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The Social-Ecological Dynamics of Large Landscape Conservation:

A More-Than-Human Approach to

Rancher-Predator Relations in the American West

by

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Table of Contents

The Social-Ecological Dynamics of Large Landscape Conservation: A More-Than-Human Approach to Rancher-Predator Relations in the American West

**Thesis Abstract -- Idaho State University (2019)**

This study finds that notable changes in human-predator dynamics are occurring. In both conservation practice and literature, there is a shift towards recognizing the role that non-human animals play in co-creating biopolitical environments, specifically human-wildlife interactions. As populations of wolves and grizzlies increase in the High Divide, the largest spike in interactions between these predator species and humans are predicted to occur on private land. Therefore, the future viability of these species and the integrity of western culture and rural livelihoods relies on successful large landscape conservation to re-establish connectivity and support access to vital ecological resources. The results of this study show that a multispecies perspective offers a deeper understanding of how both humans and animals experience and mutually adapt to changing landscapes caused by climate change, human development, and/or habitat/resource degradation, all of which effect connectivity conservation and rangeland management practices designed to mitigate the impacts of predators.

Key Words: Human-Wildlife Interactions, Predator Conservation, More-Than-Human Geography

1. Introduction

The rural Western United States is celebrated for iconic landscapes and a cultural uniqueness embedded in the social-ecological communities that inhabit the expansive region. Over the last century, human development and encroachment on wildlife habitat, as well as landscape alterations resulting from climate change, have had significant impacts and caused changes in both human and wildlife populations throughout the region (Headwaters Economics, 2015, Lalibirte & Ripple, 2004, Woodroffe, 2000). Many studies of wildlife movement trends, ecosystem changes, and the human-nature nexus more broadly, have concluded the stability of many native North American wildlife species is highly dependent on landscape connectivity, which gives them the ability to roam freely through it (Lalibirte & Ripple, 2004, Proctor et al., 2011). Through landscape connectivity, conservationists seek to remedy the negative effects of habitat fragmentation and degradation, and reverse the impacts of genetic isolation by preserving a series of protected areas and connectivity corridors across large segments of land over multi-jurisdictional boundaries through a conservation strategy known as *large landscape connectivity conservation* (Center for Large Landscape Conservation, 2018, Curtin & Tabor, 2016, Graumlich & Francis, 2010, y2y.net).

Figure 1. Example of Large Landscape Conservation: the Yellowstone to Yukon Conservation Initiative (y2y.net)

1
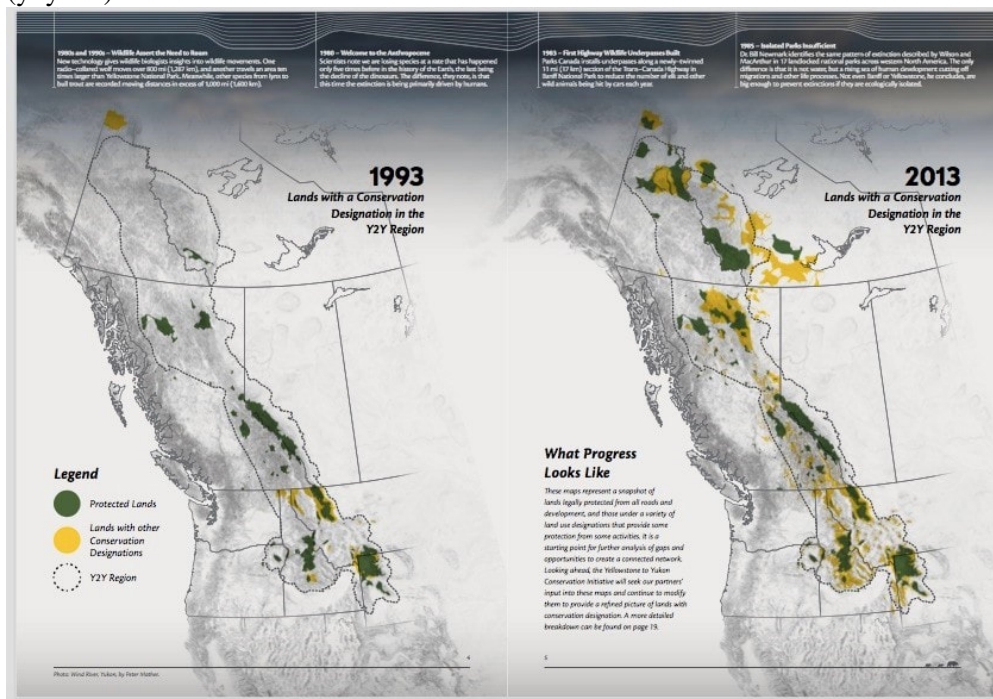
The High Divide region within Idaho and Montana is recognized as a connectivity corridor essential for protecting wildlife populations between the Greater Yellowstone Ecosystem (GYE), the Northern Continental Divide Ecosystem (NCDE), and the Salmon-Selway-Bitterroot Ecosystem (SSB), and is a crucial piece in the larger Yellowstone to Yukon landscape connectivity area. Efforts by multiple stakeholder groups seek to establish landscape connectivity in the High Divide region as it is the homerange for, and provides migration habitat to, a multitude of iconic North American species, including elk, pronghorn, and the two predator species that are the focus of this study, the grizzly bear (*Ursus arctos horribilis*) and the gray wolf (*Canis lupus*). Within this ecosystem, grizzly bears and wolves are apex predators and act as keystone species, playing a critical role in maintaining the health of the entire ecosystem (Bergstrom et al., 2009 & 2014, Beschta & Ripple, 2019). The presence of wolves and grizzlies in the GYE and NCDE has been found to influence top-down trophic cascades, and, ultimately, the landscape fluidity of faunal populations and floral communities (Fortin et al., 2005, Ripple et al., 2001, Painter et al., 2015, Wilkinson, 2017). However, the long-term health and genetic variability of the grizzly bear and gray wolf relies on the ability of isolated populations to move freely through the High Divide and reconnect with populations to the north (NCDE) and south (GYE), as well as occupy suitable habitat to the west (SSB). Thus, the future viability of these species relies on successful large landscape conservation to re-establish connectivity between these areas and support seasonal migrations, suitable habitat, genetic flow, and access to vital ecological resources (Costello, Mace, & Roberts, 2016, Curtin & Tabor, 2016).

While the High Divide provides important habitat and migration corridors for grizzlies and wolves, it is also culturally and economically important to tribal, public, and land owning human stakeholders, providing critical spaces for rural communities to live, recreate, and work (Burnett, 2013, Domenech, 2017). The High Divide is home to some of the last emblematic areas of the old West, where rural communities work the land for crop production and animal agriculture, such as cattle, poultry, and sheep. Private working rangelands are the second most common land use type in the High Divide and are a pivotal part of regional culture, community identity, and the local economy (High Divide Collaborative, 2017, Jordan, 1993). Given the prevalence of privately-owned rangelands in the region, the success of large landscape conservation rests on the willingness of ranchers to allow predators to inhabit and move across their land, as well as the ability of these predators to adapt to living on and migrating across private lands. As large landscape connectivity conservation has been established, private ranchlands are increasingly burdened with local wildlife issues and landscape changes that affect their economic productivity, including cattle depredation and the need to implement adaptation strategies, such as installing wildlife friendly fencing (Bradley & Pletscher, 2005, Burnett, 2013, Dickman, Macdonald, & Macdonald, 2011).

Figure 2 & 3. Maps of the High Divide, depicting land use type and movement of wildlife through the ecosystem. (Bray Beltran; The Heart of the Rockies; High Divide Collaborative)
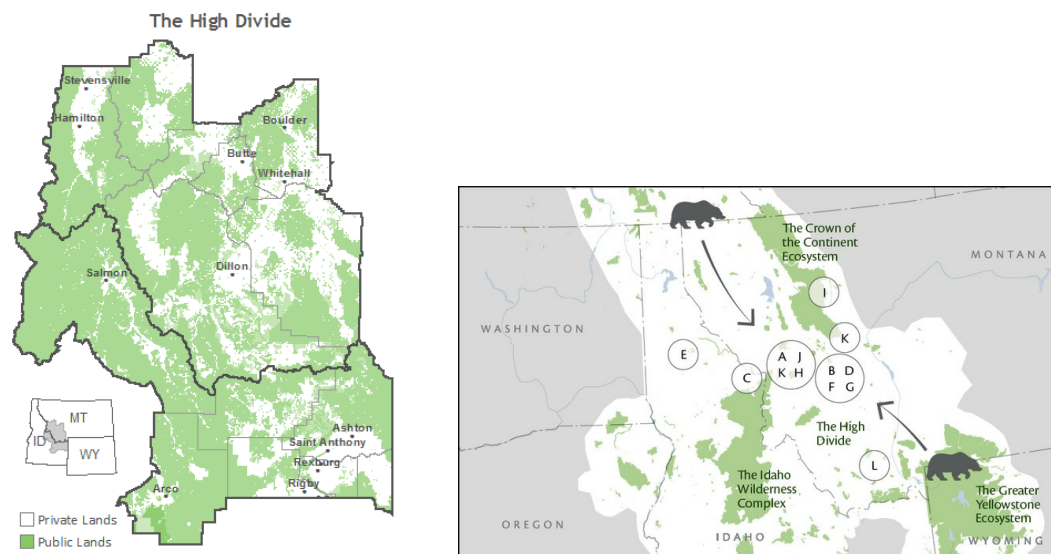
1.1 The Social-Ecological Dynamics of Human-Predator Interactions in the High Divide

The social-ecological characteristics of the High Divide have led to a complex history of human-predator interactions which continue to unfold today (Bangs & Shivak, 2001, Kellert et al., 1996). As populations of wolves and grizzlies increase in the High Divide, the largest spike in interactions between these predator species and humans are predicted to occur on private land, as grizzlies and wolves seek out food in the form of trash, pet or bird food, and livestock (IGBC, Peck et al., 2017, Sillero-Zubiri & Laurenson, 2001). Potential conflicts with ranchers and other private landowners include overlapping land use, predation on livestock, attacks on humans or domestic animals, property damage, or human-wolf or human-bear encounters (Phillips & Smith, 1998, Sillero-Zubiri & Laurenson, 2001, Treves et al., 2002, Wilson et al., 2017).

The introduction or presence of grizzly bears and/or wolves on private rangelands, and increasing numbers of conflicts between predators and private landowners, has led some ranchers to uptake lethal control and/or non-lethal predator control methods, such as changing livestock husbandry practices (e.g., low stress cattle handling), carcass removal and composting, herd monitoring, guardian animals, and putting up and maintaining predator deterrents (e.g., electric fencing and fladry around garbage and/or cattle and sheep enclosures) (Eeden et al., 2017, Lance et al., 2010, Smith et al., 2000a, Treves, Krofel, & McManus, 2016). Research on human-predator coexistence has found that non-lethal practices are effective management tools relative to lethal control, but have been shown to cost more and have higher labor requirements, such as purchasing new equipment, hiring more staff, increased hours of labor, and a loss of profit from killed livestock (Linnell et al., 2012, Muhly & Musiani 2009, Pearson & Caroline, 1981, Smith et al., 2000a, Wilson et al., 2014 and 2017). As a result, uptake of these practices has been slow. In addition to these costs, cultural beliefs, opinions, and socioemotional experiences also play a significant role in how an individual tolerates and treats predators on their private lands (Barua et al., 2013, Jacobs et al., 2014, Johansson et al., 2013, Lance et al., 2010, Naughton-Treves, Grossberg, & Treves, 2003, Parks & Messmer, 2016).

