolf Conservation & Management Plan (Big game species; hunting/trapping allowed)
Polson (Confederated *Salish* and *Kootenai* Tribes, MT)	Sporadic wolf presence before 1990s; wolf packs present in early 2000s with multiple packs established by 2009	Tribal Wolf Management Policy (Native wildlife species; not subject to taking by hunting or trapping; non-lethal techniques should be used; when non-lethal techniques fail, kill can be permitted by the Tribal Council and the U.S. Fish and Wildlife Service)
Omak (Okanogan Valley, WA)	Wolves present but packs not re-established	WA Wolf Conservation and Management Plan (Non-lethal control; hunting/trapping not allowed)

to determine if there are sufficient similarities between one case and another to generalize findings (Prokopy, 2011; Wehlage 1981).

In each community, separate focus groups were planned with participants classified as ranchers, non-ranchers, or tribal members. In Polson, Montana, we conducted a separate focus group with tribal members because of the presence of the Confederated *Salish* and *Kootenai* Tribes of the Flathead Reservation. Ranchers were defined as persons who currently ran or had run a livestock operation of any size. Non-ranchers were other local community members with wildlife management and conservation backgrounds or experience. Tribal members were part of the Confederated *Salish* and *Kootenai* Tribes of the Flathead Reservation with wildlife management and conservation backgrounds or experience.

We contacted local, state, and national wildlife management agencies and non-profit organizations to recommend potential participants from the communities whom we then invited to be part of our study. We did not specify gender or age requirements when asking for assistance with identifying potential participants but instead requested contact information of individuals who met our definitions of ranchers, non-ranchers, and tribal members and who were representative of each group. We used snowball sampling strategy. Snowball sampling is effective for identifying study participants in a target community and building rapport and trust between the researcher and participants, but it has limitations. Snowball

Table 2
Focus Group Location, Size, and Participant Information

Community	Group type	Group size	Livestock/ rancher	Gender	Race
Ketchum (Sun Valley, ID)	Rancher	1	Cattle	1 male	Caucasian
	Non-rancher	6	Not applicable	5 male, 1 female	Caucasian
Ennis (Madison Valley, MT)	Rancher	8	1 sheep, 7 cattle	7 male, 1 female	Caucasian
	Non-rancher	1	Not applicable	1 female	Caucasian
Polson (Confederated *Salish* and *Kootenai* Tribes, MT)	Rancher	8	Cattle	6 male, 2 female	Caucasian
	Non-rancher	9	Not applicable	8 male, 1 female	Caucasian
	Tribal	9	Not applicable	4 male, 5 female	Native American
Omak (Okanogan Valley, WA)	Rancher	6	1 sheep, 5 cattle	6 male	Caucasian
	Non-rancher	1	Not applicable	1 male	Caucasian
Total		49	2 sheep, 21 cattle	38 male, 11 female	9 Native American, 40 Caucasian

sampling is non-random and individuals are likely to be selected for their involvement in a certain social network (Goodman, 1961; Noy, 2008). This may lead to a homogenous sample in which all participants belong to the same socioeconomic categories (Browne, 2005). To minimize this potential effect, we only used snowball sampling to recruit a few (1–3) additional participants at each location to supplement the total number of participants obtained using other invitation techniques, and we asked participants to only recommend additional individuals who were not relatives or considered close friends.

Although 2–4 researchers attended each focus group or interview, one of two researchers always served as the focus group facilitator or interviewer using the same set of open-ended questions covering five topics: livelihoods and alternative land uses; perceptions towards large carnivores; perceived relationship between humans and large carnivores at different scales (i.e., personal, community, society); personal experiences with large carnivores; and, perceptions of large carnivore management policies and programs. We did not want to restrict participant discussion to only wolf-related issues, so we asked participants to identify which large carnivores were prevalent within local communities, and provided examples of large carnivores for which participants were free to discuss, including but not limited to coyotes (*Canis latrans*), bobcats (*Lynx rufus*), wolverines (*Gulo gulo*), wolves, grizzly (*Ursus arctos*) and black (*Ursus americanus*) bears, and mountain lions (*Puma concolor*). Each focus group or interview lasted 90–120 minutes, and was recorded with the permission of the study participants.

