Killing for coexistence: the bio- and necro-political ecology of wolf conservation and management in Washington state

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Abstract

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The state of Washington, USA has been rocked by conflict over wolves, which have recently returned to rural landscapes after their eradication nearly a century ago. While conservationists celebrate the rewilding of ecosystems, ranchers bemoan losing livestock to dangerous predators, and state officials struggle to develop a wolf management policy that will please all parties. Many stakeholders share goals of "reducing human-wolf conflict" and promoting "coexistence," but the intensity of human conflict over how to manage the wolf population – especially when that management includes killing some individuals – demonstrates that there is little consensus about what coexistence means. Examining this landscape of controversy and conflict, I conceptualize wolf conservation as not merely a technical problem for scientists to solve, but reflective of deep-seated cultural, political, and economic differences. This dissertation is thus a critical examination

of the sociopolitical norms, discourses, and processes that shape management of wolves as they (re)colonize territory, moving into landscapes where they enter new, often violent relations with human societies. It advances the geographic and interdisciplinary study of conservation as a social practice, engaging with perspectives from conservation social sciences including critical (human and physical) geography, political ecology, science and technology studies, animal/multispecies geography, human dimensions of wildlife management, human-wildlife conflict studies, and related work in wildlife ecology. It is the product of a multi-year, qualitative, ethnographic study of the entangled discourses and practices of wolf management in Washington state, with a particular emphasis on the ongoing controversy over lethal management. Arguing that the key barriers to mitigating wolf-livestock conflict are often not technical but social, I demonstrate how targeted killing of wolves that prey on livestock is used as a tool for the management of both social and ecological dynamics. I thus examine how emblematically "wild" animals are produced by and through conservation practices, and deeply shaped by human cultural, political, and economic systems. This analysis has significant impacts and implications for conservation practice and social science beyond the wolf conflict, raising important questions about the meaning of conservation and environmentalism in a world increasingly shaped by the actions of humans.

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1. Introduction: "It's a weird deal with the wolf"

On Friday, August 16th, 2019, a judge in the King County Superior Court in Washington state issued a temporary injunction to stop the state's wildlife agency from killing any more wolves. The case before him focused on a group of gray wolves (*Canis lupus)* known as the OPT pack, short for "Old Profanity Territory," so called because the pack had taken up residence in an area that was previously home to the Profanity Peak pack, named in turn after a mountain in their territory. The Profanity Peak pack's seven members had already been killed by the Washington Department of Fish and Wildlife (WDFW) in 2016, but the OPT wolves quickly moved into the newly open territory. Like the Profanity Peak pack before them, the OPT pack quickly demonstrated a propensity for attacking livestock, which roam freely in the summer months on grazing allotments in the Kettle Mountains of the Colville National Forest (CNF), the region where the wolves had settled down. When cattle were repeatedly killed by the wolves in September of 2018, WDFW made the decision to kill first one, and then a second, of the OPT wolves in an effort to deter their attacks on livestock. "This is a very difficult situation for all those involved, especially given the history of wolf-livestock conflict in this area," said WDFW Director Kelly Susewind. "Our goal is to change this pack's behavior." When more cattle were killed in 2019, they killed a third wolf, still to no avail, as livestock depredations continued. Finally, Susewind made the decision to take out the entire pack, prompting a lawsuit from environmental groups. The plaintiffs argued that the state's policy for lethal removal of wolves did not comply with the State Environmental Policy Act, and they further alleged that insufficient efforts had been made to curb wolf-livestock conflict using non-lethal measures. Allowing the case to proceed to trial, the judge issued a temporary order to prevent the killing of any more of the OPT wolves in the meantime.

The order came too late. Over the course of the previous week, WDFW staff had killed seven remaining members of the OPT pack, including the final four wolves in the early morning of August 16th, just hours before the judge issued the order to stop lethal action. From the perspective of the environmentalist organizations, the state's continuing action to kill wolves even on the very morning that the judge would consider the case was done in "tremendously bad faith," in the words of Wayne Pacelle, president of the Center for a Humane Economy. As he said, "It's like, 'Okay, we've got to get these wolves now, in case the judge stops us'" (quoted in O'Neill, 2019). The Department countered that this was simply a case of "unfortunate timing," given that the issues with this pack dated back to the previous year, and their efforts at lethal removal had been ongoing. In two previous instances, courts had denied injunctions for similar lawsuits brought by the same environmental groups, so from the perspective of the decision-makers at WDFW, the ongoing legal challenges perhaps appeared unlikely to succeed, and were not a sufficient reason to call off their longstanding effort to resolve the conflict by eliminating the OPT pack.

The OPT lethal removals turned up the heat on a fight over wolves and livestock that had long been near the boiling point in Washington state. At a January 2020 meeting of the state's Wolf Advisory Group (WAG; a group of stakeholders including livestock producers, environmentalists, and hunters, which serves to provide guidance and recommendations on wolf management to WDFW), a member of the public stood up during the routine public comment period to offer remarks. Identifying himself as "David, from Ocean Shores," he held up a copy of The Daily World newspaper, published in Aberdeen, WA, with the headline "One ranch, 26 wolves killed." The headline and story, which originally appeared in the Los Angeles Times (Read, 2019), highlights the Diamond M ranch, a cattle producer based in Laurier, WA whose

cows and calves were among the ones attacked and killed by the OPT pack. Waving the paper above his head, David announced passionately that "everybody here knows what the problem is… it's the same ranch every time," pointing the finger squarely at Diamond M and its proprietor, Bill McIrvin, for failing to take adequate measures to protect his cattle from wolves. A second member of the public, identified as Ron, echoed similar themes: "ninety-nine percent of ranchers are not having a lot of problems" with wolves, he argued, but "the elephant in the room" is the single cattle producer whose cows had been repeatedly attacked, and on behalf of whom, in his view, WDFW was repeatedly killing wolves. The seven OPT wolves killed in early August, he pointed out, were part of the headline-grabbing total of 26 wolves killed over a period of eight years after attacks on Diamond M cattle. (Five wolves were killed in other parts of the state over the same period, making a total of 31.) The "huge majority of wolves lethally removed [were] for the McIrvins," Ron said; it's "one ranching operation running this whole thing."

I spoke to Bill McIrvin in the summer of 2020, asking to hear his side of the story. He was initially reticent, saying "I've talked to a lot of people over the last few years… a lot of people trying to find something to use against us. I've said several times I wasn't gonna do any more interviews." But the tune changed as he allowed that "I'd like people to see our side of the issue." He told me, "Here's the thing that everybody misses: the wolf is not the problem. It's the laws and policies around the wolf." In his view, the state is far too slow to intervene when wolves attack livestock. He drew a comparison to cougars, which also frequently attack and kill his cows. When it happens repeatedly, though, he tells me you just "handle it… the common-sense way," meaning hiring someone to hunt and kill the "problem" cougar. The same approach would be illegal for wolves, which are protected as an endangered species under Washington state law. "It's a weird deal with the wolf – it's always been a weird deal with the wolf," he went

on. “It’s always been, for lack of a better term, worshipped.” From his perspective, the wolf is no different than any other predator. Perhaps even more important, though, is his view that the environmentalist organizations that allegedly worship the wolf also have a broader goal in mind, even as they campaign to end the practice of lethal removal of wolves. “The wolf,” he says, “is a tool to a lot of people to end public land grazing. People will say, ‘Oh my goodness, you can’t actually believe that.’ But it is. And it’s a very effective tool, I might add. You start talking about ending lethal removal and pretty soon people say, “well, shouldn’t we have a public lands debate?”

That debate – about whether livestock grazing ought to be an allowable use on National Forest lands, as it has been formally since the passage of the Taylor Grazing Act in 1934, and informally since the inception of public lands in the United States – is a political and economic issue that underlies the wolf question in Washington state and beyond. For McIrvin, the conflict is not actually about wolves. He sees wolves as a proxy: a tool used by conservationists to have livestock barred from grazing on public lands, a practice which is a critical aspect of his business model and livelihood. His cattle are raised on Forest Service grazing allotments that his family has used for decades, which have only in the last decade become ground zero for wolf conflict. The high proportion (26 out of 31) of wolves killed for depredations on his cattle is not, in his view, because he is doing anything different than other ranchers are, but simply because he owns a high proportion of the cattle in the territory where wolves have become a growing problem – a territory which is not simply his ranch property, but the thousands of acres of national forest and other public and private lands where cattle graze in northeastern Washington. For McIrvin, the wolf issue is an issue of land and legacy. In response to the claim that his ranch is “running the whole thing,” he explains that as one of the larger operators working in the region, he sees

himself as a protector of a regional way of life. He tells me about conversations he's had with neighboring ranchers, who told him (in his words), "without you guys taking the brunt of it, we'd never survive." In contrast to the environmental organizations who, in his view, "try to make it out like we're a big rich corporation," he points out that his business is a family operation. "We've been able to hunker down and survive," he tells me, but he is deeply worried about the future of his business model and his family's livelihood and way of life.

Despite the common media representation of wolf politics, in which wolves are often framed as an issue that pits ranchers *against* environmentalists (and indeed, "environmentalist" is often used as a pejorative word by conservative opponents of wolf return), in fact both sides of the wolf argument often draw on rhetoric that could easily be described as "environmental," appealing to ideas of land stewardship, balance and equilibrium, and sustainability. For McIrvin and other ranchers, the use of the land for livestock represents a form of conservation, keeping landscapes open and protecting biodiversity against the threat of development: as he puts it, "what happens, every single time, is those ranches go out of business and it sells in twenties [twenty-acre parcels]. That's the most money they can make out of that land… full up with houses and dogs." Rejecting the common urban representation of livestock producers as ultimately profit-motivated, with little concern for the environment (and indeed, sometimes as "big rich corporations" driven only by the bottom line), he repositions himself as someone deeply concerned about ongoing processes of landscape change in the region, as the broader socio-economic context for the challenge of dealing with wolves. He argues that many ranchers are already going out of business and "we only hung in because we were stubborn."

Countering this claim, some wolf advocates are dismissive of the premise that the livestock industry is in such dire straits – one describes it as a "myth" that ranchlands are being

rapidly sold off, saying "don't use that excuse with me" to justify killing wolves. Others argue that the economic shift away from ranching (in northeastern Washington, and across the American West) is indeed real, but should be understood as a good thing, with the decline of the beef industry representing a transition toward more sustainable world in the context of global climate change (an issue that few cattle ranchers are inclined to bring into the conversation!) Yet even some folks who describe themselves as "pro-wolf" support the idea of "keeping open space, not subdivisions," and note that a transition away from beef, if desirable, must take into account the globalized nature of the industry, and address demand as well as supply: if you "take this same number of cattle and take 'em to Brazil [instead], the effect on the environment is huge… this is not the worst way to make beef." At a recent meeting of the state's Fish and Wildlife Commission, one state commissioner echoed the concern that the wolf debate is a red herring, steering attention away from what they described as a "land grab," lamenting rapid economic and demographic changes in rural Washington and noting that ranchers are being offered "obscene amounts of money for our ranches." One local resident notes the cultural significance of this change for the region, saying, "the cattle industry isn't large – most people don't have a thing to do with it – and yet support for them, culturally, is unpredictably strong… everybody's got some connection to running cattle, 'my dad ran cattle on that state allotment' or something like that, so it's deeply ingrained." In this sense, the return of wolves is often lamented as an emblem of broader cultural and economic changes in the region.

This emphasis on the entangled economic and ecological effects of land use and wildlife management – noted by both the advocates of coexistence, and ranchers – is a point well worth taking, and often missed in public discourse about wolf return. Reframing the wolf debate in terms of competing forms of environmentalisms, each entangled with other social and economic

objectives, rather than simply a binary view of environmentalism-vs-development, helps to shed light on the complex and ultimately global consequences and stakes of the issue.

The OPT case, and surrounding debate over lethal removal, also demonstrates how the economic and ecological processes at work in wolf return are deeply *political*. On September 30, 2019, a few weeks after the OPT wolves were killed and about two months before the L.A. Times coverage brought the episode to national attention, Washington Governor Jay Inslee got involved. Sending a public letter to WDFW Director Kelly Susewind, whose responsibilities include making the decision to authorize lethal removal of wolves in the state, Inslee told Susewind, "I share the public's concern and am troubled that the Wolf Plan does not appear to be working as intended in this particular area in Northeastern Washington. I believe we cannot continue using the same management approach on this particular landscape." Calling on WDFW to make every effort to use non-lethal measures to "significantly reduce the need for lethal removal [of wolves]," Inslee continued:

> We must look for other strategies that address the unique nature of this particular geographical area, an area which has been characterized as prime gray wolf habitat. We must find new methods to better support co-existence between Washington's livestock industry and gray wolves in our state. The status quo of annual lethal removal is simply unacceptable.

Though the letter appeared to be quite carefully crafted to avoid the sense that the governor was "taking sides" in the wolf debate, the final sentence quoted above was celebrated and often repeated by wolf advocates opposed to lethal removal. It also sparked a significant backlash from the ranching community, with frequent arguments that the governor was "politicizing" the issue, and should leave wolf management decisions to experts, whether the professionals at WDFW, or locals with hands-on experience and knowledge. Annual lethal

removal is "unacceptable" to whom, they asked? In their view, the governor's decisions to wade into the issue was motivated by electoral politics, rather than a deep knowledge of the issue: as a famously environmentally-oriented politician, and recently a Democratic Party candidate for U.S. President whose campaign strongly emphasized addressing climate change, there was little question for them that he would be listening primarily to the ongoing "environmentalist" calls to end the killing of wolves, and counting the votes at stake in this issue. Of course, a governor's job is to govern, and the governor of Washington state holds direct authority over WDFW, making the claim that his intervention amounted to "politicizing" wolf management dubious, and perhaps revealing of his critics' own political commitments. Notably, though, Inslee did not step in to overrule WDFW actions directly, nor did he speak to the Director privately about the decision, as he could have chosen to do. Instead, the letter in which he aimed to define what was acceptable and unacceptable was released to the public. In this way, the governor aimed to govern through the process of shaping public debate, setting the terms of acceptability of human intervention regarding the lives, and deaths, of wolves. His choice reflects the entanglement of the political processes of setting resource management policy with the sociocultural processes of producing public opinion and social values (including so-called "environmentalist" values) in contemporary environmental governance.[1]

The story of the OPT wolves in 2019-2020, and the subsequent (and ongoing) debate over lethal removal as a tool to protect livestock, is demonstrative of key themes of the wolf recolonization controversy in Washington, and across the western United States more generally.

[1] As of the writing of this chapter, the issue of state policy with regard to lethal removal has been taken up – at the direction of the governor, and as petitioned by environmental organizations– by the state Fish and Wildlife Commission, which is engaged in a rulemaking process to formally codify in law processes of authorizing lethal removal, replacing the informal "guidance" created by the Wolf Advisory Group in the state's Wolf-Livestock Interaction Protocol.

The return of wolves, and decisions about how to manage those wolves when conflict arises, is often considered as a challenge of *ecological* management, but the questions it raises are deeply embedded and intertwined with *social* – including political, economic, and cultural – questions. Conflict over wolves raises questions of nonhuman belonging, and the role of human intervention (including violent intervention) to protect "wild" natures: where do wolves belong, and who gets to say so? What does it mean to "coexist" with wild animals, and is it possible to reconcile killing some of them when they become a problem, with this "coexistence"? Conflict with wolves is also deeply entangled with political-economic questions on a landscape with multiple, and contested, layers of meaning: what is a National Forest for, and who gets to say so when conflict over its use arises? These questions demonstrate the complexity of wolf return as a socio-ecological challenge that raises deep questions about land use, human-animal relations, and the sociocultural dimensions of environmental governance. "It's a weird deal with the wolf," indeed – and the entangled ecological, cultural, political, and economic aspects of that "weird deal" provide important insights into the meaning, purpose and outcomes of contemporary wildlife and biodiversity conservation that I examine in this dissertation.

In this introductory chapter, I provide a general overview and introduction to the issue of wolf return and conservation amid social conflict, as well as situating my research on the topic within multiple existing academic conversations. The following section provides context on the social dimensions of the wolf conflict, both in Washington state and beyond, and positions the theoretical interventions that this dissertation makes. In the subsequent section, I review existing scholarship in areas relevant to the topic, which include literature from the human dimensions of wildlife management, critical animal/multispecies geography, political ecology, science and

technology studies, and conservation biopolitics/necropolitics, among others. Finally, I end this chapter with a summary of my research objectives and a road map to the chapters that follow.

a. An overview of my project

Washington's ongoing conflict over wolves takes place in the broader context of wolf recolonization of rural landscapes across the western United States, after their eradication nearly a century ago. While conservationists celebrate the restoration of these apex predators and the "rewilding" of the ecosystem, ranchers often bemoan the repeated loss of livestock to dangerous predators. In Washington, the return of wolves, and their subsequent predation of cattle, has led to serious social conflict and even violence (usually directed toward animals, though with significant threats of violence toward people). In a notable 2009 case, a FedEx employee discovered blood dripping from a package that turned out to contain a poached wolf pelt, which was traced back to a local livestock producer; more recently, a number cattle were found shot to death from the road in rural Washington, presumably in protest of state policies (Cornwall, 2009; Hansen, 2019). Repeated and controversial state intervention to kill "problem wolves," such as the 2019 OPT pack, has only inflamed tensions between conservation advocates and livestock producers. Scientists, too, have been caught up in the controversy, with the closure of a wildlife research laboratory at Washington State University due to what was arguably a political backlash by state legislators against either the lab's research conclusions regarding the effectiveness of lethal removal to reduce conflict, and/or its lead researcher's personal statements and views on the issue (see Mapes, 2017). State officials have struggled to bring stakeholders together to develop a policy for managing wolves and livestock that will please all parties, but their efforts have been destabilized by ongoing conflict. Parties including ranchers, wolf advocates, scientists, and state officials all report receiving death threats at various points over the past decade, and in

late 2020, WDFW was forced to cancel a series of planned public meetings on wolf policy after police received anonymous violent threats toward participants.

As one local resident puts it, Washington state – particularly the northeastern region, where most of the state's wolves are found – has become a "hotbed of unhappiness" over wolves. While many stakeholders in Washington ostensibly share the goal of "reducing human-wolf conflict," or as the state's Wolf Conservation and Management Plan puts it, "promoting the public's coexistence with the species" (Wiles et al., 2011, p. 9), the intensity of the ongoing human-*human* conflict over how best to "manage" wolves – a phrase that for some means promoting their survival, and for others, killing them – demonstrates that there is little consensus about what this "coexistence" means, or how it should work in practice (cf. Martin et al., 2021).