However, the risks that attend a shared landscape between wolves and/or grizzly bears and ranchers do not only extend to ranchers and their livelihoods; there are numerous threats to grizzly bears and wolves that move across private rangelands, as the possibility of being killed from lethal predator control or being hunted is high (Bergstrom et al., 2014). Because of this, a better understanding of how both humans and animals experience and adapt to the changing landscapes caused by climate change, connectivity conservation, and rangeland management practices designed to mitigate the impacts of predators is needed (Beschta et al., 2013, Madden & McQuinn, 2014).

1.2 The Need for a More-Than-Human Approach to Predator-Management

Missing in many of our efforts to mitigate human-wildlife conflict are some crucial voices—the voices of the predators that inhabit these shared landscapes. In conservation and specifically predator management, individual wildlife does not often receive equal status within biopolitical deliberations, as compared to the human communities involved. Typically, gray wolf and grizzly bear populations in the western United States are managed strictly for their ecological contributions as a population. Thus, these animals are represented as statistical data points to the public, without regard for the individual. The current lack of animal agency and individuality represented within management decisions means these decisions ignore the essence of how these beings navigate the land and mutually adapt with human communities to a shared landscape (Treves et al., 2006). The biological focus driving predator management also incompletely captures the human controversies intertwined within biopolitical issues, such as how to achieve mutually beneficial human-predator coexistence within private rangelands of the High Divide (Treves et al., 2006). As Margulies and Karanth (2018) argue, "the majority of conservation literature examining human-wildlife interactions remains focused on examining the negative economic, biological, and local-scale impacts of these interactions on both human livelihoods and wildlife populations." They conclude that adding a multispecies perspective to studies of human-wildlife interactions can help identify geographic areas not only ecologically important for bears and wolves and thus cascading trophic levels, but also socially and culturally important locations for ranchers and private landowners faced with encountering predators (Margulies & Karanth 2018).

A multispecies perspective, for the purposes of this study, is defined as the acknowledgment that grizzly bears and wolves exert agency and co-create the biopolitical, ecological, and social realities of human-predator dynamics (Ogden, Hall, Tanita, 2013, Haraway, 1990, Haraway, 2010). Further, grizzly bears and wolves co-constitute the parameters of coexistence through their actions, interactions, and cultural significance on a shared landscape (Haraway, 2010). In this thesis, the lens of more-than-human geography provides the conceptual framework for adding a multispecies perspective to the study of human-predator interactions and moves us away from the historical population level statistical analysis used to describe the health of predator populations and inform conservation decisions. A more-than-human perspective places emphasis on including individuality, agency, and mutually evolving circumstances within human-predator interactions, therefore, regarding predators as influential, agentive beings, and equal stakeholders who should be considered within comprehensive management strategies. As populations of grizzly bears and wolves move further into privately owned rangelands of the High Divide and ranchers within these communities are faced with increased encounters, a shift towards a multispecies perspective, away from anthropocentric conservation, can help conservationists construct holistic management strategies for connectivity conservation that

benefit everyone involved, including wildlife. A more-than-human approach can better account for the complexities of conservation on a shared landscape and bridge the elisions of the human and predator experience created by scientists when managing for invisible boundaries and population scales of wildlife by acknowledging the co-constituted lifeworld's of humans and predators (Morris, 2018).

To formulate a multispecies perspective within predator management and to address this gap in conservation literature and on-the-ground practices, I asked the following research questions: 1) How do wolves and grizzly bears experience living on a shared landscape, and what challenges does this pose to connectivity conservation?; 2) What are the lived experiences of ranchers who share the landscape with predators? 3) How can a multispecies perspective help inform connectivity conservation and what challenges does it highlight for the future?

2. Conceptual Framework

In this paper, I draw on theories and methods from more-than-human geography and phenomenological human science to answer my research questions and challenge the historical and embedded approaches to predator management and human-predator encounters by "emphasizing landscapes as dwelt achievements of people and animals rather than as surfaces upon which human meanings are inscribed (Barua, 2014, Hinchliffe, 2003)." In this section, I outline the method and theoretical framework used to understand how human and non-human animal lifeworld's co-constitute reality and thus conservation and coexistence outcomes.

2.1 More-than-Human Geography

Historically, consideration of non-human animals' lived experiences was confined to the work of zoologists and behavioral ecologists (Collias, 1991). Taking a purely sociobiological approach, this research often omitted the entangled natures of human-nonhuman networks, interfaces, and encounters, therefore perpetuating the dissociation between a human and non-human beings existence (Carter & Charles, 2016). More recently, scholars have acknowledged the co-constituted lifeworlds of human and non-human species as "part of the condition of life on this planet (Cudworth, 2015)." These emerging, interdisciplinary fields are termed human-animal studies, animal sociology, multispecies ethnographies, and more-than-human geography (Kirksey & Helmreich, 2010). I will use the overarching term of a *multispecies perspective* to refer to how material and non-material relations shape both human and non-human lived experiences and are co-constituted through their relations and interactions. In this thesis, I use these theoretical foundations both to provide support for the importance and need of this study, as well as to provide a conceptual framework for answering my first research question; how do wolves and grizzly bears experience being on privately owned rangelands, and how does this differ from their experiences of living in publicly-owned, protected areas?

In particular, I will draw on the field of more-than-human geography, which is a theoretical framework birthed from poststructuralism (Haraway, 1990). An extension of eco-marxism, animal sociology, human-animal studies, and political ecology, the field diverges from an anthropocentric view of the nature-society nexus towards an understanding of people and nature as interconnected. Drawing on *actor-network theory* (ANT) and *non-representational theory* (NRT), more-than-human geography diverges from anthropocentric studies of social life by directing attention towards the agency of non-humans in shaping the social world (and vice versa), and is premised on the idea that nothing exists outside of interconnected social-ecological networks (Bakker, 2012, Whatmore, 2006). Thus, human and non-human animals and material

objects all play important roles in the construction of the social world, and are deeply entangled in one another. By accepting the idea of nonhuman agency in shaping social worlds "we are seeing the human untethered from its fixed isolation from other beings and things (Ogden et al., 2013)." Lived experiences of both human and non-human animals, then, are a dance between multi-natured and multi-cultured matter, and humans are just one actor among many that creates the expression of reality (Tsing, 2013).

As Wilkie states, "seeing life through a multispecies lens not only allows scholars in cognate and non-cognate disciplines an opportunity to engage in innovative scholarship, it also lays the groundwork to animalise the sociological imagination," and perhaps, unearth the underexplored areas of (human and non-human) social life (Wilkie, 2013). In this way, using a more-than-human approach offers a new perspective on human-predator conflict and coexistence and the likely outcomes of connectivity conservation in the High Divide by examining the political, biopolitical, and geopolitical landscapes of an issue through the lens of non-human entities.

2.2 Phenomenological Human Science

While a more-than-human approach allows for a focus on the non-human lived experience and the essence of meanings within a non-human lifeworld, it is not appropriate for understanding the lifeworld of human beings. Because of this, I draw on phenomenological human science to investigate my second research question; what are the lived experiences of ranchers that have predators on their privately-owned land? Phenomenology is a sociological method, rather than theory, which can be used to understand the essence of a person's experience of an event by uncovering the lived qualities and the significance an individual attaches to that experience (van Manen, 2014). Phenomenological research is a way to question how we experience the world, and provides an orientation for studying the essential characteristics which formulate a lived experience (van Manen, 2014). The lived experience, or in sociological terms-the lifeworld, "is the world as we immediately experience it pre-reflectively (van Manen, 1997 citing Husserl 1970b; Shutz and Luckman 1973)." A lived experience is constituted by and the producer of the lifeworlds it interacts with, but without conceptualization or categorization. Phenomenological human science is focused on gathering the nature of the lived experience, the subtleties which create the essence of a phenomenon, and differentiating between the appearance of an experience and the essence of it (van Manen, 1997). In this study, I use the term phenomenology in a way consistent with van Manen's definition of phenomenological human science, "to explicate the meanings as we live them in our everyday existence, our lifeworld." This approach differs from ethnography, biography, sociological, and historical research approaches because it does not attempt to assign statistical relationships, occurrences/frequencies of behaviors, dominating themes or other categorizations to a specific social or cultural group (van Manen, 1997). Rather, it seeks to capture the uniqueness, or essence, that creates one's own lifeworld (van Manen, 1997). It is in this way that I use phenomenology to capture the essence of a ranchers lived experience with predators to generate a better understanding of how predators shape their lifeworld, and to inform the conversation about how both ranchers and predators will mutually adapt as their encounters increase.

3. Methods - Creating Lifeworlds for Grizzly Bears, Wolves, and Ranchers

Data used in this paper come from 20 semi-structured and unstructured interviews. An initial list of potential interviewees were identified through Google searches and examining state

and wildlife management agency and environmental non-profit organization websites. An initial group of interviewees was contacted through cold-calling and email. Subsequent interviewees were gained through snowball sampling and networking at conferences. In total, I spoke with 10 wildlife biologists, animal behaviorists, caretakers, conservationists (NGO's), and federal agency who worked in wildlife managment, 5 ranchers who had had grizzlies or wolves on their rangeland, and 5 with rancher-predator conflict specialists. In addition, data for this study was collected through field observations, field courses, and a review of peer-reviewed scientific literature and related accounts of bear and wolf behavior and ranching practices for this study. The interview guides can be found in Appendix A and B, although throughout the period of interviewing many were organically morphed to best fit the needs of that specific interview.. For the safety and respect of my interviewee's, each reference to an individual is anonymous and vague, as to not point back to a specific person.

3.1 Animal Atmospheres

To operationalize the lifeworld of grizzly bears and wolves, I use the experimental methodology proposed by Lorimer et al (2017): animal atmospheres. Animal atmospheres provide a more-than-human lens to understand how animals experience social, ecological, and material circumstances. Creating an animal atmosphere entails capturing 1) how a non-human individual or species tunes into their world; 2) the social and emotional ways they shape and sense the landscapes in which they live; and 3) the ecological factors which influence those interactions (Lorimer et al, 2017).

Lorimer et al. propose that an animal's atmosphere (or lifeworld) can be systematically uncovered by investigating the relationality of the social, biophysical, and material factors which underlie an animal's lived experience (see Table 1). Using their framework, I identify how individual grizzly bears and wolves experience conflict and landscape change associated with large landscape conservation and movement across a shared landscape, which can help inform the design of conflict reduction strategies, ranch management practices, and connectivity conservation goals to meet the values of multiple stakeholders, including wildlife.