Recordings were transcribed by the same research assistant. Each transcription was first coded by the research assistant and then independently and manually coded by two members of the research team to ensure intercoder reliability (Hruschka et al., 2004). Each coder followed a three-step process outlined in Neuman (2011). An initial pass through of the data was performed to identify broad themes and determine initial codes. These initial codes were compared between the three coders to identify agreements and disagreements. The initial codes were revised and combined into one set of codes (i.e., the codebook). A second pass through was conducted using the codebook to organize key ideas and confirm themes within the codebook, while simultaneously looking for interactions, causes, and consequences with respect to the objective of our case study. Each theme was then summarized using a term or phrase agreed among the coders that captures the essence of the theme. A final pass through selectively identified direct quotes to highlight the themes drawn out in the first two steps, to demonstrate the transparency of findings, and to provide contextual richness (Prokopy, 2011; Sandelowski, 1994).

Results

Data were collected from 49 participants (23 ranchers, 17 non-ranchers, 9 tribal members) through six focus groups and three interviews (Table 2). Among the 23 ranchers, two had sheep operations and 21 were cattle ranchers. The rancher and non-rancher participants were all Caucasian (similar to the general population of the four counties based on 2010 U.S. Census data), while participants in the tribal group were all Native Americans. There were a total of 11 female participants (3 ranchers, 3 non-ranchers, 5 tribal members). Reponses were aggregated into five broad categories: (a) perceptions of participants towards large carnivores; (b) experiences with large carnivores; (c) groups influencing large carnivore management and policy decisions; (d) actions taken to address human–large carnivore conflicts; and (e) potential management and policy opportunities. Despite our intention to not restrict participants to specific large carnivore species and our effort to invite participants to discuss large carnivores in general, gray wolves featured predominantly in every focus group and interview. Thus, while we situate our results and discussion within the broader context of human–large carnivore interactions, caution needs to be taken to interpret and generalize our findings to other geographical and ecological systems.

Perceptions Toward Large Carnivores and Their Management

Participants' perceptions toward large carnivores and large carnivore management can be encapsulated into four descriptors: fear, vulnerability, illegitimacy, and questionable authority. These four descriptors were selected to describe and summarize the most common themes, with the first two focused on perceptions towards large carnivores and the last two on perceptions toward large carnivore management. Fear refers to worrisome feeling about losing livestock and wildlife of economic value (e.g., hunted species) to carnivores, as illustrated by the following quote from one rancher in Polson, Montana:

> We've got a couple pastures we haven't used for two years just because I'm afraid. . . . I don't want to turn cows with new born calves out there because I don't think you are going to find anything except the lonesome mother . . . it's hard to prove what happened to the calf. . . . My point is I have not used some of my pastures just because of that fear.

Vulnerability refers to an inability for a person to protect oneself and one's family. All three female ranchers across communities expressed a sense of vulnerability and were deeply concerned about their personal and family safety, as illustrated by the following quote from one female rancher in Ennis, Montana:

> We have hunters getting chewed up. I don't like the feeling of being at risk. . . . If I want to take my grandkids out, I need to be pretty selective.

Illegitimacy refers to an action being not in accordance with established rules, principles, or standards among local community members, as illustrated by the following quote from one rancher in Polson, Montana:

> I believe that the government with the wolf program has confiscated my land for the production of wolves against my will. They didn't help me pay for the land. They don't help me pay the taxes or build the fences or maintain it in any way shape or form. . . . I should be able to use it as I see fit, and yet I can't.

Finally, questionable authority refers to participants questioning the status of a person or group to make decisions, including formal policies, as illustrated by the following quote from one rancher in Ennis, Montana:

> I don't trust government to manage and control any of our wildlife. Most of the [government] people have never lived with them. They sit behind a desk. The wolves were the biggest fiasco they ever had. They were gonna collar them and notify ranchers. I don't know of anybody they ever notified. If they would let us take care of things, there would be less of [the government people].