Examining this landscape of controversy and conflict, I frame the challenges of wolf conservation, often addressed on a technical level (for example, tools and techniques for reducing wolf-livestock), at a broader structural level, examining the social, political, and cultural processes at work. Wolf conflict is not simply a technical problem for scientists to solve, nor even merely a question of conflict resolution between stakeholders with different interests. Instead, understanding Washington's "wolf wars" requires an effort to assess how wildlife conflict is inevitably entangled with and overwritten upon deep political, economic, and cultural differences in the context of the western United States. Wolves are widely understood as "wild" animals – indeed, for many they are emblematic of American wild spaces and the values of conservation – and yet they are simultaneously subject to intensive human management. Ongoing efforts that aim to "change their behavior" (to echo Director Susewind's words about the OPT pack) raise questions about what kind of wolf behaviors are considered acceptable or unacceptable, by whom, and how those behaviors might be changed through interactions with

humans. Meanwhile, competing cultural discourses frame wolves as dangerous, bloodthirsty predators, or as an endangered form of biodiversity and charismatic emblem of conservation efforts. Advocates' appeal to wolves' status as a native species and their ecological role as a "keystone" species to argue for their return as a process of landscape-scale ecological restoration, while opponents point to a more recent history, in which wolves have not been present on the landscape, to claim that wolves' return is incompatible with present-day land uses and social values. These competing claims to belonging are entangled with related arguments about both the "nature" of wolves and the purpose and meaning of the landscapes where they live. Appeals to what is the "right" nature to protect or restore often work to depoliticize human interventions, suggesting that it is simply "natural" to manage wolves a certain way. Ranchers, residents, environmental activists, and even policymakers and scientists draw on these competing discursive frames about wolves in arguments about policies such as rights of access to public lands, poaching laws, and wolf management practices.

I have used ethnographic research methods, including participant observation, interviews, and document analysis to examine the contested reproduction of the interwoven social discourses and practices of management intervention in Washington's ongoing efforts to reduce conflict with, and over, wolves. The critical theoretical framing that I offer here was developed through over three years of field work examining the conflict over wolf management in Washington state (discussed in detail in chapter 2 below), including immersion in the state's policy debates and processes, and extended discussion with stakeholders including state wildlife managers, federal land managers, livestock producer, conservation advocates, residents, and others.

I have focused especially on the ongoing, heated debate within Washington state over the practice of lethal removal of wolves. Though the actual number of wolves killed by the state

wildlife agency is relatively low, at least compared with other states in the American West, the practice of lethally removing wolves has sparked significant controversy and resistance on the part of environmental advocates, as seen in the OPT case. While wolves are routinely killed elsewhere in the country, wolf advocates frequently argue that "this is Washington, and we're different," calling for a firmly protective stance, in the face of what they see as atavistic anti-wolf sentiment. Meanwhile, some conservation groups and ranchers advocate a middle ground – what I describe as "killing for coexistence" – in which wolf killing becomes a pragmatic tool for maintaining socio-ecological relations within which wolves, livestock and people can all inhabit the same landscapes. The lethal removal debates highlight the significance of state policy, and thus geography, in wildlife management, where decisions about the life and death of wild animals can vary significantly across an imaginary line on the landscape. It's taken for granted by many who describe themselves as "environmentalists," especially in the urban parts of the state that often drive wolf policy, that killing fewer wolves would be an environmental good. However, a closer look at the lethal removal debate paints a much more complex picture of the actual role and effects of lethal removal of wolves, both on the wolf population itself and associated ecological dynamics, and as a social tool for managing public opinion and attitudes.

I frame the controversy over killing wolves in the context of broader tensions in contemporary American environmentalism. The much-debated diagnosis of the "Anthropocene," a time when human activities influence all ecological systems and relations, challenges the presumed norms of conservation as the protection of "wild" ecosystems and species, leading to calls for "post-Natural" conservation (Braverman, 2015; Lorimer, 2012). Many conservationists today struggle with questions familiar to nature-society geographers: what kinds of environments are desirable, which nonhuman lives are valued, and how are environmental interventions

justified in the absence of appeals to pristine "Nature"? The wolf, as a highly charismatic, socially and ecologically significant species that evokes strong affective responses and cultural references, is a prime case to examine such questions. Wolves embody tensions in the discourses of Anthropocene environmentalism, as an endangered species that is simultaneously a potentially dangerous predator and a prominent emblem of wildness.

I frame my examination of the wolf controversy in Washington as a case study in Anthropocene conservation, which amounts to active efforts to create desirable socio-ecological futures (including valued animal lives). I treat Washington's wolves as the product of the tangled social-ecological relations of conservation in practice, relations that produce wolves as both embodied, material beings, and as semiotic symbols at the center of fierce political conflict. In contrast to popular ideas about conserving "wild" wolves, I argue that the processes and practices of conservation amount to producing wolves, as well as the spaces where they live and the social identities of the people who coexist with them.

b. Significance to existing scholarship

i. From "human dimensions of wildlife conflict," to political dimensions of human-wolf-livestock coexistence

> "Wildlife management is comparatively easy; human management difficult." – Aldo Leopold (cited in Flader, 1994, p. 188)

While a great deal of research examines the challenges of wolf management from the perspective of the biological and ecological sciences (how to sustain a genetically diverse population, how recovering wolves interact with prey species and other wildlife, or how to reduce wolf-livestock conflict, among other questions), there is increasing recognition that wolf management challenges ultimately lie not so much in the ecological as the social sciences. Wolves provoke intense emotions and attitudes throughout their range, which extends across northern latitudes in North America, Europe and Asia. Often, the challenge of conservation is not necessarily how to manage wolves, but how to manage human responses to wolves in the context of intense sociopolitical polarization and conflict.

My research advances critical studies of wildlife conservation as a social practice by bringing together diverse perspectives from human-wildlife conflict studies, political ecology (PE), science and technology studies (STS), critical physical geography, and animal studies, among other fields. The wolf issue (across the American West and indeed the northern hemisphere) is often framed as a prime example of "human-wildlife conflict" (HWC). Indeed, the wolf is perhaps the most emblematic example of HWC, with human-wolf conflict going back centuries, and informing cultural stereotypes such as the "Big Bad Wolf," derived from European fairy tales and widespread in contemporary American cultural products (Lappalainen, 2019). HWC is the subject of an extensive literature across the social and natural sciences, and

an increasingly prominent concern for conservation around the world (Frank et al., 2019; Woodroffe et al., 2005), particularly in working landscapes where the habitats of wild species overlap with human populations and anthropogenic land uses. Predators have been a focus of the HWC literature due to the threats they pose to both human safety and domestic animals such as pets and livestock. While earlier work in HWC was focused on human needs, emphasizing reduction of wildlife impacts on human communities and economies, since at least the 1990s, HWC work on predators has increasingly aligned with conservation objectives to reduce negative impacts on predators themselves, recognized as a key priority for conservation. Human-wildlife conflicts are therefore increasingly conceptualized in more positive terms, adding an emphasis on "coexistence" in addition to conflict (HWCC) (Fascione et al., 2004; Frank et al., 2019; Madden, 2004; Treves & Santiago-Ávila, 2020).

Much social science on wolves in Washington draws on the HWC framework, using social science as a tool for managing divergent stakeholder attitudes and improving policy (Bennett et al., 2017). For instance, Dietsch et al. (2011) and Responsive Management (2019) have surveyed public opinion of state residents regarding wolves, with findings revealing sharp differences between rural and urban areas, and Madden (2015) has developed and implemented methods of "conservation conflict transformation" to defuse conflict between stakeholders. Such research seeks tools to mitigate conflict between humans and predators, often by shifting human attitudes to minimize human-wolf conflict. This tends to be pragmatic and solution-oriented, aimed at using social science as a tool to find a set of "best practices" for managing divergent stakeholder attitudes, thereby making better policy to reduce human-wolf conflict. As such, it takes for granted the implicit goals and normative stance of wolf conservation, seeking to help

state agencies "do conservation better." (Indeed, much of the above research was supported, if not directly conducted, by WDFW).

As critics of the "human-wildlife conflict" paradigm have pointed out, however, most such conflicts are more accurately described as "human-human" conflicts in which wolves are discursively constructed and deployed, and both the state and scientific institutions participate in the social, ecological, and political-economic processes that produce the conflict: they are not unbiased, external observers but participants in the politics of environmental management. Stakeholder attitudes toward wildlife are therefore not the preexisting ground on which conflict is built but are co-constructed in and through conflict. Drawing on critical perspectives from PE and STS, I frame environmental politics not as the struggle over a preexisting, external nature, but as the inherently-political processes of knowing nature through science, representing nature in discourse, and reproducing nature through environmental management (Goldman et al., 2011). I examine human attitudes toward wolves not as pre-formed and stable, but as part and parcel of the discursive production of knowledge about wolves as a contested political terrain (Robbins, 2006; von Essen, 2017). In contrast to much work in HWC, this is a critical social science "on conservation" rather than "for conservation," per se (Sandbrook et al., 2013).

ii. Wolves as "animals of the Anthropocene"

The discursive production of wolf knowledges matters because it directly shapes the lives and behaviors of wolves. Drawing on a Foucauldian theoretical framework, I treat the construction of cultural (and scientific) norms as fields of knowledge-power that determine which populations and circulations of nonhuman life are fostered while others are killed or allowed to die (Biermann & Anderson, 2017; Biermann & Mansfield, 2014). The biopolitical practices of wolf conservation include state-implemented killing (often euphemized as "lethal

removal") of "problem wolves" habituated to preying on livestock, as well as routinely "hazing" wolves to frighten them away – practices explicitly aimed at eliminating wolves that have lost their fear of people, and conditioning "normal" predation behavior in surviving wolves (Rinfret, 2009). Conservation works to produce desirable wolf bodies and behaviors, even as popular discourses about conservation emphasize increasing the population of "wild" wolves.

These critical perspectives frame wolves not as part of pristine, capital-N "Nature" (as in most public discourse about wolves), nor even as "wild" animals that are sometimes in conflict with people as part of a hybrid socio-ecological system (as in "human dimensions" of wildlife social science), but as a form of "socio-nature," produced by and in relation with human societies (Castree & Braun, 2001; Swyngedouw, 2004). Critical multispecies geographers, drawing on science studies and relational theory, have described animals as the product of tangled human and nonhuman relations "spun between people and animals, plants and soils, documents and devices in heterogeneous social networks" (Whatmore & Thorne, 1998) that "give shape or form for a moment" (Law and Lien 2013) to particular embodied forms (see also Haraway, 2008; Helmreich, 2009; Whatmore, 1999). As such, wild animals are both embodied, material, living beings and also discursively constructed, culturally significant symbols: wolves "come to exist through the variety of practices of defining and knowing them," practices including wildlife science and conservation management (Peltola & Heikkilä, 2018, p.207; see also Rutherford, 2018).

As discussed further below, I frame wolf management as a form of "conservation biopolitics," a growing analytic framework that pays attention to cultural and scientific norms that determine which populations and circulations of nonhuman life are fostered or "made to live" while others are killed or allowed to die. Understanding conservation as the co-production

(Jasanoff, 2004) of embodied animals, scientific knowledges, and human social structures calls into question many of the normative, value-laden, biopolitical objectives of conservation: "what populations should be conserved in a world consisting of entangled lives rather than clear-cut categories?" (Peltola & Heikkilä, 2018, p. 211)

While critical, multispecies scholarly approaches to conservation are rapidly advancing, much work to date focuses on species that are more obviously what Rutherford (2018) describes as "the Anthropocene's animals" (p.6). Analyses of material-semiotic co-productions of nature and society have been applied to domesticated animals (dogs in Haraway, 2008; livestock in Holloway et al., 2009) and of feral, hybrid or semi-domestic animals (coyote-wolf hybrids in Rutherford, 2018; elephants in Lorimer, 2010; salmon in Law & Lien, 2013), but less attention has been paid to how even emblematically "wild" animals such as wolves are also entangled in relations of co-becoming with humans (but, see Lorimer, 2017; Peltola & Heikkilä, 2018).

In the case of Washington's wolves, for example, the socio-natural entanglements of conservation take the form of wolf "hazing," in which ranchers fire guns in the direction of wolves, aiming to frighten them away from livestock rather than kill them – a standard management practice that is explicitly aimed at conditioning the wolves to behave in ways considered acceptable by humans. Hazing (along with culling of "problem wolves") acts as a disciplinary tool to produce particular, desirable wolf bodies and behaviors, even as popular discourses about conservation emphasize the goal of increasing the population of "wild" wolves (Rinfret, 2009).

Humans are also made through this process, as conservation biopower works to construct norms of behavior and (re)produce human environmental subjectivities (Agrawal, 2005; Fletcher, 2010; Srinivasan, 2017). In the context of shifting cultural values about wolves, "lethal

removal" also works to reassure many people that wolves remain killable, thereby producing "social acceptance" or "tolerance" of the return of (well-behaved) wolves, as I will discuss in detail in chapter 5 below. In this way, environmental governance is enacted through the reproduction of competing narratives about human-wildlife relations, differently emphasizing biosecurity via eradication of threat and/or the value of biodiversity as source of ecological health and resilience (Buller, 2008; Lorimer, 2017). In short, conservation is just as much about reproducing human values as it is about reproducing animals.

iii. The political, economic, and cultural context for wildlife conservation

To frame this work, I draw on the interdisciplinary approach of political ecology (PE), which broadly examines how ecological conditions are intertwined with power relations (Forsyth, 2003; Guthman, 2011; Robbins, 2011). Foundational work in PE from the 1970s and 1980s framed environmental degradation (largely focused on issues in the so-called "developing" world) in the context of global political economy rather than as an isolated, technical policy problem, and offered a predominantly Marxian critique of the role played by "the forces of capitalism… and their impacts on local people and environments" (Forsyth, 2003, p. 8; see also Blaikie, 1985; Blaikie & Brookfield, 1987; Cockburn & Hecht, 1990; Watts, 1983). More recently, this approach has also been turned back toward the "developed" world, including the United States. So-called "first world political ecology," since the early 2000s, has applied PE-style analysis to rural issues of access to resources, land rights, markets, and identity formation, with a particular emphasis on the rural American West (McCarthy, 2002). This has been recently renewed and "revitalized" by a new generation of scholarship (Martin et al., 2019), which argues that the West remains "typified by tensions over land and resources, identity and

belonging, autonomy and authority" appropriate for political-ecological analysis.[2] Martin et al. argue explicitly for the value of this approach to the wolf conflict specifically:

> Tensions between rewilding and heritage landscapes - questions of who and what belongs, and related narratives of identity and place - rest on dubious claims of prior occupation, appropriate baselines, and unresolved debates over land use and environmental impacts in the region (cf. Soulé and Noss, 1998; Drenthen, 2018). Although the wolf question is often conceptualized as part of a contested transition from "Old" to New West" (Nie, 2003; Clark et al., 2005), this fails to account for patterns and persistence of conflict in the more than two decades since reintroduction. Political ecology's strength in challenging problematic narratives and disentangling complex histories can help lay the groundwork for alternative conceptualizations of belonging and socioecological futures (Huntsinger, 2016). (Martin et al., 2019, p. 228)

This approach provides a framework for my research, examining the practices of wolf conservation not merely as a scientific or technical challenge, but as part and parcel of broader social and political struggles over land use and environmental values: "environmental conservation [is] intrinsically interwoven with questions of power and political authority" (Nygren & Rikoon, 2008). As Wilson (1997) argued, wolves are "symbols delineating the battle

[2] This so-called "first world political ecology" analysis offers a unique and at times surprising perspective on wolf conservation in the United States. Political ecologists have often examined rural landscapes around the world in which land users feel marginalized by urban interests and powers-that-be. In such contexts, PE frequently critiques government intervention based on narrow conservationist objectives, such as those aimed at protecting wildlife or wild spaces, especially when such interventions are informed by scientific knowledges produced outside the rural communities in question and are likely to lead to shifts in established local economic structures or to impact historical-cultural lifeways. If the human-wildlife conflict scenario described in the pages here were playing out in the Global South, political ecologists might reasonably be expected to have significant sympathy for the rural residents resisting conservationist interventions. Yet things appear somewhat differently when the residents in question are white settlers in colonial society, nonetheless appealing to their historical social and economic use of the landscape and drawing on (contested) scientific arguments to justify particular policies and systems.

lines of a much larger conflict… [between parties] struggling to impose their own preferences for land use in the American West."

Attentiveness to the significance of such *symbolic* meanings in environmental struggle is found especially in the "poststructuralist turn" within PE, which complements the critical framework of political economy with analysis of the cultural production of environmental discourses as an important form of power relations and a significant driver for environmental changes (Escobar, 1999; Forsyth, 2003; Peet & Watts, 1996). This work marks an addition to political ecology's original emphasis on the political-economic structures that drive environmental changes, emphasizing alongside these the role of social constructions, values, and norms that are co-shaped by and with ideas about nature. Political ecology of the post-structuralist vein pays close attention to the cultural politics of nature, recognizing that environments are socio-political constructions that are co-constituted by and with the identity of their residents. As Fox et al. (2016) argue, we "need to take seriously how aesthetics, sense of place, history and environmental knowledge come together to influence perceptions of and attachment to the sorts of highly humanized landscapes that characterize the Anthropocene" (p. 102). I examine the political work that is done by narratives about the environment in the context of wolf debates – including those posed by environmentalists, landowners, stakeholders, scientists, and policy-makers – arguing that human ways of relating to and understanding the environment are never essential or "natural," but instead forged through ongoing political, cultural and material practices that bind together nature and human identity (Braun, 2002; Kosek, 2006; Lave, 2012; Mansfield et al., 2015).