Interview questions for creating animal atmospheres were created to uncover information on the variables suggested in Lorimer et al. (2017) (see Table 1 & 2). Each interview was initially coded using a deductive process from a codebook of 40 codes and ultimately categorized into one of the three primary code categories; Individual Animal/Subject, Collective/Shared Experience, and Space-Time. The interviews were then evaluated in comparison to one another and used to formulate the embodied experience of a grizzly bear or wolf and ultimately to answer the research question of how wolves and grizzly bears experience living on a shared landscape, and what challenges this poses to connectivity conservation. Table 2 depicts the three themes, and subsequent codes, used in this study to operationalize a grizzly bear's and wolf's lived experience. Each of the three themes is discussed in more detail below.

Table 1. Animal Atmosphere Operationalized by Lorimer et al.

Table 1. A list of factors that configure an animal's atmosphere.

Analytical focus	Atmospheric factor
Animal subject	Umwelt
	Emotional experience
	Individuality
Collective circumstances	Social relations
	Trophic relations
	Electro-magnetic energy
	Sounds
	Tastes and smells
	Weather
Space-time	Territory
	Rhythms and habits
	Spread or contagion
	Amplification and intensification

Table 2. Animal Atmosphere Operationalized for this study

Themes	Factors
Individual Animal/Subject	*Umwelt*
	Emotional Experiences
	Individuality
	Senses
Collective/Shared Experiences	*Social World*
	Territory or Home range
	Cultural Transmission
Space-Time	*Trophic Relations*
	Geographic Location
	Rythms
	Reactions

3.1.1. Individual Animal/Subject

An animal's atmosphere is the lived experience of an animal subject. In this study, I attempt to place grizzly bears and wolves in their respective *umwelt*, or lifeworld, through an extensive literature review of the ethology of both grizzly bears and wolves, complemented with an animal behavior course, field observations, and interviews with bear and wolf biologists and behavioral ecologists. As with humans, animals have complex emotional lives which inform the *emotional experiences* of their existence (Allen & Bekoff, 2007). The acknowledgement of animals as conscious, sentient, and emotional beings allows us to research animal subjects through their *individuality,* not merely as a statistical data point within a population. This is a step away from traditional biological surveys of species dynamics and towards acceptance that each animal within a species affects and is affected by the world they live in. Additionally, both wolves and bears construct their lifeworld through their *senses (*electromagnetic, auditory,

olfactory, kinesthetic) that create a far more complex landscape than we as humans are able to understand and influence how each individual experiences the world. As initially laid out by Lorimer et al, I will use the *umwelt, emotional experiences*, and *individuality* of grizzly bear and wolf individuals to depict the individual animal subjects represented within an animal atmosphere. Deviating from Lorimer et al, I switch *senses* from the collective experience into the individual animal subject to systematically create an animal atmosphere. Individuality, emotional experiences, and senses are the foundation for understanding how individual grizzly bears and wolves experience living on a shared landscape, how they co-adapt to ecological, political, and social circumstances alongside humans, and what challenges this poses to connectivity conservation.

3.1.2 Collective/Shared Experiences

In addition to an animal subject experiencing the world through their own individual lifeworld, no single organism exists in a vacuum, so to holistically create an animal atmosphere I examine bears and wolves shared experiences and the collective dimensions of their *social world*. The social dynamics of an individual's lifeworld is highly dependent on the ecological, atmospheric, and social conditions around it. They result in specific relations between the individual and members of its own species, or intrarelationships, as well as relations among members of other species, or interrelationships. Within a given landscape, an individual chooses a *territory or home range* that is shared with other organisms and biophysical features suited to its survival. Their location within these landscapes influences what they, and other animals, including humans, will encounter within their lifeworld. Important to an individuals shared experience while moving through landscapes and defining inter/intrarelationships is the process of sharing information or behaviors from one animal to another. This form of social learning relevant to an animals atmosphere is *cultural transmission*; the passing of information through successive generations (Dugatkin, 2013, Heyes, 1994). All of these italicized factors identified by Lorimer et al are foundational to the collective experience of an animal and thus, to the creation of that individuals atmosphere, directly informs us how a grizzly bear or wolf moves through the landscape. Additionally, these factors can provide understanding about how other wildlife or humans affect the movement of grizzly bears and wolves, and how both of these will impact their overall success at moving through shared landscapes to connect with other members of their population.

3.1.3 Space-Time

The third element of an animal's atmosphere I analyze is the assemblage of all "interacting elements within a given situation," including the spatial and temporal dimensions of their experience (Lorimer et al., 2017). In other words, I investigate how a grizzly or wolf experiences its individual umwelt and social world at a certain place and time. Outside circumstances, such as landscape change or conflict in human dominated landscapes, can influence how an individual reacts to its surroundings. Also, it is important while gauging how an animal moves through its world to consider its location on the food chain, or its *trophic relations*, which affects how that individual carries itself within the environment and among other individuals. All of these relations are dependent on the highly complex range of atmospheric, chemical, and abiotic conditions that create the landscape where the animal exists. This includes 1) where the individual is *geographically located* within a *habitat*; 2) how it is moving throughout the landscape- either in habituated patterns, like migration, known as

rhythms, or as sporadic instances due to a stimuli; and 3) how an individual may know how to respond in a situation it has never encountered. This third component of an animal's atmosphere, and the many subthemes within it, connects how an individual experiences moving within shared landscapes in relation to the political, ecological, and social circumstances surrounding their movement. This element then considers how factors such as climate change, political designation, and human development may affect individual animals, and thus populations of that species and the future of connectivity conservation.

3.2 Rancher's Lived Experience

To understand how ranchers experience landscape changes associated with connectivity conservation in the High Divide, and, in particular, their experiences with grizzly bears and wolves, each interview was evaluated through thematic analysis. Codes were created using an inductive process to elicit the essence of a rancher's lived experience with predators on a shared landscape, and to evaluate how their adaptations to landscape changes and wildlife movement patterns are influenced by their lived experience. This approach enabled me to cultivate a broader understanding of the socio-political and bio-physical factors that influence a rancher's lived experience of having grizzlies and wolves on their privately-owned land.

4. Results and Discussion

4.1 Animal Atmospheres

Grizzly bears and wolves have persisted in the Greater Yellowstone Ecosystem throughout the Northern Continental Divide Ecosystem for thousands of years, learning to share the landscape with humans since their settlement in the area (Peacock & Peacock, 2006, Lopez, 1978). Both predators are highly generalized and opportunistic feeders that have a heightened ability to learn quickly and readily. These characteristics, mixed with a curious and exploratory nature, on top of the physiological adaptations that make them top predators, make their movement into human landscapes a natural progression laden with complexities (Robinson, 2005, McIntyre, 1995). To better understand how predators experience navigating through a shared landscape and to add a multispecies perspective to human-predator conservation, I create animal atmospheres of a grizzly bear and wolf through the conceptual framework of a more-than-human approach. This section answers my first research question; How do wolves and grizzly bears experience living on a shared landscape, and what challenges does this pose to connectivity conservation?

Canis lupus familiaris and Ursus arctos horribilis

4.1.1 Individual Animal Subject
Each of the landowners, conservationists, and predator biologists interviewed for this study spoke of the *individuality* and cognizance apparent in each bear or wolf they encountered, affirming that bears and wolves are moving through the landscape consciously, deliberately, and as a result of learned and instinctive impulses and behaviors (Waroff et al., 2017). Interviewee's explained, as each individual wolf or bear moves through the landscape, they influence the human and non-human lifeworlds they encounter; affecting human tolerances and actions, the experience and behavior of cattle, and determine the trophic cascade and therefore umwelt of other wildlife. These results indicate the individual ways bears and wolves move through shared

landscapes alter the outcome of connectivity conservation. In addition,As well, the results of this study document the complex *emotional experiences* of grizzly bears and wolves as they move through shared landscapes, including: fear, excitement, play/playfulness, family bonds and friendships, irritation, territoriality/competition, sociality - hierarchical domination, submission, group dynamics, risk taking and risk aversion, tolerance, patience, sadness, grief, curiosity, stress, uneasiness. Normalizing the emotional lives of bears and wolves can influence connectivity conservation by helping humans relate to individuals and potentially increase tolerance levels on shared lands and within political deliberations, as a connection is created (Myers & Saunders, 2002, Saunders, 2003).

However, *emotional experiences* and *individuality* play but a part of an animal's *umwelt*. In addition, *senses* are an important factor that impact how a bear or wolf moves through shared lands and creates challenges for connectivity conservation. Wolf and bear biologists, as well as animal behaviorists, interviewed for this study explained that individual predators repeatedly use their senses to interact with the land around them and that olfactory and memory appear to be the most important ways grizzly bears and wolves sense and experience a landscape:

> "*So, how they encounter the landscape through their nose,*
> *memory, and whatever the topography is, is never usually an issue*
> *for a wolf. They are absolute habitat generalists, they can live*
> *anywhere that we will tolerate their presence on the landscape.*"
>
> *-Wolf Biologist*

When bears and wolves smell, they take in and process a tremendous amount of information about a place, including who is around, when they passed through, where they were going, and what they ate (Mech, 1970, Peters, 1978). Scents are encountered through a variety of mediums as an individual moves through a landscape; scat, an old den, the remainders of a kill, hair on a tree left from a back rub. All of these olfactory clues help the individual wolf or bear make decisions about how to move themselves through the landscape, including choosing to either keep following a scent trail, permanently inhabit a space, or to move through quietly and quickly to avoid conflict (Conover, 2007). One bear manager explained the usefulness of a grizzly bears olfactory system in the following way:

> "*And then their olfactory system, would just blow us away, if we*
> *really truly understood it. We grasp it, but I don't think we really*
> *understand how well they can picture what is in front of them and*
> *what's beyond them just from smell. I think they pick a lot from*
> *smells of meals, from water, from air currents, smells from other*
> *bears poop, rubbed trees, you name it. Just like with humans and*
> *mathematics, where it all kind of comes together (for some people),*
> *I think with some bears, one sniff of another bears rubbed tree or*
> *scat, it just kind of all comes together. They understand things*
> *beyond things that we can understand.*"
>
> *-Bear Manager*

As this quote demonstrates, when bears and wolves move through a landscape it is their sharp olfactory senses that enables them to understand the particularities of an area (Peters,

1978). As bears and wolves move through human-dominated landscapes they are picking up on instinctual but often unfamiliar cues; dog food, old grease spills from a human thanksgiving, or decomposing cattle carcasses. Smells are the currency of a predator's lifeworld, and the difference in smellscapes in shared landscapes, compared to isolated areas, can vary greatly depending on an individual's experience and knowledge of people and therefore affect their ability to move through- posing challenges for connectivity conservation. Interviewee's explained, predators are easily attracted to human settlements due to food and waste and some will go back to those sources if they have been positively rewarded from those interactions, often weighing the benefits of high calorie, easily obtained foods, such as garbage, over the costs of spending time near human-dominated areas (Lyons, 2005). If they have had a negative experience with humans, like being shocked from electric fencing or shot at, they may choose not to follow their nose to human food sources. However, bear and wolf biologists clarified that when bears and wolves venture into human-dominated areas they are simply following their instinct to find food, water, and shelter (Naughton-Treves, 2003). If this happens to lead them into contact with a human, it is typically not with malicious intent, but rather just the outcome of routine behavior and landscape conditions (Wilson et al., 2006).