In addition to the four descriptors (i.e., fear, vulnerability, illegitimacy, questionable authority) shared by rancher, non-rancher, and tribal participants, another theme emerged from only the tribal group but not the rancher or non-rancher groups. All tribal members shared a strong sense of connection with nature (including large carnivores) by discussing their view that living with wildlife, especially large carnivores, is part of their cultural heritage. This theme was well illustrated by a quote from one tribal participant:

> Indigenous people really have a special kind of spiritual contact with the animal, so it's kind of hard to explain to a non-indigenous, non-tribal person, the connection that we have.

When examining only the focus group participants (excluding the three interviewees), we found that although rancher, non-rancher, and tribal participants all shared the four descriptors, rancher and tribal participants tended to discuss their perceptions and feelings toward large carnivores and large carnivore management more often than non-rancher participants. In particular, rancher participants tended to express a sense of vulnerability more often than non-rancher participants.

Experiences with Large Carnivores

Participants' experiences with carnivores were categorized as direct, inferred, or anecdotal. The most often shared experiences were direct, defined as any direct encounter or interaction, including hearing wolf howling in the dark. An example of direct experience was recounted by a non-rancher participant from Ketchum, Idaho:

> One of my top ten life experiences was howling to a wolf and having it respond back to me. . . . It was the most incredible experience I've ever had in my life.

The least often shared experiences among study participants were inferred experiences, describing situations in which participants thought they had an encounter or interaction with large carnivore but the thought was only based on their own reasoning rather than a direct experience. One example of such inferred experiences was shared by a rancher in Ennis, Montana:

> The same number of cattle [on my ranch], for instance, they've averaged having 20 less live calves come in in the fall since the wolves were reintroduced than they did before, and the calves [that did come in] weighed about 20 pounds less . . .

Nearly every participant relayed stories about others having interacted with carnivores (i.e., anecdotal experiences). Secondary sources included family members, neighbors, friends, and public media sources, such as a local newspaper or radio station. An example of anecdotal experience was told by one rancher in Polson, Montana:

> Our son bought some heifers and was starting a herd and [he] had a wolf problem. They aborted their calves, so he had nothing to pay the bank the first year with. The bank doesn't care. They want that payment, but you don't have any calves because of the harassment from the wolves over and over.

It is worth noting that participants who shared anecdotal experiences were able to relay the stories of others with great details. For example, a rancher in Polson, Montana told a story that occurred in another state with great details:

> . . . my oldest son . . . was helping a family gather cows and fence or whatever. The [family] said they had a pack of wolves come in around them. There was an injured bull and they said all they had was a hammer and they felt pretty threatened just having them circle around. It was kind of an eerie feeling. When you're inside your car and you see them is one thing, but when you're horse back and all you've got is a hammer. Life is a little different there.

Overall, rancher, non-rancher, and tribal groups all shared direct, indirect, and anecdotal experiences with large carnivores, but rancher participants seemed to have shared more inferred experiences than non-rancher or tribal participants.

Groups Influencing Large Carnivore Management and Policy Decisions

When asked about persons or groups affecting large carnivore management and policy decisions regardless of the official authority of the persons or groups, rancher, non-rancher, and tribal participants identified "city people" and "conservationists" as two influential groups. "City people" refer to those who live in large urban areas. "Conservationists" refer to those who are affiliated with non-profit wildlife conservation organizations, whether through employment or membership.

Participants' attitudes towards these two groups were generally negative. For example, a rancher in Ennis, Montana shared his view:

> [Current policy] is driven by large portions of our population that really don't understand . . . the damage that these predators can do . . . and they don't realize the importance of the rancher. They don't understand the ranching perspective on wolves.

Another example is the following quote from one rancher in Omak, Washington:

> It's interesting to me that people [who] live in large metropolitan areas [think] carnivores can live anywhere they want in the West. . . . There's so much advocacy out there for these large carnivores that the . . . population of the United States does not appreciate what a large carnivore can do.

The following quote from another rancher in Ennis, Montana illustrates the general attitudes of rancher participants toward "conservationists":

> Defenders [of Wildlife's] biggest money maker is the wolf. They admit that. They're not anxious to see that go away. They want to keep that conflict there. There are other organizations. All the organizations that file lawsuits. . . . It's not about the wolf, it's about sustaining the organization.