Ursula Heise (2016) brings this humanistic attention to the power of cultural values and narratives to bear specifically on the discourses and phenomena of wildlife and biodiversity

conservation in the time of extinction. Asking readers to examine "why do we care?" about endangered species, she argues that "engagements with [nonhuman, perhaps especially endangered] species gain sociocultural traction to the extent that they become part of the stories that human communities tell about themselves... biodiversity, endangered species, and extinction are primarily cultural issues, questions of what we value and what stories we tell, and only secondarily issues of science." This humanistic approach to biodiversity conservation, emphasizing the significance of sociocultural storytelling about wild forms of life, is particularly relevant for wolves, which have rich and complex symbolic and metaphorical roles in American society.

iv. Toward a "critical wildlife geography"

In the transdisciplinary and "undisciplined" spirit of critical geography, I aim to integrate this critical, humanistic attention to the power of narrative and discourse in wolf politics with theoretical and methodological approaches used to examine wildlife conservation and conflict management in the natural sciences, such as wildlife ecology. I aim to develop a practice of "critical wildlife geography" that integrates insights from critical (both human and physical) geography as well as STS, wildlife ecology, human dimensions of wildlife management, and related fields. I respond to calls for critical approaches to the biophysical dimensions of conservation geographies, such as Kenneth Young's (2014) call for a more critical practice of biogeography for the Anthropocene, arguing that the "prevalence of human influences on the biosphere requires rethinking the scope and goals of biogeography." For Christian Kull, who examines and critiques the social construction of ecological categories of "native" and "invasive" species (described as a project of "critical invasion science"), the modifier of "critical" refers to the breaking down of the human-nature distinction, recognizing the physical sciences as

intertwined with human activities and power relations (Kull, 2018). Jamie Lorimer and Timothy Hodgetts (2017) have likewise sought to map out “alternative approaches” to the geographies of more-than-human life, drawing from theoretical traditions including animal studies, STS, and Foucauldian biopolitics, among others, and to reconsider these as also being a form of biogeography.

What Lorimer and Hodgetts describe as attempts to “mobilize new conceptual and methodological resources” from critical human geography to bear on biogeography has significant overlap with the field of “multispecies political ecology” described by Jared Margulies and Krithi Karanth (2018; see also De Silva & Srinivasan, 2019; Sundberg, 2011), but it also resonates with the growing body of work in “critical physical geography,” or CPG (Lave et al., 2014, 2018), which calls to develop practices of physical geography that pay “reflexive attention to knowledge production and consideration of the social inequalities and power relations that are implicitly bound up with what we study” (Lave et al., 2018, pp. 6–7). This call to practice critical science focuses the attention (not only of physical geographers, but also natural and social scientists more generally) on anthropogenic landscapes and ecosystems, and processes by which even so-called “natural” landscapes are co-produced by and through human interventions and processes of scientific knowledge production. Such approaches “investigate material landscapes, social dynamics, and knowledge politics together, as they co-constitute each other” (Lave et al., 2014, p. 3).

As political ecologists have argued, social conflict over whether wolves belong on National Forest landscapes hinges on "always partial, always political claims to (and productions of) space" (Martin et al., 2019): National Forests are discursively constructed by many as “wild” spaces (i.e. for wildlife), but also for multiple human uses that include livestock grazing, hunting,

and recreation. The common framing of the wolf issue primarily in terms of "human-wildlife conflict" (HWC) disregards the significance of human-human conflict over land use, entangled with political, economic, and cultural processes and differences. Washington's wolf controversy is not just about wolves but about human relations, not only with one another but also with land, animals, and resources (Martin et al., 2019). I argue that conflict over wolves represents competing underlying social values regarding wolves that inform very different management actions. A critical, multispecies approach must examine how conflict over wildlife reflects "deep-seated questions about identity, belonging, and access to resources" (Hennessy, 2019, p. 14).

Drawing on approaches to human-animal relations across physical and human geography, and beyond (for example, animal geography, political ecology, wildlife ecology, and human dimensions of wildlife management research), I aim to develop a practice of critical wildlife geography for the conservation of the Anthropocene's animals. I treat wolf-livestock conflict as a fundamentally geographical challenge that raises questions of both biogeography (how wild animals use space) and human geography (how people delineate and use space, including for other, domesticated animals such as livestock). I treat animal mobility and territoriality as socio-ecological questions: animals' use of space is deeply shaped by their interactions with humans. I therefore aim to better understand the challenges of defusing conflict over wildlife by integrating theoretical insights and methods from both social and ecological sciences. Critical wildlife geography integrates social and biophysical approaches toward a transdisciplinary analysis of ecological processes and management. This work thus aims to integrate critical social science analysis with ecological theory and scientific practice, which is essential for understanding the complex challenges of managing wildlife in the Anthropocene.

v. The biopolitics of conservation

> "Conservation science is… the science of both make live and let die" (Biermann and Mansfield 2014, p.270)

I frame the practices of wolf conservation as biopolitical, drawing on Michel Foucault's concept of biopower as applied to nonhuman lives. Foucault famously described how the sovereign state's power "to take life or let live was replaced by a power to foster life or disallow it to the point of death," bringing the reproduction of life itself "into the realm of explicit calculations and [making] knowledge-power an agent of the transformation of human life" (Foucault, 1990, pp. 138–143). Though Foucault's interest was notably centered on human life, many scholars have examined the role of "biopower that extends beyond the human" (Collard, 2012, p. 29). As Irus Braverman writes, the practices of biodiversity conservation are premised on a "foundational goal of affirmatively saving life," making them emblematic of the imperative to care for and improve, not merely discipline and dominate, nonhuman lives and life-making processes (Braverman, 2015, p. 227). A growing body of literature in critical geography and animal studies treats wildlife management as a biopolitical endeavor that amounts to fostering or "making live" desirable animal populations, and killing and/or "letting die" those that threaten them (Biermann & Mansfield, 2014; Chrulew & Wadiwel, 2016; Srinivasan, 2017; Stokland, 2020). Conservation requires the management of circulations and reproductions of animal life, via intertwined practices of harm and care that often include killing some animals to make others live (Srinivasan, 2014). Animals are differentially valued – and therefore protected, disregarded, or "made killable" (Butler, 2006; Connors & Gianotti, 2021; Haraway, 2008) – based on hierarchies of human value and threat, which are often predicated on the concept of biodiversity as a collection of pure, distinct types to be protected (Biermann & Mansfield, 2014). Such

hierarchies are neither inherent nor static, but continually and dynamically reproduced through processes of social contestation.

This management of circulations of desirable and undesirable life is fundamentally geographic, as it is often accomplished through the production of spaces in which (particular kinds of) nonhuman life are understood to belong, or not. Nonhuman belonging is socially produced through the co-constitution of the animal and the space in which it exists. "Interspecies relationships produce space," writes Rosemary Collard: "spaces are produced within dynamic, heterogenous and often precarious assemblages of entities that are not all human" (Collard, 2012, p. 25). The practices of wildlife conservation – and specifically wolf-livestock conflict deterrence – amount to spatial-biopolitical practices aimed at securing space for forms of life deemed desirable: they are "selective interventions by humans into animals' mobilities to make certain animals live and to let other animals die" that are aimed "to govern the reproduction and circulation of aggregations of animals' bodies" (Hodgetts & Lorimer, 2018; see also Buller, 2008; Collard, 2012). Hakon Stokland, emphasizing the biopolitical practices of "making live," argues that wolf conservation (in Norway specifically) amounts to "conserving wolves by transforming them" through the management of reproduction via conservation breeding practices and the production of "wolf-zones" (Stokland, 2020).

Building on that argument in the North American context, I aim to emphasize that "transformation" occurs not only at the population level, in terms of which wolves reproduce and where, but also on the individual level, through practices of disciplinary power aimed at affecting wolf behavior. The spatial and biopolitical practices of conservation have significant effects directly on the animals at an individual level. Sara Rinfret (2009), also drawing on a Foucauldian framework but emphasizing the role of disciplinary power, examines how wild animals are

actively disciplined by conservation practices: certain behaviors are rewarded, and others punished through deterrent techniques or even by death, leading to adaptive responses in behavior. Animal behavior, too, is the product of multi-species relations. This argument is further advanced by Lewis Holloway, whose work on cows and automated milking machines pays attention to the "making of animal subjects" as a relational, multispecies process: there is "no essential bovine nature, but contingent and fluid bovine subjectivities emerge in particular situations" (Holloway, 2007). This non-essentialist view challenges the assumption that animal behavior is a question of acting "innately," considering animals not as bundles of pre-programmed instincts, but instead as the emergent, conditional product of interspecies, environmental, and technological relations. While this perspective is perhaps most obviously true of domesticated species like cows, so-called "wild" animals like wolves are likewise subjected to intervention by human and technological relations.

vi. Necropolitical conservation

Importantly, efforts to foster the wolf population (and more broadly, the "making live" of other animal objects of conservation value) remain deeply bound up with killing. The imperative to care for and improve life is still entangled with efforts to discipline, dominate, and even kill. Arguing that therefore "biopolitics falls short of helping theorize how and why regimes of governmentality maintain the geographical conditions for encounter between human and non-human populations that are not mutually supportive or reliant, but ambivalent or antagonistic," Jared Margulies (2019) and others have turned to the concept of "necropolitics," drawing on the

work of Achille Mbembe, to examine "the more deathly side" of conservation.[3] Whereas Foucault's attention to killing emphasizes the right to kill within the legal framework of state power, Mbembe offers attention to the ability of the state to kill regardless of right, specifically in a colonial setting, thereby inducing control over the population via terror (Mbembe, 2019). In contrast to the logic (and mythos) of the modern sovereign state, in which politics is allegedly conducted through the nonviolent exercise of reason between self-determined subjects, Mbembe argues that the project of killing is not an exception to but in fact constitutive of the modern liberal political order. The state-sanctioned killing of certain lives, particularly those that are external to the state as it colonizes those bodies and their lands, takes place outside of the state's legal system, but is nonetheless fundamental to the construction of modern state power. For Mbembe, the killing of racialized others in the colonies occurs precisely to shore up nationalist identity and is inherent to the formation and stabilization of state power.

Extending Mbembe's framework to engage with political animal geography, Jared Margulies frames the production of the "man-eating tiger" as necropolitical conservation. Challenging the common framing of human-tiger interactions as an instance of "human-wildlife conflict," Margulies argues that this apolitical framework ignores the role of human political-economic forces – the historical forces of colonial capitalism, and present day (colonial-capitalist) conservation – in producing spaces where deadly encounters with tigers are likely to occur. In this sense, Margulies argues, not all human-wildlife conflict (nor even all instances of killing wild animals to reduce such conflict) should be understood as necropolitical. In his view,

[3] Of course, attention to death and killing is also central to the biopolitical framework. As Matthew Chrulew puts it. "The biopolitics of endangered species preservation [is] a form of power/knowledge devoted to making animals live, but nonetheless perilously bound up in the production of impairment and death" (2011, p. 141). Foucault (whose work certainly recognized the continued prevalence of state killing under what he called biopolitical regimes of power aimed at "making live") turns here to the concept of racism, albeit ambiguously defined, to describe the processes of differentiation between populations that justify making live and letting die.

what makes conservation necropolitical is "evidence of calculation in (re)producing deathly spaces, where certain people are more systematically assured of exposure to greater risk of bodily harm and death compared to populations the state actively attempts to secure and maintain" (Margulies, 2019, p. 152).

This framework, while engaging at one level with what might be called "necropower beyond the human," nonetheless retains the category of the human ("certain people") as the stake upon which harm and death is measured: some humans, and not others, are made killable through their exposure to deathly spaces of predator conservation. In contrast to the case of tigers (and despite widespread misinformation to the contrary), deathly wolf attacks on humans are exceedingly rare: people are not significantly made killable by wolves through state management (though they are differently exposed to wolf risk, which largely takes the form of livestock losses). However, deathly wolf-livestock encounters (depredations) occur with some frequency, and when they accumulate, are likely to result in a different kind of deathly human-wolf encounter: lethal removal of the wolf.

I argue that the framework of necropolitics is useful not only for examining the production of spaces that are deathly for humans, and the logics of differentiation between human populations that underlie that production, but also for examining how wolves themselves are "made killable" as objects of conservationist control. Here, I seek to pay attention to how logics of differentiation (that Foucault describes simply as "racism") extend to the production of nonhuman difference. The necropolitical framing draws attention to the "conjoined logics of race and species" (Kim, 2015) that mark difference between and among humans *and* nonhumans, and work to make certain bodies valuable and worthy of "making live" precisely through the negation of devalued, killable others (human and nonhuman).

In this way, while I agree with Margulies that attention to the deathly encounters and spaces of conservation is necessary, I see the value of framing wildlife conservation as necropolitical in emphasizing not just death itself, but the active use of death (killing; "evidence of calculation in reproducing deathly spaces") to produce fear in the *animal* population. Necropolitical governance is control through the fear of differential exposure to death. In fact, the frequent juxtaposition of "biopolitics" (emphasizing "life") with "necropolitics" (emphasizing "death") as opposing concepts is, to some extent, the product of translation: the original title of Mbembe's book is "La Politique de l'inimitié" – more literally translated as the politics of enmity, hostility, or hatred. My interpretation of the "necropolitical" nature of conservation emphasizes how nonhuman difference amounts to the production of enmity, even hatred, and *fear*, rooted in differences that span human and nonhuman boundaries.

vii. The bio- and necro-politics of wolf "coexistence"

The return of wolves to Washington is emblematic of a biopolitical shift from predator extermination to wildlife conservation in American society – from killing wolves to making them live. Until the early 20th century, wolves were methodically exterminated in North America according to a prevailing settler mentality that framed them as the 'big bad wolf" - threatening, bloodthirsty, even Satanic. As Stephanie Rutherford writes, state-sponsored killing of wolves via the bounty system "served as a technology of colonization, one tentacle in an all-out assault that replaced a complex web of Indigenous nationhoods, lifeways, knowledges, and practices with European ones" (2018, p. 4). In this way, the historical project of eradicating wolves in North America is closely linked to the removal of Indigenous people – the settler-colonial process of manifest destiny, the so-called "taming of the wilderness," making the land safe for settlers and their livestock, was used to justify the "elimination of the native" (Wolfe, 2006) which includes

both genocide and displacement of Indigenous people, and also the elimination of native ecologies and animal species on which they depended. Eradication of a suite of existing species and socio-ecological relations to clear the way for settler ecologies and economies is the necropolitical colonial project; killing one population to make another live. The anti-wolf sentiment that characterized the era of extirpation represents an imperialist necropolitical mode of state control over animal life, under which predators such as wolves were perceived as threats to be eliminated due to the imperative to improve human life and wellbeing.

Today's predominant cultural discourses frame wolves quite differently. Beginning with the ecological movement in the 1940s, and continuing through endangered species listing in the 1970s, to reintroduction in the 1990s, to contemporary rewilding efforts, American society has seen an increasing cultural reinterpretation of wolves as noble and heroic (Coleman, 2006). Once recognized as an endangered form of biodiversity, wolves became a charismatic emblem of conservation efforts. Moreover, advocates today see wolves as a native keystone species and apex predator, and herald their return as large-scale ecological restoration, setting off trophic cascades that work to increase complexity and diversity in the ecosystems they return to (Ripple & Beschta, 2004, 2012; but compare Mech, 2012; Marris, 2017). This 20th-century shift to making wolves live can be described as part of a more "probiotic" mode of socio-environmental governance that seeks to promote biodiversity and embrace wildness on scales ranging from the microbial to the continental (Lorimer 2017). At the same time, critics continue to frame wolves as a dangerous, even bloodthirsty predator that threatens rural lives and livelihoods, especially cattle ranching. The mentality of extermination clearly lives on, as evidenced by recent killing of 200 wolves in Wisconsin in less than 3 days after the Trump administration lifted ESA protections, and the collection of anti-predator legislation proposals in Montana and Idaho that

one commentator recently described as a "relapse back into the dark ages of wildlife and nature exploitation" (Servheen, 2021).

In Washington, these competing discourses and values about wolves overlap with and reinforce patterns of social-political difference in a state characterized by a strong divide between rural, agrarian regions east of the Cascade mountains and urban centers on the west coast (where wolves have not yet returned). Among rural eastern Washington's livestock producers, anti-wolf sentiment is often fueled by fears of the loss of their way of life. In interviews, livestock producers argue that the return of wolves poses a threat to their livelihoods, making it difficult or impossible to sustain ranching economically. Because wolves have not been present on this landscape in living memory, their return is viewed by many residents with suspicion – at best, as an economic burden for livestock producers, and at worst, a massive conspiracy by government and environmentalists to eliminate public lands grazing, effectively pushing ranchers off the land. Wolf advocates argue that wolves kill only a small number of cattle and point out that state compensates ranchers for those losses. Many ranchers counter that the proven wolf depredations are a fraction of the total effect, since cattle are lost that cannot be confirmed as wolf kills, as well as arguing that the stress caused by predators leads to less weight gain by cows, fewer pregnancies, reduced birth rates, and other effects that hurt their business. While the state has attempted to take such considerations into account in their compensation plan, many livestock producers argue that the process of applying for compensation is too bureaucratic and slow to be worth their time. Some others refuse on principle to accept payments from the state, either out of a broader antipathy toward government overreach, or because to do so would imply endorsement of the very idea of coexistence with wolves. While such social dynamics, divided along sociopolitical and urban/rural fault lines, are typical of conflict over

wolves on recolonized landscapes across the U.S. West (Mech, 2017; Wilson, 1997), many local residents describe northeastern Washington as a particular "hotspot" of social conflict.

The bio/necropolitical framework for examining conservation reveals how the discourses of wolf belong/nonbelonging work to construct the difference between life that does and does not deserve to live, making wolves killable in the eyes of some while highly valued for others. The extreme political positions on the wolf issue in the U.S West - arguments for ending all public lands grazing, on the one hand, or killing off all the wolves, on the other – enact necropolitical attempts at the purification of space, either for wildlife or for livestock. Between those extremes, the much touted if somewhat vaguely defined concept of "coexistence" offers an optimistic vision of having livestock and wolves on the same landscape while minimizing impacts on one another. The precarious balance of coexistence is sought though interventions to reduce interactions, especially depredations by wolves on livestock. This includes lethal removal (killing) of so-called "problem wolves" that prey on livestock. It also increasingly emphasizes, with growing public resistance to lethal removal, efforts to employ nonlethal deterrents to scare wolves away, in some cases with the hope of conditioning wolf behavior to prevent depredations. Far from the dream of a "rewilded" north America, with wolves roaming freely and unleashing ecological processes far beyond human control, the model of "coexistence" between wolves and people (or more precisely, between wolves and livestock) in practice today is very much about continued control over animals. Both lethal and nonlethal techniques are used as ongoing tools to make wolves behave in desirable ways, under the careful control of human managers.

c. Research objectives and the structure of this dissertation

This dissertation research is a critical examination of the social norms, discourses, and processes that inform human intervention to manage wolves as they recolonize territory, moving

into landscapes where they are brought into new, violent relations with human societies. Framing wolves as co-constituted with human social processes – as "animals of the Anthropocene" – allows for analysis of how conservation not only protects wolves, but *produces* them, in tandem with implicit norms of environmental governance. I investigate how wolves and wolf ecosystems are socially constructed as potent cultural and semiotic symbols, and how these social constructions work, through the practices of wolf management, to (re)produce wolves as embodied, material beings. I ask: what are the environmental discourses constructed around wolf conservation in Washington? How do scientists, policymakers, and members of the public differently understand what wolves are and what it means to conserve them? How do these discursive formations and management practices differently draw on and reproduce scientific knowledge, and how is that knowledge itself reproduced by/with cultural politics? Finally, how are wolves themselves actively being shaped by conservation management?