Regardless of the intention of the bear or wolf when living within human-dominated areas, managers and conflict specialists made clear that when a bear or wolf chooses to inhabit those shared landscapes it often leads them into danger. Therefore, attractants leading these animals closer into human lives have tremendous repercussions on overall predator success and management, and therefore connectivity conservation, as lethal control by landowners or individual bears or wolves developing bad habits, is possible. Both bear and wolf managers urged the use of carcass composting and predator safe food and waste storage to minimize the olfactory attractants leading bears and wolves into shared lands (Wilson et al., 2006). As bear and wolf managers are the bridge between public opinion and policy regulations, many spoke of incorporating a sense of individuality within predator education and community-based conservation to help private landowners relate to the individuals they share the landscape with, as doing so may help achieve coexistence. As one manager interviewee explained,

> *"You really can't think "oh that bear is being a really bad bear" because it shows up on your property but really that bear is just searching for food that's available at that time of year. So that may lead a bear right to someone's house, or someone's ranch, it might lead them right by a den of sheep, cattle, or something. And that's a time of year and place where you really need to take extra precautions to think how you're going to keep that bear from getting into something it shouldn't get into. And recognizing that bears are probably routinely going to go through a place like that looking for natural food."*
> *-Human/Wildlife Conflict Specialist*

As shown, bears and wolves use instinct and smell to navigate in and through shared landscapes, but interviewee's explained predators also use memory to understand the landscape. In particular, grizzly bears and wolves use senses to acquire information about an area and then remember the particularities of each place to return at a later time. Having the capacity for remembering an area's sights, sounds, smells, and geographical features, makes each successive

time an individual moves through the landscape much easier, as that individual becomes more adept at surviving on the landscape. As with humans, familiarity allows bears and wolves to traverse a landscape with comfort and ease rather than constant vigilance. As a bear biologist explained, an individual bear remembers the geographical location their mother denned and will return year after year. Similarly, a wolf will remember where a trapper set their traps and warn the pack. Individuals remember experiences and landscape features like their favorite places to gather berries, find moths, take down elk, and sunbathe, or negative experiences like being hazed by humans, or fighting with another pack. By remembering the characteristics of places, individuals can more efficiently manage their time, as it allows an individual to focus more time on things like reproduction, foraging/hunting, and expanding territory without wasting unnecessary energy. A wolf biologist sums up her observations on how memory and olfactory provide wolves the ability to navigate through the landscape:

> *"There is some kind of travel system landscape wide- I don't know if its remainders of scent posts, old desiccated scat, or simply the geographic funnel on the topography on the landscape, I don't know, I'm not a wolf, I'm just saying there are consistent routes that are used and within their territory I think its memory and outside its due to olfactory. And of course on the inside I think it's olfactory as well, memory and olfactory, but on the outside it has got to be olfactory because they haven't been there before but they find each other. So one more thing about the trapping; when you catch a wolf once it is very hard to trap it again. Some wolves make really wide berths around traps, they avoid it and make a wide berth away from it and some wolves will go down your trap line and dig out your trap without springing them and pull them out and go to the next one. And I think, why do they do that? Why do they do that? We can imagine that cartoon again telling the other wolves about this [the trap] being really bad, but the bottom line is we don't know."*
>
> *-Wolf Biologist*

Memories may be created and retained in entirely different ways for bears and wolves than how humans process them, but despite not knowing the exact process, we can observe that memory plays an important role in shaping how grizzly bears and wolves move throughout a landscape. Memory is especially important in regards to shared lands, where individual grizzlies and wolves use recognition and experience to return to human-dominated landscapes. For example, individuals will go back to grain stashes, duck ponds, calving areas, and pet food to forage if they have successfully done so before. Memory of food storage, denning habitat, and calving practices may expose bears and wolves to the risk of trapping or death by lethal control, thus complicating the dynamics between predators and landowners. These behaviors can also be used to benefit connectivity conservation. One rancher who practices non-lethal control spoke about how patterns, developed from an individual's memory and senses, help mitigate conflict; *"One of the things ranchers are told to do when they live in predator country is to create habits and patterns, to do things the same time every day and to go to the places that you need to go the same time throughout the week, because that's how nature works, as well. They have patterns.*

They have paths. They are sort of on a schedule, believe it or not. So, they, in order for us to understand that, for them to understand our movements and to stay away from those movements, they need to see those patterns as well." These findings suggest that incorporating animal agency and individuality into management plans, and therefore acknowledging the co-constituted lifeworlds among wildlife and people, could help humans and predators coexist on the landscape as habitats overlap and encounters increase.

In addition to olfactory senses and memory, grizzly bears and wolves rely on visual, auditory, and gustatory cues, to navigate their daily activities. Hearing and sound are important for situating an individual within a given environment. Predators rely on their ears for communication and will use vocalizations for exchanging information. Predator biologists spoke of bears and wolve's ability to hear noise from up to five miles away, and made clear that they are always listening for prey, humans, danger, and kin. Interviewee's suggested that both wolves and bears will favor using olfactory, memory, and auditory senses before relying on visual cues. Although keen, eyesight is not a bear or wolf's primary way of navigating the land. However, it is an important way of understanding the landscape for grizzly bears and wolves. Being aware of how the repercussions of human development (smells, noise, landscape changes such as irrigation ditches) might affect the movement of predators onto or away from human-dominated landscapes is critical for enacting successful connectivity conservation. As the High Divide is still relatively open and free of human use and much of the land is rural, conservationists have the opportunity to preserve important ecological areas for wildlife, while others could be designated for development.

4.1.2 Collective/Shared Experience

Although individual grizzly bears and wolves share many similarities within the parameters of their umwelts, or lifeworld's, the two species have significant differences in social and biological structures that influence their *shared experiences* and *collective dimensions*. The differences in resilience, fecundity, food preferences, and sociality between grizzly bears and wolves, and individuals within these species, impacts how each one interacts with a landscape, and thus, their success at moving through it. These differences directly affect people's tolerance of individuals and whether or not a grizzly or wolf will be permitted on a shared landscape. In this section, I focus on the social lives of grizzlies and wolves, which includes how physiological adaptations, individual tolerances, risk-taking/risk-aversion, and ecological conditions affect their social world and collective experiences as they move through human-dominated landscapes of the High Divide.

Although each individual bear or wolf moves through a landscape seeking out suitable habitat, food sources, and inter and intrarelationships, interviewee's expressed that bears and wolves move through shared landscapes distinctively. These differences are in part a result of an individual's sociality (Dugatkin, 2013). Sociality in its many forms can be described as the foundation of an individual's lifeworld. Bears and wolves experience socialization through touch, communication, visual observation, and social learning. Sense of touch, whether it be physical touch, play, punishment, fighting, or nurturing, is an important factor in a bear or wolf's socialization. Predators rely on touch in a way similar to how humans use it; to reinforce emotions and messages between individuals. Vocalizations are used among wolves to communicate grief, a successful hunt, and one's location, as just a few examples given by interviewee's. Ranchers and biologists interviewed in this study discussed how social learning, and in particular, *cultural transmission-* which is a process of social learning where information

and knowledge is transferred between individuals- is important for how both grizzly bears and wolves move through shared spaces. Wolves are highly adept at relaying information to pack members on how and when to take down cattle, how to avoid and even dig up traps, and where to avoid humans. How an individual grizzly or wolf is raised, through their family and kin dynamics, environmental surroundings, interactions with the same species, as well as members of another species, all determine how that individual will experience and interact with the landscape.

Bear and wolf managers described that bears will often remain in one location longer than wolves, and make an area their permanent home. They also frequently return year after year throughout their lives to the same locations as habitat and food needs arise. In addition, bears are more likely than wolves to live closely to human settlements due to smaller family units or living independently. They have a more diverse diet; bears are true omnivores while wolves are carnivores, and they teach their young similar preferences and habits through intense parental investment; cubs stay with their mother for around two and a half years. Agency officials and conservationists interpreted through their observations and scientific data that wolves are more likely to transition through human-dominated lands, as opposed to settling, in search of prey availability and to avoid human run-ins. As shown in the quote below, they also have a higher likelihood of resilience, with a greater number of young in a litter. Annually a pack can increase from one to ten pups;

> *"So wolves are habitat generalists, they are really adaptable. So they tend to typically avoid human areas, or areas that have a lot of human activity, or just use them at night….One thing that's extremely important in understanding their biology is how fecund they are, so they are really effective at producing pups. So where you have two wolves that breed in February and they meet up for the first time, just one year later you can have up to 8-10 wolves. So its a pretty strong growth rate and so they are highly adaptable as a larger population because of that, they can sustain a really high threshold of mortality because they can so easily reproduce with high numbers of pups."*
>
> *-Wolf Manager*

All of these characteristics create challenges to connectivity conservation, by affecting the behaviors that are taught or passed on through individuals. Managers and predator behavior specialists stated that wolves and bears teach their young specific behaviors about how to interact with the landscape, as well as how to interact with human and non-human inhabitants, affecting connectivity conservation. Wolves have a complex hierarchial social system with strong social bonds and roles determining pack dynamics (Mech, 2010). As pups are reared by the entire pack, these dynamics are carried through cultural transmission and affect whether a pack will predate on cattle, den on private landscapes close to human activity, or follow elk migration patterns. Cultural transimission is also often responsible for wolf packs becoming savvy to capture, and biologists noted that once an individual had been caught, collared, and released, it became harder and harder for them to repeat the process- affecting the quantitative data which population estimates are based on and how connectivity is managed.

Along with citing cultural transmission as a cause for behavioral changes, bear biologists noted additional observed behavioral changes, including, sows teaching new generations of grizzly bears how to forage on crops, make day-beds, unlock grain sheds, den in open fields, and most notably, observing new-to-science bear sociality. Bear managers speculated that increasing populations are causing females and their young to hang out in large social groups. It was previously believed that bears are not highly social animals, with research suggesting that they would only tolerate one another when food availability is high, like the salmon runs in Alaska (Egbert & Stokes, 1974). However, biologists in the High Divide are beginning to observe bears overlapping in home range and female bears, cubs of the year, yearlings, and siblings all choosing to congregate in the same location and spend time close to one another. Observations of changing sociality among bears and wolves, along with humans having to change their daily or seasonal activities in response to predators on their private lands, point to a mutual adaptation that is occuring between animal and human communities; behavioral adaptations resulting from increasing landscape and resource overlap. What do behavioral changes such as this mean for the future of coexistence as populations of both humans and predators increase? One human-predator conflict specialist used Europe as a frame of reference, noting that the High Divide still as enough open space where bears and humans can choose to avoid each other but some grizzly bears are adapting to human communities and using them for protection;

> *"There has been a lot of research done on studying bear movement and behavior patterns with respect to human settlements or villages. When you talk about human-dominated landscapes, the High Divide is still much less dominated than these parts of Europe. But it's interesting that females with cubs often avoid larger male bears and seek a protective shield by being closer to human settlements because those larger males are wary of people."*
>
> *-Human/Wildlife Conflict Specialist*

The use of human communities on shared landscapes for protection by bears brings up a concern that future connectivity conservation will have to deal with if it is to be successful; if humans struggle to share the landscape with minimal individual encounters with bears, how will private landowners and recreationalists adapt to seeing groups of bears on the landscape?