In addition to "city people" and "conservationists," rancher participants across all four communities identified federal and state agencies as influential groups and viewed these agencies negatively. For example, a rancher from Omak, Washington stated:

> In most cases the federal land management agency and the State Fish and Game [are managing carnivores]. It's my contention though that here in the State of Washington, the state agency is brimming with people who are biologists but who are practicing advocacy. They just totally ignore the reality.

Tribal participants did not speak of federal and state agencies as influential groups, which likely reflects the fact that the Confederated *Salish* and *Kootenai* Tribes have their own wildlife management agency. Overall, rancher participants were more likely to identify "city people" as an influential group than non-rancher participants, while more non-rancher than rancher participants identified "conservationists" and state agencies as influential groups. These patterns were observed both within and across our study sites.

Desired Actions for Addressing Human–Large Carnivore Conflicts

We categorized all desired actions discussed by participants into two types: resistance-oriented and adaptation-oriented. Resistance-oriented actions refer to desired actions resulting from an unwillingness to change ranching practices or lifestyle in light of a new ecological landscape (e.g., recolonized wolves). Nearly all rancher and non-rancher participants discussed resistance-oriented actions and did not discuss adaptation-oriented actions. Among these rancher and non-rancher participants, rancher participants felt particularly strongly about being able to take direct measures to control large carnivores, evident by the following quote from one rancher in Omak, Washington:

> If I catch a wolf in my sheep it's a dead wolf, I don't care if it's endangered or not . . . it would be 3s's—shoot, shovel, shut up.

Although non-rancher participants also favored resistance-oriented actions, they tended to talk more about indirect measures to address large carnivore–rancher conflicts. One non-rancher participant in Polson, Montana, for example, discussed the need for ranchers to "get involved in your politics so that you can do something up front . . . get involved with your local organizations and know who you're electing."

In comparison to the resistance-oriented actions commonly desired among rancher and non-rancher participants, tribal participants favored adaptation-oriented actions, as illustrated by the following quote from a tribal participant in Polson, Montana:

> I think that just as we discourage certain animals from inhabiting areas where they might want to be, we need to equally discourage people from being [in places] and doing things where we don't want them to be because that's going to enhance the likelihood of that interaction [between people and large carnivores].

Potential Management Policy Opportunities

The majority of rancher participants expressed a disagreement with current large carnivore management policies in their state or at the federal level, especially policies related to wolf management. This disagreement can be illustrated by the following quote from one rancher in Ennis, Montana:

> The people that are managing [large carnivores] . . . don't understand the problem because it has never affected them. Just give them a job, give somebody a management position. But if they had to make their living with them, they would have a different policy I think. Because I know my policy is way different than theirs.

All rancher participants spoke about the need for policies and programs to help enhance their livelihoods and address their economic concerns. Both rancher and non-rancher participants identified barriers to existing livestock depredation programs, particularly the process of confirming a carnivore kill. For example, one rancher in Ennis, Montana told us:

> Confirming a kill is not that easy. You have a large area out there, and if you happen to find this calf before it's been consumed by wolves . . . it needs to be not hot weather, it needs to be less than a day old kill, otherwise the rot going

> on is sufficient to hide any concrete evidence that that was a wolf kill. . . . It's a matter of being lucky and diligent, both, to get a confirmed kill . . . they figured for every confirmed kill there was eight others that were not confirmed.

Both rancher and non-rancher participants also identified politics and public perceptions as a major barrier to effectively managing large carnivore populations. This barrier can be illustrated by the following quote from one non-rancher participant in Ketchum, Idaho:

> A big hindrance to [carnivores] being properly managed has been these animal rights groups who sue the federal government or the state and cause this thing to go to court and then cost millions of dollars to fight it which is happened with the wolves . . . then it becomes such a political thing, and [if] the animal rights groups win, they get paid taxpayer money for their expenses, it's just becoming a cash cow for them. They raise all this money to fight wolf hunts and things like that and then it takes away from the science and puts it all into the emotional and the political and the misinformation realm.