In this introduction, I have endeavored to explain and summarize key concepts and literatures that inform my theoretical approach, as well as to provide a brief overview of the linked social and ecological challenges of wolf management in Washington state. In Chapter 2, I turn to my research methodology, explaining and summarizing the field work conducted and data collected. In Chapter 3, I provide an overview of the empirical context of my case study, including both the "bigger picture" of Washington state management and policy, and a more focused case study of how wolf-related conflict has played out in the northeastern corner of the state, on and around the Colville National Forest. Chapter 4 builds on that case study by examining the role, and perceived (social and ecological) effectiveness, of the various tools and techniques used on the Colville for mitigating wolf-livestock conflict, as a contribution to the literature on the social dimensions of human-wildlife conflict management. Chapter 5

(previously published, in modified form, in *Elementa: Science of the Anthropocene;* Anderson, 2021) focuses specifically on the intervention of lethal removal as a tool for building social tolerance for wolves, with an empirical focus on debates over this practice in the state's Wolf Advisory Group, and engaging with theory from critical geography, on conservation biopolitics/environmentality and commoning. Chapter 6 (at the time of this writing, under revision for anticipated publication in *The Canadian Geographer)* builds on this effort by examining the parallel impacts of lethal removal practices on the wolves themselves, as a contribution to the nascent field I describe as "critical wildlife geography). Drawing on the concept of the "ecology of fear," from wildlife ecology, I frame efforts to manage wolf behavior as the "socio-ecology of fear." Chapter 7 draws together insights from throughout the work, engaging once more with the critical geographical literature to frame efforts to conserve wild life as practices of care, control, and discipline. In conclusion, chapter 8 circles back to the broad questions raised in this introduction regarding the meaning and significance of conservation in the Anthropocene, developing the theoretical implications (and provocations) of the premise that wolves are "animals of the Anthropocene."

2. Methodology

a. Purpose and scope

This dissertation is the product of a multi-year, qualitative, ethnographic study of the political conflict and controversy over wolf conservation and management in Washington state. As a study of the social and political processes at work in a complex conflict that encompasses a vast network of (human and nonhuman) actors, institutions, and processes, my research did not entail immersion at a single field site, but instead took me across the state to observe and speak with a wide range of participants. My field work brought me to diverse sites and meetings with diverse people across the region: from a film screening, complete with complimentary microbrew cider amidst the 30%-off sale racks in downtown Seattle's Patagonia retail shop, to a hours-long drive in an overheated Toyota in rural northeastern Washington, with barely enough clearance for the exposed rocks on the rugged, rutted-out Forest Service road. In the latter case, steering around scattered cows that refused to get out of the way, I discussed wolf management goals and challenges with a long-time local conservation advocate, as we went in search of the locations where several calves were killed in the controversial OPT depredations that preceded the lethal removals of 2019. On other occasions, I frequently sat among the observers in the "back row" of non-participants at regular Wolf Advisory committee meetings, and then moved to the virtual "back row" when those meetings moved online due to the COVID19 pandemic. Other examples of my ethnographic field work included attending a rural county's Cattlemen's Association meeting (in the middle of the pandemic, with not a face-covering in sight), and interviewing cattlemen in their barns, wildlife managers in the front seat of their pickup trucks, and conservation advocates while hiking trails through the National Forest, not to mention many more interviews conducted via the black box of the Zoom screen.

I elected to use these in-depth qualitative, ethnographic methods because of the complex social dynamics involved in wolf management. I sought to understand not only the "what" and "how" of wolf management (for example, what techniques are used to reduce conflict between wolves and livestock? How do stakeholders perceive the effectiveness of state policy for reducing conflict?) but also the complex "whys" behind social conflict (for example, why do some stakeholders see wolves as a valued species deserving protection, while others see them as a dangerous threat?). In this way, my research examines the social and political debate over wolves' return to Washington as reflective of deep-seated sociocultural differences in how humans relate to wild animals. I thus sought to explore the social and cultural processes by which different representations of wolves are produced (for example, as dangerous predators, or as noble wild animals), and to examine the interactions between scientific and popular imaginaries of what wolves are, how they behave, and what conservation means in practice. Because this research examines discursive representations of nature and environment that are complex, heterogenous, and always evolving as they are reproduced, I selected qualitative, humanistic research methods including textual analysis, participant observation, and in-depth qualitative interviews, rather than more positivist methods such as surveys often used in research into the human dimensions of wildlife management.

Ethnography, which has been described as "the most human of methods" (Yanow, 2017), is a research method long associated with the discipline of anthropology (e.g. Geertz, 1973), but also widely used in environmental geography and political ecology. As Timothy Pachirat (2017) argues, ethnographers make deliberate choices about how to go about asking and answering questions about complex human social worlds. In contrast to a positivist, hypothetico-deductive model of social science, in which the scientist formulates a hypothesis about how the world

works and sets out a technique or tool with which to measure and test that hypothesis, an ethnographer begins with the expectation that there is a great deal about how the world works that we cannot pre-conceptualize or know how to measure. We come to our research questions with humility about the gaps in our own knowledge of the social world's complexity. In the highly immersive, participatory approach of ethnography, the researcher becomes an active instrument of the research, fully prepared to be surprised by the answers to our preliminary questions, and to re-formulate and re-ask them (again, and again) in response. Anna Tsing describes this focus on *"*the ethnographer's surprises rather than on a pre-formulated research plan" (2005, p. x), in which research questions and emphases evolve along the way, following the messy, contingent, and fluid social practices being examined.

For Tsing, this approach centers the lived experience and knowledges of the communities being researched, rather than the theoretical presuppositions or ideas of the researcher: "the point of ethnography is to learn how to think about a situation *together with one's informants*; research categories develop with the research, not before it" (2015, p. ix, emphasis added). This collaborative approach to advancing theory and producing knowledge hand-in-hand with ones' informants stands in contrast to the conventional scientific separation between the objective researcher, on the one hand, and research subjects as sources of "data" to be analyzed. Critics might contend that such an approach may lead to findings that are partial or unique to local circumstances, and not broadly generalizable, but Tsing argues convincingly that the development of "patchwork and haphazard" findings is not so much a weakness of the ethnographic method as a recognition of the limitations of any method, including more "scientific" methods, for understanding complex social relations and dynamics that are themselves both "patchy" and globally-interconnected in nature (Tsing, 2005; Law, 2004; West,

2006). Similarly, St. Martin and Pavlovskaya (2016) argue that ethnographic methods "provide unique insight into human 'lifeworlds', how people actually experience and relate to places and environments" (p. 372). Through in-depth, semi-structured interviews that allow informants' own perspectives to emerge, along with direct observation of social interactions and processes at work, my ethnographic methods allow me to tell nuanced stories that tie together and make sense of the complex human dynamics at work in wolf conservation and management.

Jeff Martin makes a compelling case for the use of in-depth, qualitative methods for the study of wolf conflict in the American West specifically, arguing that such methods allow for "attentiveness to context and historical change, greater methodological flexibility, and [the] ability to reveal unanticipated factors and questions," (2021a, p. 3) in contrast to a quantitative research approach, which "can answer only the questions it chooses to pose" (Sayre, 2004, p. 671). A qualitative approach is highly useful in the context of dynamics that "require subjective interpretation amidst complex and difficult-to-understand patterns of causality" (Sterling et al., 2017, p. 168; cited in Martin, 2021a). The return of wolves to Washington is an emblematic case of an environmental issue that is "messy, complex, and heavily contested" and thus has "potentially important insights to be gained by characterizing the perspectives of various actors with a stake" in how it is addressed; in this way, wolf conservation is an ideal case for the application of ethnographic methods and critical analysis of the production of environmental discourse (Kanazawa, 2017, p. 244). I build on the previous work of Nie (2003), Martin (2021a, 2021b), and others to frame the wolf issue in terms of the political ecology of land use and ecological change in the American West, while developing a particular emphasis on how the politics of environmental management are shaped and driven by the *cultural* dimensions of the

conflict: the socio-discursive production of wolves as the objects of conservation and management.

With its ability to delve deeply into human social perceptions, discourses, and imaginaries, ethnography is thus an ideal approach for examining how power dynamics are produced discursively, through the production of particular environmental values and subjects. As St. Martin and Pavlovskaya elaborate, ethnographic research is suited to pay attention to the power of knowledge, and the production of environmental discourse as a "maker of the world" with real, material effects. It thus "opens the door to the micropolitics of environmental knowledge production, management and resource use… ethnography is central to a movement beyond the analyses of environmental discourse *per se* to an understanding of environmental governmentality, an understanding of the people, mechanisms, dynamics and power relations produced through and within particular environmental regimes" (2016, p.375). My research explores how environmental governmentality plays out in the production of discourse about wolf conservation and management. The production of social norms and values regarding wolves takes place across interrelated discursive arenas that include the realm of public opinion, the production of scientific knowledge about wolves, and the making of official state policies. While the first of these has frequently been studied as "stakeholder attitudes" toward wolves, the latter two are also essential to the construction and politicization of wolves: science and policy are not external to, but embedded within, the politics of wolf conservation. It is impossible to pull these discursive arenas completely apart, since they are always in interaction with each other, and competing knowledges and their constitutive power relations circulate between them. I examine how representations of wolves in scientific knowledge, in popular cultural discourse, and through

state management policies are articulated in the practices of wolf conservation, thereby producing wolves as embodied, material beings.

b. Why Washington?

My study focuses primarily on the challenges of wolf management and conservation in the state of Washington, during the recent period of wolf recolonization (2008 - present). One might reasonably ask, why focus only on Washington state, when the challenges of wolf management clearly span state and national boundaries? Of course, wolves themselves have no awareness of political boundaries like state lines and move readily across such human-imposed geographical constructions: from a purely ecological perspective, the study of wolf dynamics knows no such limits. However, state lines provide very important constraints on the "social side" of management, with policies, priorities and sociopolitical contexts varying widely from state to state. The state of Washington is an important geography for the examination of policies such as when wolves can and should be killed, and by whom, or how particular measures are implemented to reduce wolf conflict – and notably, these policies differ significantly from other U.S. states across the American West.

Indeed, the heated conflict of Washington's "wolf wars" in the past few years, and the unique social and political context and policy environment of the state, make Washington a prime site to examine the role of cultural norms and values in the environmental politics of wolf conservation. I argue that the state of Washington represents a kind of socio-ecological laboratory for the examination of conservation dynamics in a politically polarized social environment. While Yellowstone National Park has often been described as the ideal "natural laboratory" (e.g. Carlson, 2018; cf. Hennessy, 2018) for studying ecological (including wolf) processes and dynamics, this concept is premised on the intent to study such dynamics in the

context of their presumably "natural" ecological relations, protected from human interventions and manipulations (though of course, the very effort to "protect" the landscape via National Park status represents a major human intervention!). In contrast to this concept, I examine how human dynamics and relations shape wolf conservation in a socio-ecological system. Washington, as a state with a strong urban-rural divide (with associated political divisions) across an east-west geographic division, provides a test case for what happens when wolves move into rural (largely conservative) regions of a state whose political leanings are strongly influenced by urban (largely liberal) environmental values. In this way, Washington provides a unique laboratory for studying the social issues of wolf management across a geo-political divide, and a microcosm of the challenges of wildlife conservation in the context of the social and political divisions of the United States as a whole.

My research thus builds on prior studies of the political ecology of wolf conservation in the American West (e.g. Martin, 2021a; Nie, 2003); however, the geographical setting of Washington state allows for an examination of how the arrival of wolves in a state that leans politically toward progressive environmentalist values may spark new or unique sociopolitical responses, including significant stakeholder conflict, and thus necessitate new approaches to management. Indeed, several of my research participants and interviewees echoed the view that Washington represents a unique set of challenges that make wolf conflict here particularly difficult to solve, and potentially provide important insights for other places around the country and world (including more progressive U.S. states such as California and Colorado, where wolves are newly arriving). Notably, some stakeholders claim Washington as a success story for wolf recovery, describing the state's efforts at nonlethal coexistence as "leading the country" toward a new model of wolf management, and pointing to relatively low rates of both livestock

depredations and wolf removals compared to other states with wolf populations in the Western U.S. On the other hand, many note that Washington struggles to resolve heated social conflict between stakeholders, with some claiming that the issue is more contentious here than anywhere else. One local resident, describing the intensity of the conflict, told me that "this is gonna be ground zero [of wolf conflict] for a while," for reasons both social and ecological: between "culture, mountains, wolf populations, source… [it's] set up to be like this. You're never gonna have another place like this." This (arguably) unique set of social and ecological circumstances is worthy of close attention, examining both what it is that makes it unique, and what lessons might be learned for wildlife conflict, and socio-ecological management more generally, in other settings.

c. Field work conducted

I began preliminary research investigating the issue of wolf management conflict in Washington in the early spring of 2018 and gained approval from the University of Washington Institutional Review Board to begin conducting my field work in April 2019. Most of my intensive field work took place over a two-year period from mid-2019 through mid-2021. Research was undertaken at numerous locations across the state, including at meetings such as the state's Wolf Advisory Group and the Fish and Wildlife Commission, in offices of agencies such as Washington Department of Fish and Wildlife, in private homes and vehicles, and in public spaces such as National Forest lands where wolf management practices take place. Considering the risk of the ongoing pandemic, a significant proportion of field work that was initially intended to be conducted in person was moved online, with many in-depth qualitative interviews conducted via Zoom or Microsoft Teams.

My ethnographic research consisted of three primary methods: 1. analysis of texts such as newspaper articles, government reports, etc. 2. participant observation and 3. qualitative interviews.[4]

First, I analyzed documents including both public representations (e.g., news media publications) and formal and informal governmental policy documents, which I used to develop preliminary themes and questions relating to wolf controversy and debate. In the public realm, these documents include newspaper articles, opinion pieces, and press releases, as well as other advocacy documents produced by stakeholders in the wolf debates. In the policy realm, documents included minutes and/or recordings from policy meetings of groups such as the Wolf Advisory Group and the state Fish and Wildlife Commission Wolf Committee, as well as both unofficial policy documents (the state's Wolf-Livestock Interaction Protocol, for example) and official policy documents (the state Wolf Conservation and Management Plan, for example: Wiles et al., 2011). These documents were uploaded to content management software (Atlas.ti) for preliminary coding to develop research themes and key concepts.

Second, I employed participant-observation to develop a deeper, more nuanced understanding of the politics and practices of wolf conservation. Beginning in 2018, I regularly attended relevant public meetings, such as the state's (quarterly to monthly) Wolf Advisory Group meetings, Fish and Wildlife Commission meetings (especially when focused on wolf management issues), and numerous informational sessions, webinars and other public outreach conducted by both WDFW and various wolf advocacy groups. Observations from these meetings were recorded in field notes during and immediately following field work, then transcribed and uploaded to content management software (Atlas.ti) for coding. This participant-observation was

[4] Methods 2 and 3 involved human subjects but were determined to be exempt from Human Subject Review by the UW Institutional Review Board since they caused little risk to the human subjects in question.

used to triangulate the data collected in textual analysis, refining research questions, and examining further themes the emerged through interaction with the day-to-day processes and practices of wolf management and policy decision-making.

At the same time, I also began outreach to participants for continuing in-depth conversations, aiming to deeply understand the roles, perspectives, and values of individuals with significant investments in the wolf management debates. My preferred methodology was the "go-along method" (Carpiano, 2009; Drury et al., 2011; Evans & Jones, 2011) in which I continued my participant-observation by following stakeholders in their day-to-day activities, asking questions that drew both from a prepared interview protocol, but also were prompted by unexpected events and occurrences throughout the day. Though my capacity to conduct such in-person research was unfortunately limited by the pandemic, this approach nonetheless generated several crucial experiences that deeply informed my research: long drives around wolf country with conservation advocates; hiking on a National Forest allotment with WDFW and USFS staff; attending a Cattleman's Association meeting in rural Colville, WA, and so forth. A typical interaction of this form was a full day experience (approximately 8-10 hours), involving meeting a participant at their office in the morning and riding out in the passenger seat of their pickup truck to join in their daily work rounds. I observed, and occasionally participated in, wolf-management related activities, ranging from setting up wildlife cameras, to interacting with range riders working to deter wolf-livestock conflict, to touring a wolf sanctuary, to attending planning and organizational meetings, to engaging and responding to public wildlife complaints. These encounters combined the advantages of both participant-observation and interview methods, allowing me to ask detailed questions and gain nuanced insight into participant's

understandings of the challenges of wolf management, with a grounding in the day-to-day experience of their work on the ground.

When it was not possible to arrange such a "go-along," or when such a day raised further questions for deeper investigation, I turned to my final research methodology, the in-depth, semi-structured, qualitative interview. Interviews were conducted with key informants including policymakers, agency and NGO staff, livestock producers, Wolf Advisory Group members, and members of the public. Interviews were semi-structured, using a prepared interview protocol, but with flexibility to follow different lines of inquiry and investigation as appropriate to the conversation. In some cases, a formal interview was conducted in addition to a go-along with a participant and used to dig deeper into themes and ideas emergent from the previous conversations; in other cases, the interview was my only direct interaction with a given participant. Interview questions were open-ended and broadly qualitative, and explored the views, opinions and ideas expressed by practitioners around issues related to wolf management. Interviews were anonymous, encouraging detailed accounts of the politics of wolf conservation, including in many cases controversial topics and viewpoints that are not accessible via published or public materials.

Participants (for both go-along and interviews, or both) were recruited in multiple ways. Initial potential participants were identified in preliminary research, including state and federal agency staff, NGO staff, members of the Wolf Advisory Group and other policymakers, livestock producers and residents affected by the return of wolves, and advocates and managers involved in wolf conservation. Snowball sampling via these initial participants quickly produced an extensive list of potential participants. Participation in the research was typically solicited by e-mail, as in the case of land managers and scientists involved with the project, of whom I often

requested to join as a participant-observer in regularly planned activities, and/or to conduct an in-depth interview. In other cases, participant-observation in ongoing activities allowed me to connect with new potential participants. All participants were informed of the subject of the research study and of the investigator's role as a researcher and participant-observer in conservation activities. Age, gender, race, ethnicity, and other demographic characteristics varied across my participant group. All research subjects were adults who are physically and mentally capable of making the decision to participate and gave oral permission to be included in the research. My approach aimed to allow me to include a wide range of stakeholders representing different backgrounds, and no one who wished to participate was intentionally excluded.