Moving forward, understanding the role of socialization, cultural learning, and the overall shared experience of individuals is important for gaining a multispecies perspective within predator management and is necessary to connect how these factors will play a role in predator movement across multijurisdictional landscapes. This information can help shape successful connectivity conservation policy, as behaviors developed by individuals who interact with human spaces would not be an issue for human-predator coexistence if the behaviors died with that individual. However, the processes of socialization and social learning allows learned and adopted behaviors to be passed across generations, where the changes in animal behavior act on that individual's phenotype. This leads to differential selection of reproduction and survival, thus continuing these behaviors throughout the population (Dugatkin, 2013). Ranchers interviewed for this study spoke of their concern for this:

> *"So last year we thought it was a sow with two 2-year-old cubs. But this year it's the same bear but the cubs are there and even*

bigger, so we're not sure if the cubs just didn't leave her or if they were younger than we thought. We don't know but they were still on her this year and they are the ones who are killing the calves, for the most part, because we set up trail cams and everything. Yeah so it's just a very scary thing because then those bears are going to go off and she is going to have more cubs and then all four of them are going to be killing. So it's this thing that just keeps growing, and more and more bears will predate on cattle."
-Rancher from Montana

A predator biologist further explains the role of social learning in this process in his own words:

"The social learning is interesting- and again this is all anecdotal because it's difficult to observe it- but there is some reason to suspect that some behaviors like cattle killing might be socially transmitted. That bears learn to hunt cattle from observing other bears doing that. I don't know the degree to which anybody has evidence of that but like the Upper Green River country it does seem like you have a bunch of bears. And it's not like you have really dumb cattle- these cattle have been hunted by bears for over a decade now, fairly intensively- so you'd think they would get fairly good at avoiding grizzlies but the number of grizzlies that seem to be killing cattle there makes me think okay this is a group of bears that is really learning to kill cattle. And they maybe see each other doing it or they smell or hear each other doing it and they go check it out. And think oh well he did that, maybe I can do that too. Who's to say? But that is a group of bears that are learning from each other on how to kill cattle."
-Predator Biologist/Manager

The implications of these learned behaviors on human-predator dynamics, specifically on shared landscapes, are considerable: changes in land management could evolve distinct characteristics within populations of predators. Essentially, humans could be instigating divergent evolution between predator populations through behavioral extremes; those living closely to humans and those choosing to live separate from them. This means, in order to predict movement and human-predator interactions for connectivity conservation into the future, we must acknowledge that cultural transmission and social learning processes among individual animals may lead to population level effects and incorporate this information into conservation strategy.

4.1.3 Space-Time

The third component for creating an animal atmosphere is to place an individual within a specific space and time. The space-time element of an animal's atmosphere, which is the assemblage of all "interacting elements within a given situation," including the spatial and temporal dimensions of their experience (Lorimer et al., 2017), is integral to placing a mulitspecies perspective within the contexts of external biopoltical circumstances. Landscape

change, human and animal movements, trophic cascades, and human politics all influence how individual animals experience a shared landscape and create challenges for moving through it. Understanding the space-time element of an animal's atmosphere requires analyzing the way grizzly bears and wolves experience a shared landscape in relation to their 1) location on the food chain, or *trophic relations*; and 2) where that individual is *geographically located* within a *habitat* and how it moves throughout the landscape based on social and ecological circumstances. By placing an individual in a specific place and time, we can connect an individuals experience on a shared landscape to the larger political, ecological, and social circumstances surrounding their movement, allowing for reflection on how factors such as climate change, politics, and economic and community development may affect the future of these species and connectivity conservation.

Interviewee's spoke of the exceptional ability of bears and wolves for self-awareness, an awareness that tunes them into abiotic, atmospheric, and ecological conditions and allows them to easily integrate into human-dominated environments. Specifically, they mentioned environmental factors, the placement and actions of other organisms, and landscape/temperature changes as all impacting where an individual was trophically placed. Integral to successful large landscape connectivity conservation is understanding how trophic relations influence landscape wide structure and ecosystem health. The presence of wolves and grizzlies in the GYE and NCDE has been found to influence top-down *trophic cascades* and ultimately the landscape fluidity of faunal populations and floral communities (Fortin et al., 2005, Ripple et al., 2001, Painter et al., 2015, Wilkinson, 2017). However, the future viability of grizzly bears and wolves relies on successful large landscape conservation to re-establish connectivity between the High Divide to support seasonal migrations, suitable habitat, genetic flow, and access to vital ecological resources (Costello, Mace, & Roberts, 2016, Curtin & Tabor, 2016). Establishing connectivity through the High Divide means working with private rangelands to increase conservation efforts and maintain open space. Important to this initiative is understanding the ways space-time elements, such as trophic cascades within *geographic locations*, or *habitats*, or the differing ecological conditions and political circumstances bears and wolves must face while existing on a shared landscape, affect connectivity conservation. One rancher interviewed in this study, speaks to the importance of being aware of seasonal/atmospheric/ecological changes to predict predator movement;

> *"Our lives very much revolve around the grizzlies and the wolves. Now as ranchers, that used to not [be the case] before the reintroduction of the wolves and even the grizzly bears due to issues of climate and definitely very obvious changes in the environment grizzly bears have come down from their higher grounds in the trees and so forth. They are digging on a root called caraway because their main food source was decimated due to again temperature changes up in the highlands and the mountains. Now, the grizzlies are coming down into our irrigated meadows and digging up caraway and eating it and it's sort of a phenomenon and there are many grizzlies doing it and they are doing it amongst cattle and cohabiting for the most part. And so our lives very much revolve around how to best maneuver around*

Due to individual instinctual and/or learned behaviors of hunting/gathering for food, some bears have been observed moving further into private rangelands as food sources like alfalfa, barley, dog food, cattle, and human trash become more readily available with increased housing density and population growth. It has been observed that grizzly bears are beginning to day-bed in grain fields and become more active in the nighttime to avoid human encounters (Ordiz et al., 2011), while wolves come in for livestock predation and trash, although they are not attracted to crop fields. Rancher's spoke of the differences within movement depending on individuality:

> *"They definitely move around. Wolves and bears both move [and]*
> *cover a lot of ground and have very, very wide areas that they*
> *inhabit. So, yeah, lots of movement. There are resident bears that*
> *live in the basin. There are travelling bears that come through.*
> *Wolves, there are definitely dens all over the basin. Some bears*
> *are collared, some wolves are collared. So that we know again*
> *both active and not active - which change year to year. Wolves and*
> *bears, especially wolves will typically move around dens. Bears*
> *will come through headquarters areas especially if we have grain*
> *or garbage out."*
>   *-Rancher from Montana*

Understanding how ecological or social conditions such as prey shortage, drought, harsh winters, human development, or human tolerance can influence the movement of bears and wolves and pose challenges to connectivity conservation is important to understanding how to mitigate conflicts. In a recent bear movement study, sedentary areas were not considered, leading to a lack of knowledge of how a bear is using den sites or spending sedentary time throughout the day/night and possibly excluding a critical part of a bear's lifeworld into science-based management decisions (Costello, Mace, Roberts, 2016).

Another aspect of how predators experience shared landscapes and create challenges for connectivity conservation that interviewee's referenced was bears and wolves attraction to human roadways. Predators have been observed feeding on roadkill and using roads as territorial barriers or for protection (Ordiz et al., 2011). Individual female grizzly bears with cubs may choose to live closer to humans to gain protection from large males. Bear and wolf biologists speculated that personality and individuality influenced the variation of tolerance among individuals using roads;

> "*But it's interesting that females with cubs often avoid larger male*
> *bears and seek a protective shield by being closer to human*
> *settlements because those larger males are weary of people. So*
> *that creates an interesting situation for people and they think why*
> *are these bears here? They become anxious, they are fearful. Or*

they are thinking what are we doing that is attracting bears? It's
an interesting behavioral situation for bears…"

-Human/Wildlife Conflict Specialist

Among the 20 individuals interviewed for this study, all made it clear that climate change and human influenced landscape change is affecting how bears and wolves experience shared landscapes by disrupting trophic cascades. Human land use practices, such as road and housing development are affecting how a bear or wolf moves through a geographic location and thus understands the habitat. Conflict specialists attributed recent increased numbers of conflicts among humans and wildlife to new housing developments. Interviewees also suggested that the increasing costs of ranching from new agricultural technology, predator management, general upkeep, and finding labor, are causing many ranching families to sell off part or all of their land to housing or commercial developments. As large percentages of ranchland are being lost to development, second home owners and/or short-term renters are begining to occupy previously rural areas of the High Divide. Predator managers spoke of these human communities being less wildlife aware, and thus increasing conflicts on shared lands.

Along with the human aspects that affect predator movement, climatic events such as wildfire can drastically alter the geography of a landscape. As mentioned in the individual animal/subject section, memory is an important component for how bears and wolves understand the landscape; they memorize the specific features of an area and use sensory clues to navigate through it. Interviewee's spoke of observations where wildfire had catastrophically changed large segments of land in the Western United States, causing once memorized landscapes to be unfamiliar as wildlife moves through. This will impact each individual's survival and behavior within affected habitats, possibly creating challenges for connectivity conservation by leading them into private rangelands for easy food access and protection. Subsequent behavioral changes among individual bears and wolves will impact their ethology, stress levels, genetic flow, and overall adaptability to connect with other populations, leading to population level effects. An example of this is whitebark pine and Yellowstone grizzly bears (Felicetti et al., 2003). The cyclical process of climate and human landuse practices affecting bear and wolf populations will disrupt the fluidity of game species, floral communities, and riparian ecosystems, all central to the goal of connectivity conservation. Thus, using the space-time element of an animals atmosphere to understand how bears and wolves experience a shared landscape is necessary for achieving successful connectivity conservation and human-predator coexistence.

4.2 Rancher's Lived Experience

While understanding the lived experiences of grizzly bears and wolves on shared landscapes is crucial to connectivity conservation, it is only a portion of the story. In order to understand the lifeworld of human beings and gain a full picture of human-predator coexistence within shared landscapes in the High Divide, I draw on phenomenological human science to answer my second research question; what are the lived experiences of ranchers who share the landscape with predators? I use phenomenology to uncover the lived qualities and essence of a rancher's experience with predators on their land, as well as the significance that an individual attaches to these experiences (van Manen, 2014), to better understand the challenges posed to connectivity conservation.