Non-rancher and tribal participants identified the lack of knowledge or "misinformation" as a major barrier to effective carnivore management. In comparison to the rancher participants, who emphasized the need for letting local ranching communities take control of large carnivore populations, non-rancher and tribal participants identified education as a means to reduce large carnivore–rancher conflicts. This shared policy interest can be illustrated by the following quote from a non-rancher participant in Ketchum, Idaho:

> Everybody has their own perspective, and it's kind of hard to manage when everybody has a different perspective. Education can bring a lot of perspectives closer together. I think that's a key for this highly volatile, emotional issue.

Discussion

Looking across the five broad, aggregated categories of responses (i.e., participants' perceptions towards large carnivores and their management, experiences with large carnivores, identified influential groups, desired actions, potential policy opportunities) across the four study sites, we saw three general patterns. First, all three types of participants talked more about how socioeconomic and political factors rather than ecological factors affect human–large carnivore interactions. Specifically, participants' perceptions towards large carnivores and large carnivore management were related to (a) their self-perceived knowledge regardless of accuracy (e.g., as illustrated in a quote about vulnerability, "we have hunters getting chewed up"); (b) if they would be more understood by society and be able to have a voice in the matter (e.g., as illustrated in a quote about influential groups, "they don't understand the ranching perspective on wolves" and as illustrated in a quote about questionable authority, "let us take care of things"), and (c) their economic concerns (e.g., as illustrated in a quote about fear, "I have not used some of my pastures just because of that fear [of losing calves]"). Second, the types of desired actions for addressing human–large carnivore conflicts appeared to correlate with historical context. In the three communities in Idaho and Montana where participants had lived with wolves for over a decade, adaptation-oriented actions were discussed more frequently than resistance-oriented actions; while in the Okanogan Valley of Washington where wolves were just

starting to establish packs, resistance-oriented actions were discussed more often. However, we also noticed that participants from the Okanogan Valley discussed adaptive measures they had taken to reduce risk of livestock depredation to other large carnivores they encountered regularly over time (e.g., mountain lion). This further suggests that historical context influences how local communities perceive and interact with large carnivores. Third, there seemed to be a link between a community's willingness to coexist with large carnivores and state management policies. Participants within the three communities in Idaho, Montana, and the Flathead Reservation where newly approved management plans for wolves included lethal control reported a higher degree of acceptance of wolves and had more discussion about strategies for coexisting with wolves than the community in Washington. At the time of our study, Washington's wolf management plan was still under review and focused mostly on protecting wolves with limited lethal control. Thus, the acceptance of wolves and willingness to coexist observed in Idaho, Montana, and the Flathead Reservation may be a function of a perceived ability to control wolves through policy; while the hostility observed in Washington may relate to the proposed policy framework that was perceived as pro-wolf. This is further supported by our results, which showed that rancher participants from Washington were more concerned with having a voice than rancher participants from other states. While we cannot separate the historical context from state management policies, participants' comments suggest both factors are relevant.

Building on scholarship that argues for greater attention to the social, political, and economic dimensions of human–wildlife interactions (Røskaft, Händel, Bjerke, & Kaltenborn, 2007), our study provides additional evidence that a sole emphasis on economic concern misses key sociopolitical factors that shape human perceptions toward large carnivores. At the forefront of our participants' minds were questions about who gets to decide how to manage large carnivores, how others view large carnivores, and what policies and actions are acceptable. Programs seeking to minimize human–carnivore conflicts should take into account these considerations. Toward this end, we offer the following four directions for future research and policy interventions: information, empowerment, economics, and management practices.

Misinformation to people living in areas with large carnivores and to people living away from areas with large carnivores (e.g., "city people") was identified as a major barrier to effective carnivore management. It is important to recognize that different individuals or stakeholder groups tend to believe that their knowledge about large carnivore management and conservation is truly informed by science and may label information presented by others holding different views as misinformation. People tend to read or access information that affirms their already established opinions rather than referencing material that contradicts them (i.e., confirmation bias), especially when experiencing cognitive dissonance (Hart et al., 2009). In the case of human–large carnivore conflicts, people may seek out scientific information that could be interpreted to supports their own views. Understanding the interplay between wildlife sciences, human perceptions, and current institutional frameworks for large carnivore management is crucial for developing innovative policy strategies to address large carnivore–human conflicts and to promote coexistence. Efforts are specially needed to identify: (a) how different stakeholder groups define misinformation; (b) the types of actual misinformation prevalent among ranchers, local communities, the general public, wildlife professionals, and decision makers about large carnivore–rancher interactions, ranching realities, and large carnivore ecology; (c) the sources of perceived and actual misinformation (e.g., media reports, statements or opinions from local community leaders); and (d) potential strategies to improve delivery of information to better target specific audiences and to improve communication among various stakeholders.