One significant set of stakeholders whose perspectives remain under-voiced in this dissertation are the Indigenous people belonging to Native American tribes that have lived for millennia (and coexisted with wolves) on the lands that are now eastern Washington. In my initial research on the topic, I was surprised by the absence of Tribal representatives in the formal processes of wolf management in Washington. No Native members or representatives sit on either Washington's Wolf Advisory Group (which is formally described as representing three key constituencies: hunters, livestock producers, and environmentalists) nor the Fish and Wildlife Commission (which requires geographic distribution of its members across the state without stipulating who they represent). Meanwhile, the Confederated Tribes of the Colville Reservation (CTCR; a confederation that represents twelve Indigenous Tribes with traditional territories stretching across what is now eastern Washington as well as north in British Columbia and south into Oregon) are a federally-recognized sovereign nation, and manage land and natural resources (including wildlife) independently on the 1.4 million acres of the Colville Reservation. Though many Native American tribes have recently led efforts to support increased wolf

protection, including endangered species listing at the federal level, the CTCR are not among these. The CTCR "considers the population of wolves on their lands recovered" (WDFW et al. 2021) and has taken an approach to wolf management that allows for harvest (hunting) of wolves in areas with established populations, in contrast to Washington's prohibition on hunting (Colville Confederated Tribes Fish and Wildlife Department, 2017) – a stance that is, of course, controversial amid Washington's ongoing debate over killing wolves.

As I recruited participants for my research, I initially hoped to gain deeper insight into the role of CTCR Tribal management of wolves (both on reservation lands, and as seemingly a key stakeholder in Washington's statewide efforts), the differences between state and Tribal management goals and strategies, and the apparent lack of Tribal representation in the state's processes. I reached out to multiple Tribal representatives in the hope of conducting interviews or go-alongs regarding their wolf management efforts and filled out multiple versions of the Tribe's formal research request. Despite repeated efforts, I received no follow-up from the Tribe. Recognizing that "*research* is a dirty word among many Native communities" (Tuck and Yang, 2014), I interpreted this as representative of an implicit refusal to be "researched," and elected not to continue to pursue this angle of my investigation. This choice, of course, creates significant lacunae in the research, and more importantly, risks perpetuating the lack of representation of Indigenous voices in Washington's wolf management conversations, which I do not take lightly. Nonetheless, I felt that my positionality as a white settler and outsider to the community would make it inappropriate to follow a research agenda that I was not invited to pursue by the Tribe. For these reasons, this dissertation emphasizes Washington's management of wolves outside of reservation lands, with little detail about or comparison of CTCR perspectives, practices, or policies. I believe there is great potential for future research on this

topic to better integrate the objectives and desires of Native communities regarding the politics of wildlife management than I was able to do here. I eagerly hope to find ways to support or contribute to the development of a community-based research agenda, aiming to decolonize the processes and practices of environmental research (both around this specific topic and others).

In contrast to common practice in interview-based qualitative research, I elected not to audio-record most of my interviews and interactions with participants. I made this choice for multiple reasons, including the impracticability of audio-recording and transcribing day-long, mobile interactions in outdoor settings with extensive background noise. The most important reason for this decision, however, was concern about anonymity voiced by many participants. Multiple early interviewees, whom I asked for permission to record, expressed concerns about the uses and possible sharing of the recording: "why do you need to record this? Who will hear it?" Even when reassured that the recording and transcript would not be shared, participants frequently seemed to be guarding their words, speaking carefully lest they see themselves represented in print, a very legitimate concern given the history of inflammatory media and publicity around wolf conservation conflict.

In the interest of setting people at ease to obtain unfiltered perspectives and opinions and reducing concerns about possible retributions for their words, I chose not to request to record in most cases, instead rapidly taking field notes to capture as much information as possible during the conversation. Upon finishing the interview, I immediately transcribed from these handwritten field notes to a digital text document, reconstructing and filling in the conversation from memory where possible, as well as adding detailed memos with preliminary insights and interpretations of the conversation. My interview process thus included a built-in element of analysis and interpretation in real time (with iterative re-interpretation later), providing important insights and

direct perspectives on the meaning of the conversation that would likely be lost over time and could not be deduced from a transcript. This approach, while non-traditional, accords benefits that would likely be missed by separating interviewing, transcription, and coding into separate phases in the research process. These transcribed notes were uploaded to qualitative data management software (Atlas.ti) for coding after transcription. I then verified key quotations with participants (typically via email) after the fact, when necessary, to accurately represent their words in my writing.

I analyzed and interpreted data via an iterative process, coding and re-coding my data (which included text documents, field notes from participant-observation and go-alongs, the interpretive transcripts of interviews described above, and in a few cases actual verbatim interview transcripts) as a single, continuously evolving data set. I examined this data set not only for its manifest content, such as detailed information about the history of wolf management or tools and techniques for addressing wolf conflict, but also for the unstated assumptions and uses of language and metaphor; that is, interpreting and analyzing the discourse of wolf conservation and management. Discourse analysis has been described as the examination of "how people use language to construct their accounts of the social world" (Tonkiss, 1998; cited in Rose, 2001, p. 140). As Mark Kanazawa argues, "language is not merely a passive medium that objectively describes environmental issues" (2017, p. 244); instead, language is always political, shaping what people believe they know and how they know it. Indeed, language is powerful not only because powerful people craft it strategically, but even (perhaps most of all!) when it is interpreted to be neutral, when certain terms or narratives are taken for granted or accepted as the grounds of a particular debate or argument. The process of *critical* discourse analysis (based in the concept of discourse as a form of knowledge-power, building on the work

of Michel Foucault) allows for the empirical account of the construction of individuals' social worlds, replete with "their details, their casual assumptions, their everyday mundane routines, their taken-for-granted architecture, their banalities," and can thus lead to "startling accounts of how subjects and objects were and are discursively produced" (Rose, 2001, p. 139). As Rose further notes, there may be "many discourses which jostle and compete in their effects… but certain discourses are nonetheless dominant" (p. 137), and the work of the critical discourse analyst is to understand "which narratives will tend to win out, and why" (Kanazawa 2017, p. 245).

The co-production of conservation discourses and practices (Anderson, 2017) can be explored and analyzed using a data set built from a combination of textual documents, field notes from participant observation, and interview transcript. Such an approach to the construction of a multi-media empirical data set stands in contrast to the systematic sampling necessary in quantitative data analysis, where data must be both rigorously systematized, and demonstrated to be broadly representative of a broader population to draw conclusions about that population. In the context of critical discourse analysis, as Rose argues, "eclecticism is demanded by the intertextuality of discourse" (Rose, 2001, p. 149), and one "may quite legitimately select from all possible sources those that seem particularly interesting" (Phillips & Hardy, 2002; Tonkiss, 1998), in search of "coherent pattern[s] of statements across a range of archives or sites that sets the terms for the operation of both truth and power in any field of knowledge" (Green, 1990, p. 3). My analysis thus places written accounts of the world of wolf conservation and management alongside the accounts created by the collaborative process of participant-observation to understand how the material-discursive production of wolves as the object of conservation takes place.

Both the written documents and my notes from field work were coded by the same process, using a combination of etic codes developed through my review of important themes in the theoretical literature, and emic codes that emerged directly from the data itself. I developed an initial set of codes in Atlas.ti to organize qualitative responses into significant discursive themes, and then added new codes as new themes emerged from my growing body of data. I carefully read and initially coded my data as promptly as possible after collecting it. I then wrote extensive memos on emergent themes and concepts, and relationships between these, before returning to the data. Coding was not done in a single pass, but through multiple iterations of re-coding, often returning to the same data "with different codes in a second -- or third or fourth or twentieth -- moment of interpretation," (Rose, 2001, p. 209) such that interpretation and data collection were intertwined and mutually reinforcing. Through this process, I developed thematically connected collections of quotations to draw from in support of my claims in the various chapters of the dissertation, via evidence taking various forms including references to textual sources, field notes from participant observation, and transcripts from interviews.

d. My synergistic, ongoing research on wolf-livestock conflict across the American West

My dissertation research was augmented by an opportunity that arose in mid-2020 to collaborate with a group of researchers examining wolf conflict on a broader scale across the western United States. The ongoing project "Managing Wolves and Livestock on National Forests in the Western United States," sponsored by the U.S. Forest Service's (USFS) Pacific Northwest Research Station and involving researchers from the USFS, Montana State University, and the University of California Berkeley, examines the challenge of wolf and livestock management across national forests in multiple U.S states. This research was based in the Forest Service's growing recognition that the co-occurrence of wolves and livestock on

National Forest (NF) lands poses significant challenges for managers, related both directly to wolf-livestock conflict (for example, livestock stress and depredation of livestock by wolves) and to human conflict over wolf policy and management practices.

This ongoing project aims to provide a comparative assessment of approaches to wolf-livestock management across multiple states that will be applicable to help Forest Service managers reduce conflict and address the concerns of stakeholders. The project entails qualitative social-science research into the social and ecological dynamics of wolf conflict, with a focus on states where wolves and livestock co-occur on National Forest lands, via a survey of USFS land managers across the region and in-depth case studies (document and policy analyses and qualitative interviews) of six National Forests in Washington, Oregon, Idaho, Montana, California, and Wyoming.

Beginning in mid-2020, I collaborated with an interdisciplinary team of researchers on this study. In this role, I conducted a literature review of the existing natural and social science on tools and techniques used for wolf-livestock conflict mitigation (which informs chapter 4 below). I also conducted a qualitative survey of National Forest range managers on forests with both wolves and livestock, examining their perceptions of the use and effectiveness of such tools, and well as their characterization of the dynamics of the conflict on their forest. Finally, I took a deeper dive into conflict dynamics on two specific forests: the Colville National Forest in northeastern Washington and the Wallowa-Whitman National Forest in northeastern Oregon, each of which was identified as a conflict hotspot in their respective states. (In fact, the Colville NF, where my research was already ongoing, was the driving force behind the creation of the project: USFS managers on the Colville requested that the agency undertake social-science study of the issue due to the ongoing social challenges they were facing, in search of "lessons learned"

from other forests or states with histories of wolf conflict). Parallel case studies were conducted by other team members on forests in Idaho, Wyoming, Montana, and California. Case studies entailed intensive research on the policy environment, the history and socio-ecological context of wolf conflict, and the ongoing dynamics and efforts to mitigate or reduce conflict. I used methods including textual analysis and qualitative interviews with stakeholders involved in/working to mitigate the conflict on their respective forests, including USFS land managers, state wildlife agency staff, livestock producers with permits to graze their animals on NF lands, NGO staff, and others.

This research – especially the component focused on the Colville NF – was highly complementary with my ongoing dissertation research. In contrast to the framing of my existing dissertation research as a critical analysis "on conservation" rather than "for conservation" (Sandbrook et al., 2013; see section 1.b.i. above), though, the USFS project explicitly aims to provide practical insights and lessons learned that will help land managers (including specifically USFS range management staff on the affected forests) adopt practices and promote flexibility in range management practices to mitigate conflict, both between wolves and livestock and among stakeholders. This emphasis on practical, applied outcomes of social-science research has complemented and balanced the theoretical emphasis of my own training in political ecology and critical human geography, and helps to ground my findings and arguments here in the context of insights useful to practitioners as well as contributions to academic theory.

On the Colville National Forest case study specifically, I conducted seven new interviews using the interview protocol developed for this project. These complemented eight interviews previously conducted for dissertation research with interviewees very directly connected to the Colville National Forest. This collection of material was (re)coded in Atlas.ti using a codebook

developed for this project (again, in parallel with the other five case studies). With the consent of my fellow researchers and my research participants, I was able to synergistically draw these projects together, using dissertation research I'd already conducted in the Colville NF region to inform the case study, and drawing on material produced for this research project in the production of this dissertation.

3. An overview of human-wolf-livestock conflict in Washington state and the Colville National Forest

The gray wolf was the target of an extermination campaign in the 19th and early 20th centuries that eradicated wolves from the contiguous United States by the 1930s. After being protected by Endangered Species Act listing in the 1970s, wolves were reintroduced in Yellowstone National Park (Wyoming) and central Idaho in 1995 and 1996, and have since spread to Montana, Washington, Oregon, California and most recently Colorado. Wolves first returned to Washington in 2008 and have made a significant comeback since then. As of the end of 2021, WDFW reports a minimum of 206 wolves in 33 packs, including 19 successful breeding pairs (Washington Department of Fish and Wildlife et al., 2022). Wolves in the eastern region of Washington are considered part of the broader Rocky Mountain population, which also spans western Montana, northwestern Wyoming, much of Idaho, and eastern Oregon. This wolf population (but not the ones in western Washington and Oregon) was delisted from federal protection in 2011, leaving wolf management policy to the states and making possible the development of very different approaches across state lines. Unlike in many other western states, where wolf populations have also been delisted at the state level and can now be hunted or trapped, wolves remain protected as an endangered species under Washington state law.

Though wolf return is strongly supported by the environmental conservation community, it nonetheless remains controversial. Across the American West, livestock losses from wolves can cause a significant economic impact for livestock producers (Bangs et al., 2006; Muhly & Musiani, 2009) as well as social and emotional impacts in the communities where they occur. In a fraught social context "compounded by cultural and political polarization" (Martin et al., 2019; see also Coleman, 2006; Nie, 2003; van Eeden et al., 2020; Ditmer et al., 2022), livestock

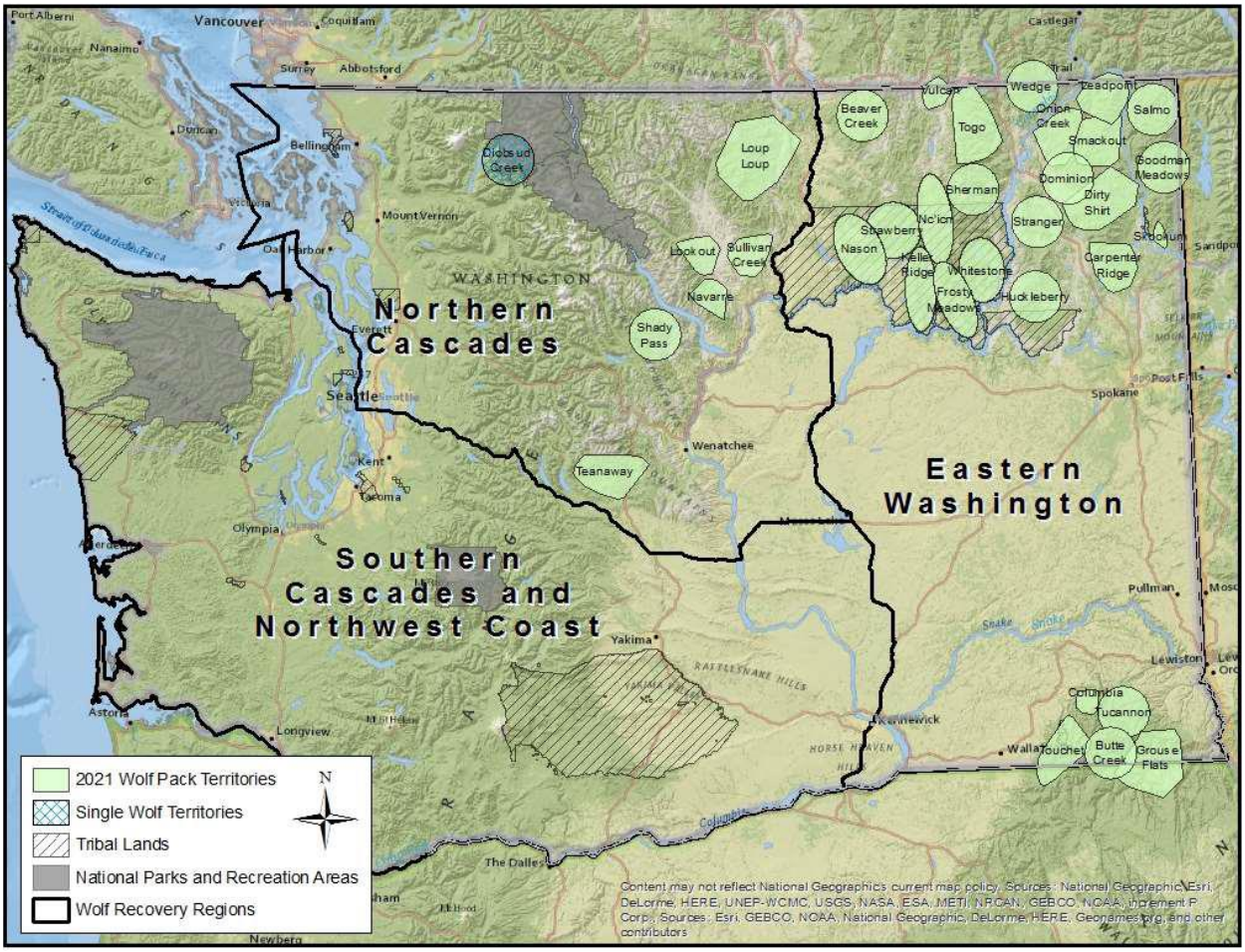
predation often causes rising tension over wolves, which can reduce tolerance and support for wolf conservation (Miller et al., 2016; Treves & Karanth, 2003). This leaves livestock producers, wolf advocates, and wildlife and land managers alike looking for solutions to minimize depredations and reduce conflict.

Controversy and conflict over wolves in Washington have largely centered on the predation of cattle by wolves, especially in the northeastern corner of the state, and the killing of wolves in those areas in response. In this chapter, I provide a detailed, rich account of wolf-livestock dynamics, as well as social perceptions and dynamics related to the conflict, both across the state and in the northeastern corner specifically. I draw on ethnographic research in the region, analysis of documents relating to wolf-livestock conflict over the period of 2008-present, and in-depth qualitative interviews with stakeholders including livestock producers, agency staff (WDFW and USFS), NGO staff, range riders, and others.