To uncover a rancher's lived experience with predators, I first investigated the essence of ranching itself. Results from rancher's interviewed for this study show each feel a deep

connection and intimacy towards working with and on the land, the creatures who live on it, and all of nature's processes. In this study, ranchers explained that they are drawn to the freedom, wide-open and wild country, and to the solitude and meaningful work provided by ranching. Several interviewees explained that they ranch because it's the only vocation they know and they stick with it because it's all they care to know. As one rancher in Centennial Valley, MT explained, ranching is more than a job, it's a way of life. Ranchers in this study pointed out that the ranching lifestyle demands a lot out of an individual, and that they must remain innovative and adaptable, as something—weather, climate, seasons, people, circumstances, costs, equipment—are always changing. In the quote below, an interviewed rancher puts this in her own words:

> *"I'd say it's more of who one is. Just because we spend so much time doing it and we're so dedicated. You know you don't get your two days off a week. You're not done at a certain time, you're done when the animals are all taken care of. During calving season we work like 12 hour days and sometimes a lot longer depending on what the cattle need. And we are up at all hours. And you know we do get time off for sure, and in the slow season you know it's a little bit slower but there are always things that can be done on the ranch. But it just always takes so much work and so much effort that it's not like a job. And if you don't love it, you're never going to stick with it because it is so much work."*
>
> -Rancher from Montana

Another rancher from Teton Valley, ID agreed with these sentiments, explaining: "*Then it just, it's a 24/7 job. You know. It's not a job. It's a lifestyle. It's a way of life. I enjoy animals. I love my horses and my dogs. I even like cows. If you don't like cows, you better not be in that business because they'll do everything they can to make you crazy.*" Understanding the essence of ranching helps lay a foundation to answer the second research question and more deeply grasp the phenomenon of ranching with predators. When asked about how living with predators affects their operation, ranchers explained that the burdens they already face and described above are intensified, because living with predators means constant vigilance. Ranchers spoke of increased stress from ranching with grizzlies and wolves nearby, caused by worrying for the well-being of their cattle, sheep, chickens, or goats; working at all times of the day and night; uncertainty about their future and safety; and having to witness the outcome of gruesome attacks on their livestock. A rancher takes us into his experience with these physical and emotional burdens in the quote below:

> *"You never know when it is going to happen. You know. So, now you have to be vigilant 24 hours a day. Well, ranchers work hard enough as it is. They don't need to be up all day and night. And all this shit takes place at midnight, you know, the middle of the night. That was the thing on the range. You know. I could be out there daylight to dark. And then the last year I was out there until 1 - 2 o'clock in the morning. You know. I stayed out there at night just to see what was going on at night and it was horrifying. I mean cattle*

*screaming and bellowing and stampeding and running this way
and running that way. You know, bears were killing calves and
cows. It was a nightmare."*

<div align="right">

-Rancher from Idaho

</div>

As this rancher went on to explain, seeing his cattle's hind quarters completely torn open and bleeding from a wolf pack, or hearing them scream and trample one another as a result of grizzlies in the area, takes a deep emotional toll. In this study, ranchers invoked a sentiment of love for their cattle, often speaking of them as "their girls," and many felt powerless having to sit idly by as predators took down their livelihood and companions. These quotes demonstrate the intense feelings that accompany losing their cattle to predators:

*"The ideal life that I told you about in the beginning turned into
this nightmare, you know. Finally, I just got so depressed trying to
deal with it and seeing cattle getting killed every night and you
know it was my responsibility as a proverbial shepherd to take
care of my livestock."*

<div align="right">

-Rancher from Idaho

</div>

*"Yeah, it's really hard. We had a calf lost the last year and its
heartbreaking. Especially because you can't do anything to help
them. Most of the attacks are at night and you're not going to be
out there at night. I don't care who you are, haha, you're not going
to be out there. It is, it's heartbreaking, we know all of our cattle
really well. We know most of their numbers, we've calved all of
them out, we've been dealing with them since they were babies.
Some of them we've bottle fed. So any death, whether it be the
heart disease or bears, really hits hard. And it's kind of like a
personal attack. Just because you weren't there to help them- you
couldn't help them."*

<div align="right">

-Rancher from Montana

</div>

Beyond these emotional impacts, landowners explained ranching with predators on the landscape can mean long, hard days and increased time, labor, and financial burdens. Below a human and wildlife conflict specialist reflects on his experience working with rancher's to mitigate the problems caused by predators and the emotional and physical burdens it caused:

*"I started working with this individual [rancher] and he was so
upset about the number of bears that were on his ranch and he
talked about being a prisoner on his own property, worrying about
his children lives, his future, bears coming in close to their caving
areas at night. That was intense stuff, really worrying about his
safety and that of his families. Over the years we implemented
many types of prevention projects; fencing, grain storage,
removing carcasses, employing range riders as wolves came. It
was amazing to see how this individual, his personality, by*

providing tools that have helped reduce direct conflict on their ranch, this individual has come to see, he is extremely tolerant of a high density of bears now on his ranch."

-Human/Wildlife Conflict Specialist

The physical and emotional constraints associated with depredation events are high because kills must be confirmed in order to be compensated. However, ranchers complained about the lack of follow up by agency officials after predation has occurred. If a kill cannot be confirmed, and it must be within 2-3 days of it happening for the evidence to be considered, ranchers will lose out on compensation, forfeit the profit from that cow, and bear the labor costs of searching for predated cows rather than working the ranch. For these reasons, many ranchers complained about the ineffectiveness of compensation programs:

"Well, you know. I am out there. If I don't find it within 48 hours, 24 hours or 48 hours, if I don't find it next day, the chances of me getting paid for it are slim. The next day maybe. There might be enough hide left to see the fang marks and the blood shot in the hide that you know shows the trauma. But after that it's gone. Ain't getting paid for it anyway. So, the compensation system sucked really."

-Rancher from Idaho

However, rather than be reactive, most ranchers are trying to be proactive and prevent depredation events, influencing some of the challenges to connectivity conservation posed by coexistence. Ranchers reported adopting flexible management strategies to account for landscape change each year, and even making changes day-to-day and season-to-season based on weather and animal interactions. Specifically, those ranching with predators must alter where to calve, when to calve, where to put cattle seasonally based on what crops bears enjoy in the springtime or when wolves move into the valleys during the winter. Many interviewed ranchers also mentioned observing and noting the daily, weekly, seasonal, and annual behaviors of individual bears and wolf packs that live on their property. A rancher from Montana explains her experience monitoring bear and wolf movement based on seasonal landscape changes:

"And so our lives very much revolve around how to best maneuver around [grizzly bears and wolves], how to share the basin with them without increasing chances of conflict and encounters. That is mainly in the summer months. Also extreme in August and September of every year. So then the bears go to sleep for the most part in the winter and we can take a deep breath and just have a little bit of a quieter time. Then wolves are the opposite in my experience up here. They are a little bit more active and out and about and possibly a challenge but often not in the winter and more in the early spring when babies are born, whether that's cattle or elk and deer. The bears are just kinda waking up and also asleep. They sort of switch on and off."

-Rancher from Montana

23

As a result of living with predators, most ranchers interviewed had mixed opinions on best practices for mitigating predator conflict and sharing the landscape. Some individual ranchers explained that tensions over resources, land, and safety have been increasing with the presence of predators on their lands. These individuals spoke about feeling disrespected when predators inhabit their space. Other ranchers interviewed admitted knowing that grizzly bears and wolves simply follow their instincts into these encounters (Treves & Karanth, 2003). Understanding the mixed feelings among landowners and landusers who encounter individuals on the landscape is an important foundation for creating comprehensive predator management and connectivity conservation goals. Rural communities and individual ranchers expressed that mixed opinions are a result of having to accommodate deep emotions, personal safety concerns, community values, and individual livelihoods in relation to sharing the landscape with predators. However, many ranchers spoke highly of predators and saw them as an integral part of a healthy ecosystem and were willing to have them on the landscape. An example of this sentiment was given by an interviewed rancher:

> *"I think we all have a place on the landscape, including bears and wolves. They are keystone predators. They are an incredibly essential part of the ecosystem. You know, people will sometimes say, "Oh, their association is pro-wolf and pro-grizzly." It's like - No, we are not necessarily pro-wolf. We are pro-balanced ecosystem and healthy natural systems. And grizzly bears and wolves are very much a part of those systems as are sharks and other keystones. It concerns me. It is scary to think of the trajectory that we are on with the amount of animals and the amount of people that are coming into contact now, especially in this part of the world. And so there is no doubt in my mind that there is going to continue to be conflict. Management has to happen. I love grizzly bears. But oftentimes we have to take one out. I shouldn't say often, but there have been times we have had to be a part of a decision to get rid of a particular grizzly bear, to get rid of meaning kill, because its chances of teaching others what it's doing. And while it is never fun to be part of those decisions, it is important that it happen. And so it is really, really difficult for some people to understand that part of this whole thing. And it is a very real part of it. But, yeah, overall, I think it is really important that we continue to have a shared landscape, continue to have a safe landscape, a safer landscape, and just move along with the time."*
>
> *-Rancher from Montana*

Interviewee's explained there is a complex web of factors driving human-predator interactions and making the uptake of predator-friendly ranching practices slow. However, they also feel that a shift in tolerance is occurring, evident by the acknowledgment and identification of individuals. As one community conservation manager puts it, *"As time has gone on, there is less a threat and more an acceptance. For example, now neighbors may call and say, "Oh, by the*

way, you know, so-and-so is in the field." *They are referring by names not of a person but to a bear that they recognize. That has certainly been a big shift.*" This individual recognition of bears and wolves by private landowners supports the idea that including individuality within education and coexistence strategies could help to mitigate conflicts on a shared landscape.

Although tolerances and opinions remain heavily divided, above all results from this study show that ranchers want to be heard, respected, supported, and believed when it comes to their choice of using lethal or nonlethal control. Most are willing and extremely capable of adapting to changing circumstances as predators move into their rangelands. However, evident from the interviews analyzed in this study, differences in bear and wolf behavior impact how ranchers regard and tolerate individuals on a shared landscape, and ranchers had lower tolerance levels of wolves on a landscape than bears, and lower overall tolerance for bears and wolves than other wildlife. Interviewee's speculated that this trend in tolerance is due to historical and cultural influences of wolves; citing the perception of wolves as monsters and the mythological details surrounding their reintroduction to the GYE as reasons for this deeply rooted disapproval. These results are interesting considering the differences in behavior discussed in the animal atmosphere section above and lead to the conclusion that alternative factors, such as social, emotional, and cultural influences, play a role in a person's tolerance of predators on a shared landscape (Wieczorek Hudenko, 2012).

Knowing how landowners exist on the landscape- socially, culturally, economically, politically, and ecologically- is an important step to promoting predator-friendly ranching techniques and achieving large landscape conservation goals. Adding their voice to conservation is critical to a multispecies perspective, and gives a better understanding of how both humans and animals experience and adapt to the changing landscapes caused by climate change, connectivity conservation, and rangeland management practices designed to mitigate the impacts of predators (Beschta et al., 2013, Madden & McQuinn, 2014).