We found resentment expressed by rancher participants toward people who do not live in areas with large carnivores and influential conservation organizations. Across all study sites, ranchers commonly expressed that "city people" and "conservationists" living far away do not understand the struggles ranchers face regarding the stress and threat of raising livestock in the presence of large carnivores. This sentiment points to an opportunity for creating innovative programs that engage "city people" and "conservationists," especially leaders of urban conservation communities, in conversations and exchanges with ranching communities so that all stakeholders can feel their voice is being heard by others, and the ranchers, in particular, can feel they have the potential to influence future management policy decisions. Such conversations and exchanges would require a carefully devised structure that provides an equal platform for both sides to share their experiences and opinions in a non-confrontational way. Strategies for enhancing communication within the context of a conflicted issue include role play, using a mediator, and bringing people from different sides of an issue to visit each other (Cox, 2012). These strategies have been mostly applied and examined in the field of human resources in relation to workplace conflicts, and little has been done to assess their effectiveness within the context of natural resources management, particularly in the case of large carnivore–human conflicts.

Financial compensation programs have been a focus of past efforts to mitigate large carnivore–rancher conflicts among state and federal agencies, as well as wildlife conservation organizations. However, as evident by the results of this study, ranchers seem to be dissatisfied with the confirmation-reward process and are concerned about loss of funding in the future. Policy innovations are needed to figure out how to address economic concerns of ranchers and other community members whose livelihoods may be compromised by large carnivore-related depredations, particularly under the current fiscal environments of the state and federal governments and non-profit organizations.

Finally, there was little discussion among ranchers and non-ranchers about management practices for addressing human–large carnivore conflicts other than shooting large carnivores, hiring a range rider to guard livestock, and building fences around livestock. The general perception is that there are few tenable management options to reduce conflict. More research on large carnivore behavior and the characteristics of large carnivore–livestock interactions is needed to help identify additional methods to mitigate conflict. Efforts are needed to "translate" or to help operationalize management tools that have been identified and tested through research to be applicable for ranchers. For any management practice to be successfully adopted and continuously utilized, it needs to be technically, economically, and socially sound. We suggest involving ranchers early on in ecological research to produce viable management recommendations.

In addition to the four directions for future research and policy interventions, ranchers, non-ranchers, and tribal participants spoke frequently about the need for management strategies, especially related to how local communities need a voice. Ranchers, however, spoke more frequently about the need for policies and programs that help enhance their livelihoods and address their economic concerns, while non-ranchers and tribal members spoke more frequently about the need for more scientific information and education programs. Thus, current policy framework and management system may be too generalized to account for the diversity of concerns from different stakeholders. Failing to take into account the multiple views at the local level risks alienation of particular stakeholder groups and threatens the overall viability of any long-term management and conservation efforts.

Conclusion

Our study examined the complexities of human–carnivore conflicts using a case study approach with a focus on four rural communities in the American West. Acceptance of carnivores and willingness to coexist are associated with the broader historical and policy contexts. The challenges for developing and effectively implementing management policies are to understand how different stakeholder groups define and interpret scientific information, identify what mechanisms can be used to create opportunities for stakeholders with different viewpoints to communicate with each other in a constructive manner, and assess what makes stakeholders feel they are being respected and treated justly. These challenges need to be addressed in parallel to, if not before, the ecological dimensions of carnivore research if successful programs for carnivore management and conservation are to be developed. In addition, research is needed to develop additional management practices that can be used to mitigate human–carnivore conflicts beyond existing resistant (e.g., shooting) and adaptive (e.g., avoidance) approaches. Although our study findings are focused on human interactions with wolves in rural communities in the American West, it suggests a range of human dimensions factors that merit further consideration when trying to address conflicts between humans and carnivores beyond wolves and in other geographical locations.

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