I begin with an overview of the history of wolf return at the state level, including state policy and an overview of stakeholders involved. In the second section of the chapter, I focus on a case study of human-wolf-livestock conflict in northeastern Washington (Ferry, Stevens, and Pend Oreille counties, especially on federal lands in the Colville National Forest). This chapter provides detailed empirical context for the conceptual interventions that will follow in later chapters of this dissertation. It also demonstrates the challenges associated with managing a socio-ecological system that includes a species of high conservation interest evocative of fierce and polarized public attitudes and perceptions, amid significant social conflict, and in the context of management policies and practices that are fragmented across jurisdictions spanning the local, state, and federal levels. The compartmentalization of environmental management into disparate spheres (for example, the management of *ecological* dynamics, as opposed to *human* ones, as the

realm of natural resource agencies; or more narrowly, the management of *land* as opposed to *wildlife* as distinct objectives) leads to significant stakeholder tensions and co-management challenges. By taking a holistic view of the multi-layered structure of socio-ecological management in Washington, I provide a more nuanced understanding of these dynamics that will better serve decision-makers across these levels.

Figure 1: Known wolf packs and single wolf territories in Washington, 2021, reproduced from Washington Gray Wolf Conservation and Management 2021 Annual Report (WDFW, 2022).



i. History of wolf conflict in Washington

The first confirmed resident wolf pack to re-establish in the state of Washington was the Lookout Pack, in Okanogan County, in 2008. They were soon followed by packs in the Colville National Forest (CNF) area of northeastern Washington, where the population quickly increased. There were five confirmed wolf packs in the state as of the writing of the 2011 Wolf Conservation and Management Plan (Wiles et al., 2011), and the population has continued to grow rapidly, an average of 26% per year from 2008 to the present (Washington Department of Fish and Wildlife, 2019). In interviews, state officials firmly emphasize that wolves returned to Washington only via natural recolonization and were never actively introduced, despite significant local disbelief: some portion of the public "actually believed that they were brought into the state of Washington by the Department of Fish and Wildlife… which we never have," evidencing a high degree of local distrust of WDFW even in the earliest days of wolf return. Livestock producers and Forest Service managers alike point to the growth as evidence that the wolf population has sufficiently recovered and does not need the level of protection that the state currently affords. As one federal land manager told me, "I think 2020 was Washington's 11th consecutive year of increasing numbers of wolves… I don't know how you can be critical of a state's policy when that's the trend." Many livestock producers suggest there are even more wolves than the state will admit: "I think there are more wolves... It amazes me, the department is always the last one to know. Then when they do actually figure out there's a pack, then they announce it like they discovered it."

Wolves were listed as an endangered species under the federal Endangered Species Act between 1974-2021, and by the state of Washington from 1980 to the present. The wolf population in the eastern portion of the state was removed from federal listing in 2011 as part of

the Northern Rocky Mountain population. Wolves west of that boundary were federally listed until January 2021, when they were briefly de-listed, an order that has since been vacated by a federal judge. Even after federal de-listing in the east, however, wolves remain protected statewide on Washington's state endangered species list, which WDFW staff point to as the key policy "that drives what we can and cannot do." The state's management plan, approved in 2011, designated three recovery regions and set criteria for downlisting based on the number of breeding pairs in each region, making delisting dependent on geographic dispersal through the state, which has not yet happened.

The state's Wolf Advisory Group was convened in 2013 and includes representative stakeholders (currently 14 members) grouped into three categories – hunters, livestock producers, and environmentalists – who provide guidance on wolf management to WDFW via a consensus-based collaborative process. The WAG process was revamped in consultation with Francine Madden, an environmental social scientist and consultant, following the process she describes as "Conservation Conflict Transformation" (CCT; see Madden & McQuinn, 2014). Madden served as the neutral third-party facilitator of the WAG from 2015 to 2018, before handing the reins back to a WDFW facilitator. Building on peacebuilding insights and techniques used in the aftermath of war and ethnic conflict, CCT aims to "transform" conflicts over wildlife by bringing stakeholders to the table to communicate their diverse perspectives. Drawing on the framing offered by CCT, multiple participants in the WAG process described Washington's wolf conflict as "akin to the Middle East conflict," pointing to alleged roots in deep-seated social identity differences. Some participants view the process of discussing these differences around the WAG table quite positively, citing perceived reductions in tensions between members of the group, improved understandings of the range of different perspectives within the group, and

progress in developing a consensus around management policies. Others question whether tensions are really reduced, and some further suggest that the selection of WAG members by WDFW makes the group non-representative of the range of public opinion, arguably sidelining important voices in the process of reaching a consensus that is ultimately amenable to what WDFW aims to do (personal communications, 2021).

A key task of the WAG has been the creation of the state's Wolf-Livestock Interaction Protocol ("the Protocol," Washington Department of Fish and Wildlife, 2017), first developed in 2017, which "prescribes proactive measures livestock producers can take to reduce the probability of wolf-livestock conflicts [and] establishes a framework for the department's response when conflicts between wolves and livestock do occur," including setting criteria for the state's use of lethal removal. Per protocol requirement, livestock producers "are expected to proactively implement at least two deterrence measures," in collaboration with WDFW. These deterrent tools include the presence of livestock guardian dogs, the use of fladry, which are flags on wires that flap in the wind and can be used to create a boundary that wolves are frightened to cross, the use of radio-activated scare devices that create noise or light to scare wolves off, or good old-fashioned harassment, sometimes called "hazing" of wolves, which can include yelling at them, air horns or cannons, shooting guns over their heads, or other efforts to scare wolves away from livestock. When such efforts fail, however, the state turns to "lethal removal," or targeting killing of the "problem wolves" that have repeatedly preyed on cattle, usually accomplished either by trapping or by shooting wolves from a helicopter.

Environmental groups petitioned the state in 2020 to codify legally binding rules on wolf-livestock conflict, as opposed to the non-binding "guidance" provided by the Protocol; their petition was initially denied by the Fish and Wildlife Commission (FWC) but then overruled by

Governor Jay Inslee. At Inslee's direction, WDFW is currently developing alternatives under the State Environmental Policy Act (SEPA) process for formal rulemaking to codify their practices regarding both lethal and nonlethal efforts to mitigate conflict. The state is also currently engaged in "post-recovery planning," developing a plan to replace the current state wolf plan once wolves are delisted at the state level. In the wake of the OPT pack removal controversy of the summer of 2019, however, tensions between wolf advocates and livestock producers had escalated dramatically (as discussed in chapter 1), with several cattle found shot to death in Eastern Washington, presumably in retaliation or protest of the killing of wolves. Disturbing messages were posted on an environmental group's Facebook page, including "Turn the guns on those who slaughter our wildlife!" and "Stop killing wolves. Shoot cows. And ranchers?" Soon after these events, a series of scheduled public meetings for post-recovery planning that were intended to occur in late 2019 were cancelled by WDFW due to anonymous threats to participant safety. WDFW staff explained that they were informed of the threats by the FBI but declined to comment on exactly who was threatening whom. One wildlife manager told me, "It just escalated to the point where we didn't feel safe getting together in a room to talk about this stuff," pointing to both the significant need for, and limited success of, the state's peacebuilding efforts.

Meanwhile, the Colville National Forest Land Management Plan (U.S. Forest Service, 2019) was updated in 2019, sparking litigation from environmentalist groups, who were dismayed to see no mention of wolf management in its pages. In *WildEarth Guardians et al v. US Forest Service et al* (2:20-cv-00223, June 2020), the plaintiffs, a coalition of environmental advocacy groups, argue that the USFS failed to adequately study the wolf issue in the new Plan. (USFS staff countered that because wolves in eastern Washington are not an ESA-listed species,

their management is not within the jurisdiction of the U.S. Forest Service, and it would be inappropriate to step on the toes of state and federal wildlife managers by creating additional Forest Service rules and regulation related to wolf management). This lawsuit was dismissed in federal court in September 2021, though the groups will likely appeal. In *The Lands Council v. US Forest Service* (2:20-cv-00324, Sept 2020) another group of environmental advocates argues that the Forest Plan allows excessive cattle grazing and is damaging to forest ecosystems. The choice to take this fight to the Forest Service appears to be happening in Washington specifically because of the social context of strong support for environmental protection in general and wolf advocacy in particular. As one Forest Service manager, who works across state boundaries, tells me, "In other states, there isn't pressure on the Forest Service to hold [permittees] accountable for implementing separation strategies, avoidance measures... That is front and center in Washington in particular."

ii. Wolf management geography, policy environment, and legal status

A large percentage of Washington's wolves live in the northeastern corner of the state (in Ferry, Stevens, and Pend Oreille counties, largely within or adjacent to the CNF), with smaller numbers in the Cascade Mountains (the Okanogan-Wenatchee National Forest) and in the southeastern corner of Washington (the Umatilla National Forest, which is associated with nearby Oregon and Idaho populations). Significantly, dispersal to other regions of the state has been slower than anticipated, creating tensions in northeastern Washington. In interviews, USFS staff highlight the high wolf population density in this corner of the state, arguing that wolf recovery in Washington "didn't work out as planned" because "dispersal of wolves statewide hasn't happened;" "you got wolf packs touching wolf packs touching wolf packs in northeast Washington, and the population is thriving beyond people's expectations" yet wolves remain

"largely concentrated in the northeast part of the state." This use of geographic criteria for dispersal, as described in the state's Wolf Plan, has emerged as a point of contention: unlike the neighboring state of Oregon, where recolonizing wolves were delisted based on population growth that occurred primarily in the eastern portion of the state, Washington's managers remain constrained by state-level endangered species listing. One local resident in northeastern Washington tells me, "This place has enough wolves to delist the whole state. They're just not spread out." In the view of some WDFW staff, wolves have already "far exceeded" recovery goals, and should be managed like a delisted species, which would free up resources to tackle other species. This policy constraint is highlighted by regional-level Forest Service staff, who work across state boundaries, as a key distinction and likely reason for social conflict over wolves in Washington being higher than in neighboring states.

The US Fish and Wildlife Service was the official authority of wolf management during the period when wolves were federally listed, until 2011 in Eastern Washington and to the present day, except for most of 2021, in Western Washington. Today, WDFW is the lead agency for management of wolves across the state and has taken on a role of working directly with cattle producers to try to reduce wolf-livestock conflict. WDFW employs "wildlife conflict specialists," two of whom are in northeastern Washington, and staff biologists, who respond to concerns and depredations, implement and support the use of nonlethal tools, meet with producers to share information, develop nonlethal deterrence plans, and coordinate range riders between multiple agencies and producers, among other tasks. The Colville Confederated Tribes retain the right to manage wildlife within the reservation and have what is described as a "co-management relationship" with WDFW; they also retain hunting rights on the "north half,"

former reservation lands that include National Forest lands in the Kettle Mountains (per US Supreme Court *Antoine v. Washington*, 1975).

Due to Washington's listing of wolves as an endangered species, no "harvest" (hunting or killing of wolves) is permitted except by Native tribal members. Lethal removal of wolves is conducted by WDFW, following guidelines in the Protocol created by the Wolf Advisory Group. Lethal removal is only used when strict criteria have been met, which include at least three confirmed depredations in a 30-day window, or 4 in 10 months, despite ongoing use of proactive non-lethal measures. Forest Service managers point to these criteria as a key point of contention: livestock producers want the state to move to using lethal removal more readily when needed, while environmental groups continue to push for even more restriction on lethal removal. Unlike in other Western states with wolf populations, such as Montana, Idaho, Wyoming, and Oregon, the US Department of Agriculture's Wildlife Services (WS) program, which commonly conducts lethal predator control on a range of species across the United States, does not lethally remove wolves in Washington (per *Cascadia Wildlands v. Woodruff*, 2015, which ruled that WS had not adequately examined the environmental impact of lethal removal in WA). While both WDFW and USFS staff are aware of WS's absence, they claim not to know why this state-to-state difference exists; meanwhile the environmental groups who brought the lawsuit claim this as a victory and point to the importance of the litigative approach for protecting wolves.

iii. Key stakeholders and relationships in wolf-livestock conflict management

Washington's Fish and Wildlife Commission (FWC) is the decision-making authority regarding the state's wildlife management and directs and oversees WDFW policy. WDFW also receives wolf policy guidance from the WAG, albeit in an advisory capacity that the agency can elect to disregard. Tensions have emerged over who has authority within and between these state

institutions. For example, when Governor Inslee sent his 2019 letter directing WDFW to reduce repeated use of lethal removal, several members of the WAG felt sidelined and disrespected (personal observation, WAG meetings). Numerous groups (including both environmentalists and livestock producers) complain of not having representation at the WAG, and seeing decisions made that do not reflect their interests, while others argue that the WAG is essentially powerless anyway. There is also conflict within the environmentalist community, especially between those groups currently pursuing litigation against the state and/or federal government and those pursuing compromise solutions via the WAG, with some of the former describing the WAG itself as a "diversionary tactic" aimed to undermine their efforts via litigation. In northeastern Washington, many livestock producers call for increased involvement of county-level government. Stevens and Ferry Counties have a "Special Deputy and Wildlife Specialist" whom they see as a local watchdog over WDFW and would like to also put in charge of lethal control; a local campaign urging citizens to "call your sheriff's office first" regarding predator issues works to undermine WDFW's authority on the issue.

Figure 2: A billboard outside Chewelah, WA gives the local sheriff's office phone number, rather than WDFW's, for the reporting of wildlife incidents. Photo by author.

Multiple groups are currently employing range riders to attempt to reduce wolf-livestock conflict: some are directly hired by WDFW, some use cost-share agreements between WDFW and ranchers, and some are employed by NGOs such as the Northeast WA Wolf-Cattle Collaborative (NEWWCC) or the Cattle Producers of Washington (CPOW). WDFW is the lead agency, generally involved in coordinating between producers, range riders, and NGOs, and keeping the USFS in the loop. USFS and WDFW staff generally agree on their distinct and separate roles: the FS manages the land while WDFW manages the wildlife, and they try to "stay in our respective lanes," a common framing regarding state and federal co-management across the western U.S. (see Martin et al., 2021). From this perspective the Forest Service's role is limited, as one USFS manager makes a point to tell me: "we don't get into a lot of conversations about how the state should be managing the wildlife or wolves. We also shouldn't be speaking

about how ranchers should manage their businesses." This distinction (and a related tendency to direct responsibility toward WDFW as the wildlife manager, where the wild animals are perceived to be the problem at hand) is widely echoed in interviews with producers: "It's not the Forest Service's job to manage wolves. It's not the rancher's job to manage wolves;" and "the cows aren't attackin' the wolves. It's the wolves attacking the cows, so whose responsibility [is it]?"

Nonetheless, the "Forest Service is part of this conflict, very much so," in the words of one manager, because of their authority over grazing permits. They describe themselves as doing their best to be proactive in addressing conflict: the producer and WDFW "need to be talking" and "we [the USFS range managers] do the work to bring them together." Even in the context of "staying in their lane," WDFW staff see what they call a "gray area" where wildlife management and land management necessarily intersect, so "we have to have those conversations," and they note that the Forest Service has been responsive to WDFW requests to look at husbandry-related tools for mitigating conflict between wolves and livestock, such as delaying turnout of livestock onto national forest lands. Meanwhile, environmental groups (especially those suing the Forest Service, of course) would like to see the USFS doing even more, such as closing allotments that have had chronic conflict, but USFS staff see this as beyond their purview and authority.

USFS staff describe a "really good relationship" between themselves and WDFW, and with grazing permittees. However, multiple interviewees describe significant distrust for WDFW on the part of producers and the local community, telling me "It's a difficult relationship" and "resentment builds up" toward WDFW. Many are critical of WDFW's approach to the wolf issue over the years, saying they "do not understand developing relationships and trust," have been "arrogant [and] condescending," "know-it-alls not from the community," and that producers

"feel lied to" by WDFW, particularly when it comes to the higher-level decision-making "over in Olympia." In the words of one local resident and livestock producer, "the relationship is extremely dysfunctional and there's no trust between permittees and the Department of Fish and Wildlife." Local WDFW staff recognize these dynamics and describe themselves as working to develop better trust in the community, however they are also frustrated by state level policies that some describe as "much more politically driven than biologically driven," motivated by "what will the environmental community say, will we get sued?" and not aligned with local values. Conversely, environmentalists argue that WDFW is "not paying attention [to public opinion] but just to ranchers."

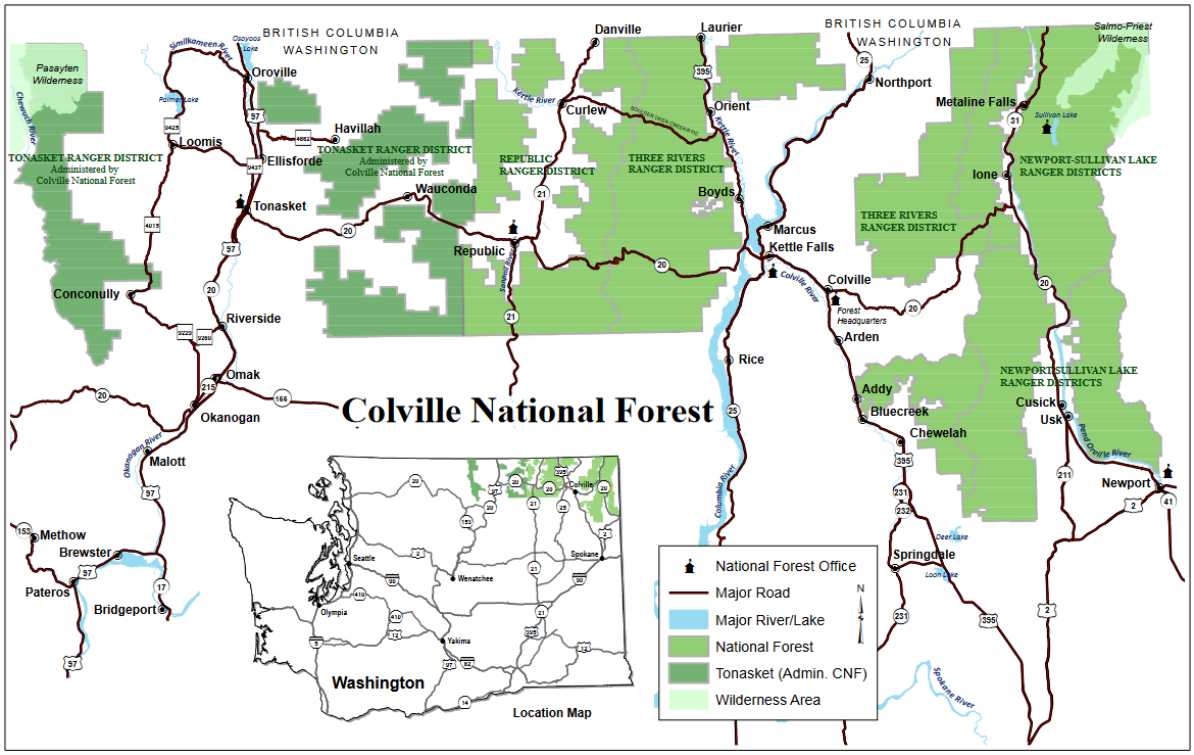
b. The Colville National Forest case study

i. Geographic characteristics and cultural history

The territories managed by the federal government (U.S. Forest Service) as the CNF, which is where most of the wolf-livestock conflict in Washington has occurred, include two mountain ranges, the Selkirk Range to the east and the Kettle Range to the west, separated by a valley that includes the Lake Roosevelt National Recreation Area (Columbia River) and more developed areas of the towns of Kettle Falls and Colville. In the words of the U.S. Forest Service, "the ecology of the Colville [NF] is highly diverse with forests ranging from ponderosa pine and Douglas fir… to western red cedar, western hemlock, western white pine and an excellent variety of deciduous species," the "topography is varied, ranging from rounded mountain slopes at low elevations to high peaks and basins above 7,300 feet in elevation," and the "principal ecosystem services are timber, wildlife, fish, water, forage, and recreation" (U.S. Forest Service, n.d.) The western portion of the forest (the Kettle Range, consisting of the Republic Ranger District and the western part of the Three Rivers Ranger District) was part of

the Colville reservation until 1892, and tribal hunting rights were retained there by treaty. The area is still commonly described as the "north half" of the reservation. Forest Service staff note that state protection of wolves in Washington creates a dynamic where wolves can be hunted all around them (on the Colville Reservation to the south, in Idaho to the east, and in British Columbia to the north, as well as by tribal hunting on the CNF itself,) but non-tribal residents are not permitted to kill wolves on the CNF, except in "caught in the act" cases of depredation on livestock.