4.3 A Multispecies Perspective on Human/Predator Coexistence and the Future of Connectivity Conservation

To address my third research question; How can a multispecies perspective help inform connectivity conservation and what challenges does it highlight for the future? I asked interviewee's to consider the current and changing human/predator dynamics on a shared landscape, and how they envision these interactions influencing large landscape conservation efforts.

Results from this study support that with an ever increasing human dominated landscape, landowners, grizzly bears, and wolves are adapting to conflicts as they arise with behavioral adaptations, experiences, changing interests, and expanding habitat and resource overlap (Carter and Linnell, 2016). Human-predator encounters not only affect the human communities whose livelihoods depend on these landscapes, but are also shaping the behavior of the wildlife involved (Herrero et al., 2005). Conflict specialists and ecologists interviewed in this study explained that population pressures, landscape change, and human development are altering the movement of grizzlies and wolves within a shared landscape, causing both humans and grizzlies to alter their behavior in response. The future of large landscape connectivity conservation, therefore, rests on the ability of predators to move through human-dominated landscapes, and in return, landowners and landusers to tolerate predators inhabiting or migrating through those lands. This suggests the need for policies and practices which promote coexistence across multi-jurisdictional and multi-ecological boundaries. This study supports that a multispecies

perspective can work across these boundaries by providing deeper insight into the individuals and landscapes affected by coexistence.

Examples given by conflict specialists of how a multispecies perspective informs future challenges to connectivity conservation, include the switch from generational ranching families to second home owners, the transition of open space to developed areas, increasing tourism, and inconsistent policies and tolerances. They suggest that learned behaviors among predators living in close contact to humans, as well as developed strategies in ways humans have learned to live with predators, are resulting in mutually changing human-wildlife interactions on a shared landscape. Interviewee's explained that increased development of ranchlands has led to an increase in second home owners, out-of-state visitors, and seasonal renters and recreationalists. Predator managers and conflict specialists spoke to this phenomenom, referencing Airbnb and nightly or seasonal rentals, as drastically changing the landscape of human-predator interactions by causing less tolerance and education of predators and therefore increased safety issues. A human-wildlife conflict specialist reflects on changing trends within their community:

> *"You know when I moved out here you could pretty much only count on that second home being occupied for a month or two out of the year. Now with the availability to link these home owners with short-term rentals and a bunch of cleaning services that have sprung up around that business, we've got houses now that are occupied 10 months out of the year. And its not the same people coming back, the owners and their friends, its strangers. Its people that- well so in the conflict business you really want to be able to reach the community, and make sure that people are educated and have what they need- bear resistant garbage cans, things like that- or that they understand they are in bear country and should be carrying bear spray if they go out for a trail run or even just go across the river on a fairly well used gravel road that they need bear spray. But if you have new people coming in every few days, and especially if you have a property owner who does not want to scare them off by saying they are in grizzly bear or mountain lion country, then it becomes a bigger challenge."*
> *-Human/Predator Conflict Specialist*

This quote demonstrates the challenges managers face when working with ranching communities who know the land intimately compared to transient residents who are new to the area or passing through. Conflict specialists explained that ranchers have learned to live with predators, many working with bear and wolf managers to mitigate their attractants and find solutions to sharing the land with predators. However, the relationships that managers and ranchers have worked to cultivate over many years is absent when it comes to nightly or seasonal visitors, leading to issues such as their not using predator safe food and garbage storage, carrying bear spray, or understanding wildlife conduct codes more generally. According to predator managers interviewed for this study, this switch in dynamics endangers all involved and typically, it is the bear or wolf that will be held accountable for a humans unsafe practices or lack of knowledge, as they are commonly killed for these infractions. As we move forward with large landscape connectivity conservation goals, progress in predator management will be

compromised when managers must focus their attention on a transient population; spending time, resources, and money on educating new individuals in bear and wolf country. This shift in human community dynamics is going to change how animal communities interact with the area as well, and thus the future of predator conservation. As explained above, individual bears and wolves are learning to inhabit human dominated areas due to food rewards, protection from competing individuals, and access to resources and habitat, and these behaviors are being passed through populations.

Despite the rising threat of changing human/predator dynamics due to human development in wildlife habitat and growing bear and wolf populations, ecologists noted that the High Divide is not yet faced with overly human-dominated regions, as compared with other parts of the continental US, Europe, and Asia who have predator-rancher conflicts. Because of this, interviewees expressed that there is an opportunity for the High Divide to weave large landscape conservation goals into coexistence strategies and support increasing populations of bears and wolves alongside rising human land use and development. A human/predator conflict specialist interviewed for this study summarizes how planning sustainably can help to mitigate conflict on a shared landscape and promote healthy wildlife populations:

> *"If we spend attention on minimizing the footprint expansion from our smaller villages, towns, and cities. If we put time into land use planning for the Missoula's, the Bozeman's, even small communities like Dillon. If we put emphasis on the smaller urban areas, which is relatively small. Montana is bigger than the country of Italy and it has got 1 million people, Italy has something like 60 million people. It's amazing how their [bear] populations are extremely small but they've hung in there for years and years, in Italy. There is going to be more growth in Montana, the question is how much and where, and can we mitigate some of that. And this incredible rural landscape out there, places like the High Divide which are largely still in agricultural production. I don't want to be so cavalier and say that it will take care of itself because you can't have endless fragmentation of those important ranch lands either, but I'm just suggesting the scale, the small human densities. If we could manage ourselves and our urban densities in MT, that would be a big first start in mitigating landscape change I think."*
> *-Human/Wildlife Specialist*

Interviewees went on to explain that if factors represented in a multispecies perspective, such as wildlife movement patterns, comprehensive habitat requirements (not minimum), individual behavior, and the complexities that encompass human-predator conservation, are considered in predator management, the High Divide can be preserved as an essential corridor for cultural and ecological uniqueness within the American West. As conservation easements and exurban development become more prevelant in the High Divide, including a multispecies perspective on human/predator coexistence within this region can aid our ability to preserve open space by involving individual landowners and rural communities within conflict resolution planning and making conservation decisions that benefit all stakeholders, including wildlife. A

conflict resolution specialist offers his experience of the importance of adding individuality into predator conservation:

> "That sort of evolution, to see people change- and this individual is highly respected, the idea of a key opinion leader within the community, that was a very valuable lesson I learned, a lesson of patience- you know, don't give up on somebody even if they are red faced in front of you. We stayed, we were all patient and made that investment for people like the individual I'm describing and it really payed off in the long run. So there is a lesson I'm describing too, understanding how key opinion leaders can influence- and his willingness to change and try all of these preventative practices, it really spread into the community. And now this individual is talking about carcass removal and the importance of fencing in front of people all along the Rocky Mountain Front. He is willing to go out and talk to other ranchers about it, it's really fascinating."
>
> *-Human/Wildlife Conflict Specialist*

Including the perspectives of individuals within conservation policy and management decisions would encourage larger representation of rural landowners, which, according to interviewees, there is a current lack of, in collaboration efforts. Personal experiences of ranchers can inform solutions to remain up to date and practical, consistently challenging management and conservation agencies to evaluate their practices. Just as it is important to consider the individuality of each animal that comes through an area, it is important to understand the individual rancher who they interact with.

By focusing on the individual for both rancher and grizzly or wolf we can work to protect the landscape to benefit all. Interviewee's unanimously agreed that rangelands play a pivotal role in connectivity conservation, and one only they can play; preserving large segments of land maintains the openness and integrity of the West, the beauty, wildness, and solitude, for all beings, not just wildlife. Both groups agreed that protecting land to promote connectivity is timely, and that conservation efforts must collaborate with ranchers to secure large areas of undeveloped land as exurban development and conservation easements continue. A wolf biologist interviewed states her opinion that private land is crucial for maintaining connectivity, saying *"It is critical to their survival. It's critical to maintain the connectivity of private lands. And private lands have some of the best, and worst, habitat that I've seen. But it's wrong to think that by getting rid of private landowners you will have connectivity. It's not going to happen. People need to work with the ranchers and other private landowners. And create systems that allow them to share that landscape. Its critical."* Preserved open space provides better habitat for wildlife than human development, for the obvious reasons. It provides space to eat and reproduce, raise young, rest, and inhabit. Less obviously, it can also help to curb human-predator conflict by slowing the rate of encounters, as well as maintain the cultural integrity of the American West.

Along with conservationists supporting ranchers to keep the integrity of an open landscape and support working livelihoods, another important reason to maintain connectivity corridors expressed by interviewee's is that open space can be beneficial for the economy. The

ecological value of the High Divide is highly influenced by the presence of bears and wolves, but they also provide economic value to the area because they attract tourists which directly support local economies. Those interviewed explained that the characteristics of the High Divide; specific habitat requirements, low human density, and iconic Western culture, make it so predators have the potential to thrive in the region. The specificity of these characteristics also make it unrealistic to reintroduce bears and wolves into other parts of their historical range within North America, making their presence in the High Divide that much more special. However, as agency officials and conflict specialists explained, migratory communities do not always profit directly from tourist attractions. As a solution to this, many managers spoke to equalizing the burden of human-predator conflicts within connectivity corridors by asking the nation to take responsibility to help support predators on the landscape. Specifically, one solution that came up repeatedly was for the states to implement a tax on the millions of visitors that flock to these areas every year in hopes of seeing a grizzly bear or wolf. A tax, fee, or donation program would support compensation in conflict reduction programs, grazing permit buyouts, and overall preservation efforts. Ranchers and conservationists agree that sharing the burden of accommodating these iconic species is fair and sustainable, and benefits all involved.

5. Conclusion

This study finds that notable changes in human-predator dynamics are occurring. In both conservation practice and literature, there is a shift towards recognizing the role that non-human animals play in co-creating biopolitical environments, specifically human-wildlife interactions (Ogden et al., 2013; Braun and Whatmore 2010; Karanth and Margulies, 2018; van Dooren et al., 2016). As Karanth and Margulies (2018) suggest and the findings of this study show, "The turn towards multispecies modes of inquiry in social research has opened up productive avenues for exploring the complexities of human- wildlife relations and encounters across diverse assemblages of human and non-human species."

By incorporating a more-than-human approach, we make room for the needs and wants of other species, attuning us to the co-constituted worlds of human and non-human animals and augmenting our ability to manage more effectively for the complex biopolitical and socioeconomic issues around interactions (Karanth and Margulies, 2018). Advocating for the individuality and socio-emotional lives of wolves and grizzly bears can push us beyond the anthropocentric perspective which dominates predator conservation and challenge us to value their wellbeing equally with all other stakeholders involved in land management. Including the spatial and temporal dimensions of a predator's experience is integral to placing a multispecies perspective within the contexs of external biopoltical circumstances, such as landscape change, movements, trophic cascades, and human political dimensions. Each of these influences how an individual experiences a shared landscape and can help us predict challenges to connectivity conservation into the future. Equally important to researching how predators use and understand the landscape is studying how landowners exist- socially, culturally, economically, politically, and ecologically- on the landscape. Adding the voices of landowners to conservation is critical to a multispecies perspective, and to promoting predator-friendly ranching techniques and achieving large landscape conservation goals by preserving open space. By acknowledging the individual and their agency, both human and nonhuman, we gain a deeper respect for those living within a shared landscape, and, therefore, what it means to coexist. A multispecies perspective offers a deeper understanding of how both humans and animals experience and mutually adapt to changing landscapes caused by climate change, human development, and/or

habitat/resource degradation, all of which effect connectivity conservation and rangeland management practices designed to mitigate the impacts of predators.

The results of this study show that including a multispecies perspective in predator management and related science will allow us to identify areas not only ecologically important for bears and wolves and cascading trophic levels, but also socially and culturally important for human-predator interactions and tolerances (Barua et al., 2013; Madden, 2008; Madden & McQuinn, 2014). This is especially important as human development and predator populations increase and therefore encounters among humans and bears and wolves become more prevalent, creating a greater need for successful connectivity conservation strategies.

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7. Appendix

7.1   Animal Atmosphere of Grizzly Bear / Wolf

Semi-Structured Animal Atmosphere Interview Guide

Thank you for meeting with me today. I appreciate your time. To give you a little more context on what I will be interviewing you about today, I am conducting research on how grizzlies and wolves use, understand, and adapt to living and moving through privately owned rangelands and the way they experience human encounters on these landscapes. I am interested to study how the impacts of landscape change and conflict on privately owned lands will affect grizzly and wolf behavior and connectivity conservation and management decisions into the future.

Background Information
1. Name
2. Affiliation
3. Position
4. In what capacity do you work with [wolves or grizzlies]?
5. How long have you worked with these animals?

I.   Lived Experience
1. What questions are you currently asking as an ecologist/biologist/etc to better understand how [grizzly bears/wolves] are using their environment? Why?

2. In what ways do [grizzly bears/wolves] sense and shape the landscape in which they live?

3. How does a [grizzly bear/wolf] use a landscape as they move across it? What ecological components do they seek out seasonally and during different behaviors like hunting, mating, etc…?

4. As [grizzly bears/wolves] expand into their historical habitats, do you believe they have instinctual knowledge of those landscapes and how to survive in them, or do you believe they are learning and teaching themselves new skills to adapt?

5. Could you explain to me how [grizzly bears/wolves] use each sense? (Hearing, smelling, tasting, seeing, touch, awareness of other individuals)

6. How can you best describe the emotions or feelings of a [grizzly bear/wolf]? If they experience emotion, which ones and how do they exhibit them?

7. What capacity of memory do you believe [grizzly bears/wolves] have?

Only with extra time:
8. Do you believe they are unique individuals, with personalities?
9. Can you give me stories of individual [grizzlies/wolves] that you have worked with or encountered?
10. In what ways are [grizzly bears/wolves] and humans similar?

Do you have anything to add that would allow me to better understand how a [grizzly bear/wolf] **experiences the social and emotional dimensions of their lives?**

II.   **Human-Predator Experiences and Adaptation**
   1. How does a [grizzly bear/wolf] perceive humans on the landscape? Do you believe this is different between private and public lands? If so, how?

   2. How do you think [grizzly bears/wolves] understand moving from public (protected areas like GYE, COC) to private ranchlands? Which clues or methods, if any, do they use/acquire to recognize this transition?

   3. Can you explain how a [grizzly bear/wolf] might use a private ranch at different times throughout the year? Why are [grizzly bears/wolves] attracted to private land?

   4. What traits does a [grizzly bear/wolf] possess to make them more likely to adapt to human-dominated landscapes than others?

   5. Have you noticed a pattern between food availability or climatic events and livestock predation? What trends have you observed in the _(fill in)__ ecosystem?

   6. Below I will read possible scenarios a [grizzly bear/wolf] might encounter on private land; Could you walk me through how a [grizzly bear/wolf] may act in these scenarios, using the perspective of a [grizzly bear/wolf] as best to your ability?
         i.   Hunting for natural food sources or water
         ii.   Predation on domestic livestock (cattle, sheep, or poultry)
         iii.   Eating trash or birdseed
         iv.   Encountering a human
         v.   Running into electric fencing
         vi.   Smelling a decaying carcass
         vii.   Hearing gunshots

   7. How do these experiences impact the individual [grizzly bear/wolf] encountering them? For example, in what ways does it affect stress levels, change eating habits, and influence overall social/individual behavior? How do you expect these impacts to influence that individual and [grizzly bears/wolves] as a whole in the long-term?

8. How will these impacts alter how we manage [grizzly bears/wolves] in the future and make conservation decisions? What traits will make a [grizzly bear/wolf] successful moving and living in private rangelands? Passive aversion conditioning or avoiding humans all together?

9. What are the behaviors [grizzly bears/wolves] have adapted to live on private rangelands or in human-dominated landscapes?

10. How do you think landscape change (habitat alterations (climate change), human development, food/water changes, population increases, etc) has affected how [grizzly bears/wolves] use, understand, and move through private landscapes? Through the High Divide?

11. In what ways will these landscape changes affect how [grizzly bears/wolves] use private ranchlands into the future? The High Divide Ecosystem? On what timescale?

12. As a [grizzly bear/wolf] expands into unfamiliar habitat how might that individual teach itself about that new place and food sources?

13. What are the biggest threats to their future success within the High Divide? What are other challenges they face?

14. Do you have any suggestions for how [grizzly bears/wolves] and humans/ranchers can coexist? What has to happen/change?

15. What is the impact of destroying trouble [grizzly bears/wolves] on the overall population? How do people and communities react to those events?

16. Have you observed different human tolerance levels for [grizzly bears/wolves] on private landscapes compared to other wildlife (wolves, elk, foxes, etc)? Please explain…
    a. How do these differences impact the future of connectivity conservation for [grizzly bears/wolves]?

17. What is the importance of [grizzly bears/wolves] success to the ecosystem and other wildlife of the High Divide?

Do you have anything to add that would help me better understand how a [grizzly bear/wolf] **interacts with ranchers, private rangelands, and landscape change?**
Do you have any questions for me?

7.2 Rancher Semi-Structured Interview Guide

A) Socio-demographic Information
1. Race/Ethnicity

2. Age

3. Marital status

4. Number of Kids

5. Education

B) Ranching Operation/History of Livelihood
1. Geographic location of ranch, closest local community

2. Size of operation
   a. Land Acreage (leased and owned)

3. Number and Type of livestock (cattle, poultry, sheep, etc)
   a. How many head of each species?

4. How many generations of ranching as there been in your family, only up to you? (multi-generational & #, or first-generation)

5. Do you hope to pass your ranch down to your kids?

6. How many workers do you employ?
   a. Year-round, seasonally?

7. To what extent are you involved in the day-to-day operations? Do you share daily decision-making with anyone? (Spouse, parents, in-laws, children, business partners, other?) What do they do?

C) Lived Experience
I am hoping to understand your experience as a rancher and how that experience has shaped you as an individual and the events in your life. Anything you are willing to share from your day-to-day activities, beliefs, memories, your worries and hopes for the future, and how you interact with your work, land, and community are extremely welcomed.

1. Can you tell me about yourself and how you got involved in ranching?
   a. Do you see ranching as an occupation or is it more than that to you? How is being a rancher part of your identity (who you are)?

2. What aspects of ranching do you most enjoy?
   a. What is something you've had to overcome as a rancher in your life?

3. In what ways, if any, has your experience as a rancher shaped how you see the world?

4. What meaning does your land have to you?
    a. The land itself, the characteristics on it (water, soil, vegetation, animals)?

5. Will you walk me through a "day-in-the-life" for you?

6. What are the major challenges your ranch faces right now?

7. Looking forward, what are your biggest concerns for your ranch?

Is there anything about your life as a rancher you would like to add so I can best capture your experience of it?

D) Human-Predator Experiences and Adaptation
Now I would like to ask you about your experience with wildlife on your ranchland and the ways it has impacted you.
1. What wildlife have you observed on your ranch? How do certain species use your ranch throughout the year? Has the overall number of wildlife changed over time?
    a. Do elk come on your land?

        i. What are the impacts? Would you say it is overall a good, bad, or neutral thing? What are the ways you adapt or deal with elk on your land?

2. What role do wildlife play in your management decisions?
    a. Which species are important to the ranch? How often do they come? Do you change your management practices to accommodate them?

        i. How flexible is your management for wildlife objectives from year to year? Have you made any major changes in the past? Do you anticipate making any changes in the future? If so, please explain.

3. Have you had an experience with [grizzly bears/wolves] on your ranch? (If no, skip to question 5)
    a. What happened? (predate, change herd behavior, eat trash, move around property, den, eat natural food sources, etc)
    b. Have you been able to identify specific individuals that have visited your property?
    c. How often do [grizzly bears/wolves] frequent your ranch? How has as this changed over time?
    d. In general, how do you feel about having [grizzly bears/wolves] on your ranch?

e. Do [grizzly bears/wolves] belong on privately owned rangelands? Why or why not? Is there a particular threshold or number of [grizzly bears/wolves] that you would allow on your ranch?

4. How has having [grizzly bears/wolves] on your land impacted the way you manage your ranch?
   a. I asked you earlier about your day-to-day activities as a rancher...How has it impacted your day-to-day management activities? What changes to management practices or strategies have you had to make? Why did you choose to make these changes? How effective have they been? Do you know of others who have made these same management changes in response to [grizzly bears/wolves] on their ranches, either now or in the past? Did their management changes affect your decision to make these changes too?
   b. What are the costs and labor requirements associated with those practices?
   c. What other options did you consider? Why didn't you choose them?

5. ***If you have not had predators on your land...what impacts do you expect if they were to visit?

6. How willing are you to engage in the following predator-control practices and why?:
   a. Lethal control (shooting, poison, trapping)
      i. Why?
   b. Changing livestock husbandry practices (low stress cattle ranching)
      i. Why?
   c. Carcass removal and composting
      i. Why?
   d. Herd monitoring (range riders)
      i. Why?
   e. Guardian animals
      i. Why?
   f. Electric fencing around garbage and/or cattle enclosures
      i. Why?

7. Do you believe that grizzlies and wolves should be able to move across private ranchlands? Should private lands be used for connectivity conservation?
   a. Is there a particular threshold, or number, of individuals that you would tolerate moving across your ranch? (1, 10, 100)

8. Do you believe that humans and predators can live together in the High Divide? Why or why not?
   a. What is your ideal scenario of what that coexistence looks like?

b. Are you willing to co-exist with predators, even if that means adapting your behavior? Why or why not?

9. What effects, if any, do you feel you will encounter as predator populations increase in the High Divide?

10. When you have a question about wildlife conservation, rangeland management or livestock management innovations, from whom do you seek advice?

11. Have you ever encountered a [grizzly bear/wolf] outside of your ranch?
    a. How did you feel during that experience? Was it different than on your property? What was that experience like?

12. Scenario: IF you are in a room of people deciding the fate of grizzly bear and wolf conservation for individuals moving from the GYE to the COC or central Idaho, what would you want to express about ranching and your livelihood?

End: Is there anything you would like to add to help me most accurately understand your experience as a rancher? Is there anything you'd like to ask me?