Figure 3: Colville National Forest general vicinity map. Reproduced from U.S. Forest Service webpage (https://www.fs.usda.gov/colville)



USFS staff describe the CNF as a "different landscape than much of the West;" it is densely forested and "steep, rugged and hard to cross." Topography and vegetation are often cited as key challenges for wolf-livestock coexistence here, with very little visibility due to dense

vegetation and rugged terrain. On grazing allotments, cattle can often move deep into forested areas and are hard to keep track of, while wolves move around relatively easily. From the perspective of some wolf advocates, this is "unacceptable terrain" for livestock grazing and invites livestock depredation to occur. Producers counter that the region "does not have wolf habitat" (participant-observation, Cattlemen's Association meeting), arguing that the absence of large elk herds in these dense forests means that the wolves lack prey, and are therefore likely to target livestock: so "if west-siders want to see wolves, go to big country."

ii. Regional context and wolf introduction history

Livestock grazing has occurred on the CNF since at least the beginning of the 20th century; once predominantly sheep, most grazers switched to cattle by the 1950s, and the forest has grown denser as a result (personal communication, FS staff). Locally, the use of public land for livestock grazing is seen by many as an important part of the history and heritage of the community, despite being a relatively small proportion of the local economy. USFS staff highlight the historical significance of grazing: "This has gone on here for a long time. [Since] the late 1900's, people have been raising livestock here and homesteading. It's a good place to raise livestock and have a ranch." Ranching is understood as having conservation value, with ranchers frequently framing themselves as acting to the benefit of the ecosystem, albeit in a different way than the groups more commonly labeled "environmentalist." Ranchers argue that ranching maintains open space and biodiversity and thus has ecological value, and express concern that if ranches go out of business due to wolves, the land will get "chopped up in 20s" and developed, thus becoming "no good for wildlife at all - full up of houses and dogs." Contrarily, a wolf advocate describes grazing livestock as an "anachronism," but says the

ranchers “keep the myth alive” of ranches being sold off and divided: “don’t use that excuse with me,” the wolf advocate says, “it’s a privilege to use public lands.”

Significantly, the wolf population in northeastern Washington has consistently increased over the period of 2008 to the present, with both USFS and WDFW staff noting that population growth has happened much faster here than elsewhere in the state. One WDFW manager describes a “significant recolonization of wolves… particularly in northeast Washington associated with the area around the Colville National Forest.” USFS staff tell me that wolves are increasingly “a major consideration in how we manage livestock on the national forest” as they are “filling in every bit of available habitat… At this point… it's a challenge to throw a dart at the map and find a spot where there's not wolves in northeast Washington in the Colville National Forest.”

Some managers describe the social response to wolf return as mixed, juxtaposing “anger and fear,” especially on the part of the livestock producers’ community, with “excitement and joy” for others, and noting that wolves are an “extremely polarizing species.” Others strongly emphasize the negative response over the positive: “they definitely weren’t embraced,” “the community didn’t react favorably,” and “the [livestock] producers obviously were not happy,” with many feeling that wolf return was “something that was being thrust upon us by the more populated side of the state.” From this perspective, the people who “looked favorably toward a recovering wolf population [represent] a minority, not the majority.” Many producers feel that “our ancestors removed ’em for a reason, and nothing good is coming of” their return.

Some managers claim that acceptance is growing as it has “become common knowledge [that wolves are] here to stay,” and “socially, we’ve made some strides,” but others stress that the social conflict over wolves has continued or even gotten worse over time: there is “very little

social acceptance for wolf recovery in Eastern Washington, or in rural Washington," and over the decade-plus of wolf recovery the situation has gone "from not good, to really bad." One livestock producer tells me, "Right now, it feels like we're losing ground on tolerance," and a USFS manager echoes that "relations are at an all-time low." Many feel that the level of intensity and polarization over wolves is higher here than elsewhere in the U.S. West. One long-time advocate of coexistence efforts describes the words of a colleague of theirs, who works on wolf recovery in Idaho: "[they said,] 'at least it's not as big a pain as northeast Washington with it.' Wait. You're from Idaho, and… you're saying [it's] not as bad as northeast [Washington]?" USFS staff agree: "particularly in Washington, wolf-livestock [conflict] from a social perspective is very, very high," and "my counterparts in the other regions right around [USFS] Region 6 [Oregon and Washington] are… not spending nearly the same amount of time on wolf-livestock conflict as I am." Producers and USFS staff alike point out that the current level of social conflict is bad for wolf recovery; one tells me that with "social acceptance being quite low in Eastern Washington... it's likely now if people see a wolf, chances are they're gonna shoot at it in Eastern Washington. That isn't good for wolf recovery… people feel like their only options might be to take things into their own hands."

USFS staff and livestock producers alike describe a disconnect between state management, arguably driven by "westside values" (a broad brush used to paint the greater Seattle metropolitan area as uniformly "environmentalist," a term that takes on a clearly derogatory intent in this context), as opposed to the local perspectives of residents. One USFS manager tells me that people who "have no experience with it still form opinions that are very strong" based on "what they watch on TV or what they've read about or what documentary they've seen," and the "external community doesn't understand" what's happening locally.

Livestock producers point out the state's geographic-political divide: "politicians can control this state with the votes that they can see from standing in the Space Needle... there is so much population over there, and they think so much alike, and they think so much different from us." Some producers further characterize wolf management as the "overreach of rotten government… seeing how much control they can put on us," and linking it to governmental efforts to mandate masks and vaccines during the COVID-19 pandemic, which they similarly oppose (observation, Cattlemen's Association meeting). One resident describes the difference between eastern Washington's livestock producers and western Washington's environmentalists as "the cultural divide on steroids." In this context, livestock producers' relations with WDFW are frequently characterized by distrust, especially up the ladder at WDFW in Olympia – one producer tells me that their community in general has "very little trust for the department."

In the context of this political polarization and local distrust of government, questions of adaptation to wolves (such as the use of nonlethal deterrents, or changes to husbandry practices) tend to raise strong reactions, with many producers arguing that they are being blamed for conflict when it occurs and asked too much to shoulder the burden of adaptation. WDFW staff say that "the public is perceiving that… the Department always wants more and more and more from the producer;" they describe a typical producer attitude as "it's the Department of Fish and Wildlife's problem, so you fix it." Wolf advocates describe producers as unable or unwilling to adapt their business model to changing conditions, while producers argue that they should be allowed to use a "common-sense approach" of killing wolves when needed, but the state is the one "asking them to just sit on their hands" (observation, Cattlemen's Association meeting).

Amid this conflict, the Diamond M ranch run by Bill McIrvin has become a focal point controversy, with national media attention (e.g. Read, 2019) highlighting that many of WA's

lethal removals have been done in response to depredations on Diamond M cattle. Wolf advocates, such as those who spoke up at the January 2020 WAG meeting, argue that this rancher's unwillingness to adapt is a central part of the problem, suggesting that WDFW is too quick to kill wolves on their behalf ("84% of wolves killed for one rancher - that says it all"). Other producers, however, tend to defend Diamond M, echoing McIrvin's perception that as a larger operation he gets the worst of depredations that nonetheless affect everyone in the region. One tells me, "Diamond M actually held it together – it would have been so much worse without them. Twenty-seven wolves killed for one ranch is a bullshit lie… but they make a great whipping boy in the media." USFS staff tend to avoid direct reference to Diamond M but argue that "certain producers" are hit harder than others just because of the number of cattle they have: "we have permittees… anywhere from 25 cow-calf pairs up to upwards of 800 pair. If you look at [it] statistically, people that have more livestock on the National Forest are probably gonna have more opportunities for conflict."

USFS managers are deeply frustrated by what they see as unnecessary polarization and politicization of the wolf issue, describing themselves "trying to manage… scientific or biological things" while also being limited by "what's socially acceptable to the extremes... and everything in between. There's no good way to do that." They point to differences in state policy (especially lethal removal policy) as driven by politics, saying that WA's wolves are "managed more [based] on the social desires of certain fractions [of the] public," and that other states aren't trying to "socially manage" wildlife in this way. Some WDFW staff agree that wolves are "a political football… it's a political issue, right versus left, more than really a wildlife management issue," and it ultimately comes down to competing values, which they cannot dictate: "I'm not gonna go to a rancher and say, you need to be more tolerant, to embrace coexistence… it's not

my place to say." Producers echo: "get politics out of it" (observation, Cattlemen's Association meeting).

USFS managers describe wolf social conflict as closely connected to the longstanding debate over public land grazing, highlighting "strong emotions against grazing on public lands" and "litigation all across the West to rid the public lands of livestock grazing." Though they describe their own management practices as scientifically based and sustainable, the perception of grazing as "degrad[ing] public resources" contributes to public opposition to killing wolves on behalf of producers. The connection to the broader grazing debate is also echoed by producers themselves: one suggests that the goal of environmental groups is to "depopulate and rewild the west," and even goes a step further to suggest that stoking conflict over wolves helps them fundraise: "their whole reason for existence is the controversy," they're "getting their donations" because of wolves being killed so "the last thing they want is for this to be settled." Many environmentalists counter that they are not necessarily opposed to all public land grazing, but that it should happen in certain places and not necessarily everywhere on the forest.

iii. Wolf-livestock dynamics

The Colville NF has a total of 58 grazing allotments on over 800,000 acres; currently 42 of these are active. USFS staff describe them as "very good and productive grazing lands… even though they're non-traditional… they're very productive and livestock gain very well here." They typically use about 150-250 acres per cow-calf pair and charge permittees by the head-month. The Forest Service issues a revocable license over a 10-year period, usually re-authorized to the same permittee repeatedly. Unlike many National Forests dealing with wolf-livestock conflict across the western United States, the CNF has only cattle and not sheep/goat allotments. Livestock typically graze on the National Forest from roughly June through October; in general

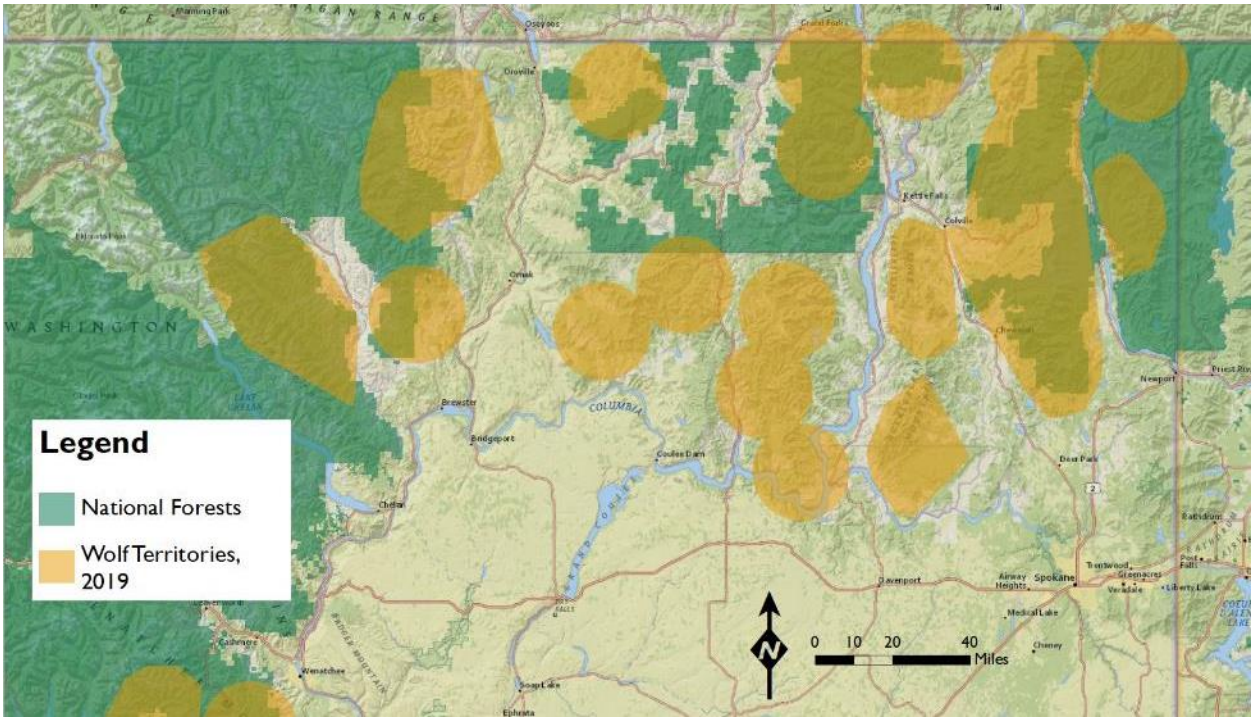
permittees “follow the green up” from low elevation to higher, since there is not enough vegetation at high elevation early in the season to support grazing.

Resident wolves were first confirmed on the CNF in 2009, toward the beginning of wolves’ return to Washington. According to the land managers, wolves currently occupy most or all the suitable wolf habitat, making this the only forest in WA where this is the case. One land manager notes that they had livestock depredations as early as 2007 or 2008, even before there were confirmed resident packs. Today, there are approximately nine wolf packs on the CNF, plus seven others on nearby tribal or other lands (Washington Department of Fish and Wildlife et al., 2021). One land manager suggests that “you actually have a higher density of wolves here than anywhere in the lower 48.” However, this claim is belied both by the population estimates made by state wildlife agencies, and our team’s survey of National Forest managers across the Western U.S (unpublished data). The former shows that Idaho has over 1,000 wolves (Phillips, 2021) , and Minnesota has over 2,500 (Erb & Humpal, 2020), compared to Washington’s fewer than 200. Though the spatial distribution of these populations within the states is not precisely known, there is little evidence to support the idea that wolf density is higher in northeastern Washington than in neighboring territories in Idaho. USFS managers corroborate this, reporting an average of 11 and a range of one to 20 wolf packs on a given forest with established wolves. Nonetheless, it is clearly true that wolf density is much higher in the CNF than elsewhere in WA, a factor that contributes to the social conflict over wolves, along with state’s ban on hunting and the strong advocacy by environmentalist organizations to reduce the use of lethal removal.

Significant wolf-livestock conflict in the Colville NF began with the 2012 Wedge pack conflict (Geranios, 2012), which led to Washington’s first lethal removal. Repeated conflicts since then have led to multiple lethal removal actions by WDFW that stirred state-wide

controversy (including the Wedge pack in 2012, the Profanity Peak pack in 2016, and the OPT pack in 2019). According to the USFS managers, all their grazing allotments, and an estimated 35 permittees, are affected by the presence of wolves. WDFW and USFS staff say that "almost every producer that we work with has had interactions with wolves," and "all our permittees have experienced some level of conflict, whether that's a direct or indirect effect." A single wolf pack may overlap multiple allotments and affect multiple producers.

Figure 4: Known or estimated wolf pack territories in Northeastern Washington, as of 2019. Data courtesy of WDFW. Map by author.



USFS staff describe the situation as a high level of conflict, with "frequent or regular depredations and stress [and] high impact on cattle and producers in affected areas," making the Colville one of only five forests self-reporting at this level across the western U.S., and the only one in Washington state. USFS staff perceive the conflict as getting worse, telling me that it used to be that depredations occurred mainly in August and September, but in 2020 problems started

in May: it “seems to be getting worse each year” and “the trend is that depredations are on the increase.” USFS staff, generally empathizing with the grazing permittees, say that permittees have learned to expect “reasonable losses” but say “it doesn't mean that [they] want [their] whole herd of livestock desecrated.” Contesting the likelihood that this is at stake, WDFW frequently emphasize that there are many wolf packs without conflict, often citing the statistic that “80% of wolf packs don’t depredate livestock.” They acknowledge, though, that “when conflict between wolves and livestock does occur, it can become chronic and have significant economic impacts on individual livestock operations.”

USFS staff do not dispute that many wolf packs haven’t had conflict, but they point to the sheer number of wolf packs: “everywhere you point to on the Colville National Forest there's wolves. The likelihood of one of those packs … being one of those 20 percent that depredate are much more when the whole map is covered versus when there was just one or two packs.” From a wolf advocate perspective, meanwhile, current livestock management practices are inviting such conflict: one wolf advocate tells me that “they “take these cows and drop them off in bunches” along the road, “30 cows here, 30 there,” so they spread out and are free to roam in large expanses of forest: “how in the heck are you supposed to keep track of those cows?” For them, this is an “anachronistic system of range management.” On the other hand, USFS staff argue that producers are doing all they can, pointing out that the number of resources invested in wolf deterrence has grown exponentially, with increased range riding and deterrence efforts. The current effort at nonlethal methods is unsustainable in the view of USFS land managers (personal communication, 2020).

iv. Impacts of wolves (perceived and actual) on producers and livestock

USFS managers and producers report direct losses in the form of livestock killed or injured by wolves. WDFW reports 33 proven or probable injuries to livestock by wolves in 2020, and nine livestock killed (Washington Department of Fish and Wildlife et al., 2021). One USFS manager tells me, “A one percent loss rate is the norm. If it's over that, there's something going on out there. Some of our permittees are saying they might be missing 25 or more percent of their livestock that are unaccounted for.” Though dead livestock are often the focus of anti-wolf sentiment, injured animals also lead to costs including vet bills, and time spent on animal care. Many managers suggest that the actual number of depredations may be underreported: “What I'm hearing is that the actual number of depredations are far higher than what's being reported and being fed into the decision making of whether or not to lethally remove a wolf.” One tells me, “We don't always find all the carcasses. If you don't find 'em within a few days, they can almost be completely consumed,” and a livestock producer echoes, “a pack of wolves eats the evidence pretty darn fast.” Another producer complains that “the only wolf kills that get counted are the ones confirmed by the department” and you “usually find about one out of seven.” They continue, “if they asked us, how many wolf kills have you had, we’d say, we’re short 70 head with wolves in there... [but] they don’t do that.” Some producers feel that WDFW plays down or denies the true number of depredations, and therefore call for greater involvement by the sheriff’s office, saying that the staff at the sheriff’s office “is the one bit of light that we’ve got – because [they’re] on the scene to hold [WDFW] responsible” when depredations occur. The cost of applying non-lethal, proactive efforts to reduce conflict is also a reported impact: “it takes time and energy,” especially in high conflict cases, and has emotional impacts on the producer:

“you're like caretakers for these livestock... [you] provide for their wellbeing... It's an awful thing when something dies… There's that emotional toll as well.”

USFS staff and producers also frequently often mention decreased weight gain as a significant impact: the “cattle don't gain,” so “calves are comin' up with a lower weight. That's a direct loss because they don't bring as much to the market.” Producers say that this is actually a “larger economic loss than the few numbers of confirmed depredations” (compare Steele et al., 2013). They also point to decreased pregnancy rates, reporting a “jump from 6% to 20% open cows.” “When you put wolves in with them, 20% don't breed” one tells me, “Last year I had 31% open cows on [a given allotment with wolf conflict].” Producers emphasize that wolves are killing valuable, healthy livestock, saying the “idea that wolves only kill the weak is a misconception,” “people will tell you [that] they just keep the ungulate herd healthy and whatever because they're killing the sick and the weak and whatever -- that's not right. But it's [a] very popular belief.” On the contrary, they argue, wolves “only touch the biggest, fattest, healthiest calves,” and the idea that they “clean up the sick, kill the weak – bullshit!” Another echoes, “It’s a lie” but it’s “so widespread that I... never heard a dissenting view.”

Wolf effects are often described, by producers and USFS staff alike, as being cumulatively enough to drive people out of the business: land managers tell me that *“*[ranchers] can't sustain a profitable operation” because “at some point it either hits an emotional or a financial threshold. We've had a handful of ranchers that have sold out of their Forest Service permits. They quit raising livestock… it's just not worth it to them.” They highlight “all of the stress and the social turmoil” as well as the economic bottom line. Producers report that “it’s killin’ our industry… who wants to get into cattle right now when they can see what’s going on?” One local resident argues that “the business model [of northeastern Washington ranchers]

probably couldn't be worse for wolves": "You have cow/calf pairs as your business model in the Selkirk Mountains with wolves, and even if you took away all that conservative stuff and the anti-government, and anti-Jay Inslee, and anti-Olympia, and anti-department, and all that, it's still a tough row to hoe." Another producer highlights that this is not just an economic loss but the loss of their way of life: we've "got asphalt where we used to be raising livestock;" their goal was to "pass the legacy on to our kids and our grandkids" but our "grandson says, as long as you've got wolves, I'm not doing it!"

v. Why does conflict happen for some people or places and not others?

Many local observers say that wolf-livestock conflict is unpredictable, noting that the location of conflicts varies from year to year: "there's really no rhyme or reason as far as predicting it,"

"it's a very complex system," and "we don't know what it is" that causes depredations, and thus have "no magic wand to fix it." Wolves' den locations and rendezvous sites are often unknown prior to the grazing season, so conflict may occur in some cases simply because a given pack's territory happens to overlap with livestock use: "where [denning or rendezvous] activities are takin' place… may have more conflict than somebody that's just to the east or west of 'em." Others suggest that certain packs learn or adapt to recognize cattle as a food source. Citing the statistics mentioned above, WDFW managers say that they expect to see 20 percent of packs having livestock depredations: "what the science suggests is that 20 percent of wolf packs, in any given year, will prey on livestock, while 80 percent will not. It's not always the same 20 percent." Because of this, "it has the potential to happen everywhere. It's not gonna happen everywhere every year."

The question of when and how wolves learn to "change behavior," (that is, to switch to preying on livestock in the first place, or to avoid it as the result of various conflict-deterrence tools), is hotly contested. Some suggest that the whole pack typically learns this new hunting behavior as a group, while others claim it is usually just individual "problem wolves" within the pack (often stated with the corollary that prompt removal of such wolves is the best solution to the problem). In some cases, livestock depredations have been observed to begin early in the season, including on low-elevation private lands relatively near to human habitations; a USFS manager argues that once the wolves "get habituation of that food source" they are likely to continue to have depredations. This is echoed by producers: "you gotta try and discourage them… if they get to where they depend on 'em for a food source, the only way to fix it is the eradication of the pack." Another rancher says, "I don't blame 'em. Once they get a taste of them good T-bones, they don't wanna go back." Wolf advocates disagree, however, seeing livestock predation as a sort of sideline for wolves rather than a definitive switch: "even when wolves are attacking cows, they mostly are still eating ungulates." Wildlife managers largely agree with this claim, suggesting that wolf predation of livestock is not so much a question of prey switching as "broadening of the prey search image," though this has not been substantively tested in the scientific literature. The role of predator learning regarding prey selection (including social learning, in which behaviors are taught by one individual to another), and the role of human intervention in influencing those behavioral processes, are not well understood by scientists, leaving ample room for speculation by all parties about how best to "try and discourage 'em." (A deeper discussion of the challenges posed for wolf management in the context of uncertainty about wolf behavioral science is found in Chapters 6 and 7, below.)

Meanwhile, others have suggested that landscape conditions are the major factor in wolf-livestock conflict, with certain places on the landscape becoming recurrent conflict hotspots, even after "problem wolves" have be removed. Difficult terrain is often cited as a challenge for monitoring livestock in the CNF, especially on very large allotments where cattle spread far and wide, making it very difficult to use deterrents or maintain sufficient human presence. Over the period of 2019-22, the WAG has frequently debated creating locally specific management plans for what they first called "chronic conflict zones" with multi-year histories of livestock depredation (they soon changed the term to "special focus areas" due to producers' resistance to the use of the words "chronic conflict"). However, the WAG never made clear whether these areas of repeated conflict should be considered unique due to ecological or landscape conditions, or the wolves themselves, with some members suggesting that the issue is instead "chronic conflict packs" that have learned a particular behavior, and others arguing that chronic conflicts may result from the producer's practices rather than being specific to the wolf pack or the landscape. Meanwhile, USFS staff and livestock producers often point to pack size as a key factor, arguing that bigger packs need more food and thus are more likely to go after livestock: "there's a correlation between pack size and packs that are likely to prey on livestock;" "when you start to get numbers [like] six, eight, ten [wolves] in the pack, the… nutritional need... rapidly increases." This is confirmed by state wildlife managers, who frequently point to ecological science (e.g. Bradley et al., 2015) in support of their conclusions: "within less than a year you have a pack go from two wolves to seven, the needs for protein change dramatically;" the "likelihood of wolves preying on livestock are much higher if the pack size is eight or more." Pack size may also change wolves' hunting effectiveness: one USFS manager suggests that larger packs are "more efficient in hunting on that larger scale."

USFS staff and producers alike argue that the wild ungulate population is too low, creating a lack of food source for the wolves. There "should be a robust population of ungulates, but we're not seeing them," one manager tells me; another says "to put it simply, when wolves are hungry, they'll find something to eat. If there isn't big game there in numbers that could meet that need, and there's livestock, they will probably kill livestock," even though in their opinion, "wolves do prefer wild ungulate, big game, over livestock when it is available." Producers agree: "When a wolf gets hungry, he's gonna find somethin' to eat." Producers often argue that conflict is only going to get worse as prey availability continues to decline. (WDFW has commissioned a study in collaboration with UW wildlife ecologists to examine effects of wolf return on prey species as well as other predator populations, with results pending). For producers, "the best nonlethal deterrence is having enough ungulate population" (observation, Cattlemen's Association meeting) but "all of your ungulates are down in the valleys" due to wolves. Many producers blame WDFW for not doing enough to maintain the ungulate population, and/or not believing depredation of livestock is a real problem. For wolf advocates, meanwhile, the issue is not fewer wild prey animals, so much as that prey behavior has changed, gently mocking hunters in the process: "wolves are impacting prey animals' behavior… lots of hunters feel that there are fewer animals [because] you have to get out of your truck to shoot a deer."

c. The social and political dimensions of human-wolf-livestock conflict

The ongoing conflict over the return of wolves in and around the Colville National Forest demonstrates how ecological change is entangled in human political, economic, and cultural context, rather than simply an issue of scientific management. As acknowledged by many wildlife and land managers, their role in conflict mitigation often has much more to do with managing social perceptions of and responses to wolf conflict than managing the wolves

themselves. The social response to wolf return in the region has been largely negative among residents, especially the livestock producers' community, with significant distrust between stakeholders, especially on the part of livestock producers toward WDFW as well as toward the state and government in general. Deeply polarized viewpoints about the state's efforts to mitigate wolf-livestock conflict play into east-west (urban-rural, left-right) divides within Washington state and ties into other pre-existing conflicts such as local fears of rural land use change and the debate over livestock grazing on public lands. Local and national media attention have fanned the flames of conflict, as have the actions of individuals on both sides. Wolf advocates argue that livestock producers have been unwilling to make reasonable efforts to adapt their business model to accommodate wolf return, and that wolves should not suffer for the sake of this extractive, government-subsidized industry. They see a key barrier to conflict mitigation in producers' unwillingness to adapt business practices to changing conditions. Producers counter that they are doing all they can, pointing to ongoing range riding and other non-lethal efforts. They argue that despite their best efforts, the return of wolves – and accompanying stress, social turmoil, and economic impacts – make it impossible to stay in business.

In this context, the effectiveness of the various tools and techniques used for mitigation of wolf-livestock conflict become a key point of social contention. Building on the context and themes developed in this chapter through the Colville case study, I therefore turn now to a detailed examination of the tools and techniques that have been applied in the Colville, and the (perceived) effectiveness of such tools for reducing both wolf-livestock conflict and social conflicts over wolves.

4. Mitigating human-wolf-livestock conflict in the Colville National Forest: a case study in tools and techniques

In the context of human social conflict over wolves across the American West, livestock protection has long been sought through lethal wildlife control efforts. These include the historical efforts to exterminate wolves, but also more recent efforts to "coexist" with wolves (Carter & Linnell, 2016; Lute & Carter, 2020; Martin et al., 2021) by killing at least some of them. Lethal approaches to conflict reduction include the targeted removal of just the "problem wolves" that prey on livestock (Bangs et al., 2006) as well as the creation of permitted public hunting seasons aimed at reducing the wolf population more broadly, which are legal in several states in the Western U.S. Lethal removal simultaneously reduces the predator population and (arguably) increases public tolerance for wolves via the social perception of increased human control over problematic wildlife dynamics (Richardson, 2022). However, the effectiveness of lethal approaches to reduce conflict has been contested, both with regard to predators generally (one review describes predator control efforts as "a shot in the dark" for lack of adequate scientific study; Treves et al., 2016; see also Eklund et al., 2017; Treves et al., 2019; Miller et al., 2016; Van Eeden et al., 2018), and for wolves specifically (Bradley et al., 2015; DeCesare et al., 2018; Harper et al., 2008; Kompaniyets & Evans, 2017; Poudyal et al., 2016; Treves et al., 2016; Wielgus & Peebles, 2014).

With public opinion increasingly turning against lethal wildlife control (Bruskotter et al., 2007; Slagle et al., 2017), especially in states like Washington with strong environmentalist constituencies (Responsive Management, 2019), there has been an increasing trend regionally toward non-lethal solutions (Martin, 2021a; Stone et al., 2017), part of a broader movement toward coexistence with predators globally (Bergstrom, 2017; Frank et al., 2019; van Eeden,

Newsome, et al., 2020). Nonlethal conflict avoidance and mitigation efforts include monitoring of wolf locations, changes to livestock husbandry practices to avoid overlap or reduce attractants to wolves, and non-lethal deterrence measures to discourage wolves from preying on livestock. Such efforts aim to create "landscapes of coexistence" (Oriol-Cotterill et al., 2015), in which human-caused mortality risk (whether via lethal control, legal hunting, or poaching) is low enough for species like wolves to be sustained.

Yet there has also been long-standing skepticism that it is possible to find effective non-lethal tools on a scale applicable to the vast grazing areas of National Forest allotments. Two prominent wolf scientists once wrote that "all means of protecting livestock from wolves over large areas are largely ineffective and expensive" (Mech & Boitani, 2003, p.336). While this conclusion may have been overstated, the scientific consensus today is that even as the use of nonlethal methods grows, their effectiveness is still not well understood or demonstrated (Eklund et al., 2017; Miller et al., 2016; Stone et al., 2017; Van Eeden et al., 2018). In the context of this belief, and with anti-wolf sentiments still prevalent, convincing livestock producers to adopt non-lethal methods to prevent depredation can be challenging. The "willingness of livestock managers to adopt nonlethal techniques often relies on proof of their efficacy" (Dickman, 2010; Moreira-Arce et al., 2018; Stone et al., 2017; Treves et al., 2016; Young et al., 2019), where definitive proof is hard to come by, and "skepticism comes from stories or experiences of improper deployment" (Martin, 2021a). Lethal tools continue to be widely used as part of the suite of approaches, and many livestock producers continue to advocate for faster and more aggressive lethal control rather than necessarily embracing nonlethal coexistence.

In this chapter, I build on the case study of human-wolf-livestock conflict mitigation in the Colville National Forest (Chapter 3) with a detailed examination of how tools for wolf-cattle

conflict mitigation, including both lethal and nonlethal tools, have been used in the northeastern corner of Washington state. I begin by reviewing the existing scientific and social-scientific literature on such tools and techniques, including both the published, peer-reviewed science, and practitioner recommendations and "how-to" guides developed by NGOs and/or state agencies. Second, I turn to a detailed case study of how the various tools and techniques have been implemented on the Colville as a notable instance of ongoing human-wolf-livestock conflict.

As a contribution to the literature on the human dimensions of wildlife management, I examine the perceived effectiveness – and debates over that effectiveness – of these tools, with the recognition that many tools have complex effects on both social and ecological levels, and that efforts to simply say "what works" are likely an oversimplification of such complex dynamics. I thus argue that, even as state and federal agencies, NGOs, livestock producers and others have made a significant investment in developing and implementing better tools and techniques for reducing wolf-livestock conflict, this reliance on a "technical" approach to conflict reduction will likely continue to fall short if it is not paired with a recognition of the significant institutional, spatial, and especially *social* dimensions of coexistence (see Martin et al., 2021). As the Colville case study demonstrates, the barriers and constraints related to achieving wolf-livestock coexistence do often include a lack of appropriate tools and techniques for the landscapes and ecological dynamics in question. However, they also include significant social, political, and cultural constraints that reach far beyond the scope of any ecological tool to address.

a. Tools and techniques for wolf-livestock coexistence

I offer here a typology of approaches for mitigating wolf-livestock conflict, grouping extant tools and techniques into four categories: 1. reconnaissance, 2. husbandry, 3. deterrents,

and 4. removal (drawing on Martin, 2021a; Miller et al., 2016; Wilkinson et al., 2020) These tools are summarized in Table 1 below.

Reconnaissance includes tools and techniques for understanding wolf presence and movements on the landscape, and thereby proactively avoiding interactions through spacing or reducing overlap with livestock. These techniques include radio collars (usually implemented by state wildlife agencies, with data on wolf movements provided to livestock producers, or telemetry scanners used by livestock producers or herders to detect wolf presence directly), trail cameras, howl surveys, and public outreach or communication, such as collecting information about wolf sightings. These can be used specifically and intensively in conflict situations by livestock producers or local organizations, or as part of a broader wolf population monitoring effort, such as by state wildlife agencies.

Husbandry includes tools and techniques deployed on livestock to reduce attractiveness to wolves and minimize likelihood of conflict. This category includes guarding of herds (by people or dogs; most applicable to sheep herds) or "range riding" to actively patrol pastures to monitor livestock and wolf presence (more applicable to cattle). Husbandry approaches also include a suite of methods for "reducing attractants" for wolves (Stone et al., 2016), such as prompt removal and disposal of livestock carcasses, prompt removal and treatment of sick or injured livestock, and protecting calving areas from wolves. On Forest Service grazing allotments, husbandry-related practices could also include delayed turnout of livestock onto grazing allotments, taking temporary non-use of grazing allotments to avoid known wolf use areas, reducing livestock numbers in grazing allotments with suspected wolf presence, or changing the timing or order of pasture use to avoid wolf presence. Finally, the use of "low-

stress livestock handling" techniques to promote herding instincts in livestock that make them less susceptible to wolf attack is an approach growing in popularity among some ranchers.

Deterrents, or "non-lethal deterrence measures," are tools deployed to affect wolf behavior directly, discouraging wolves from preying on livestock. This category can be further subdivided in several ways: first, in terms of what part of the wolf's sensory capacities are they aimed at (injurious stimuli that cause pain, versus non-injurious tools that may include physical, visual, acoustic, and olfactory stimuli); second, automated vs human-operated tools, and third, tools with aversive as opposed to disruptive effects. This category includes a range of tools such as lights, noisemakers, non-lethal munitions, fencing and fladry, and others.

Finally, removal refers to the physical removal of wolves from the area where conflict occurs, which may include lethal control as well as translocation. Lethal removal has historically been the go-to approach for managing predators in general, including wolves. Historically, removal was done at population scale (extermination); but in the context of wolf conservation today, wolf removal usually refers to targeted killing of specific individuals identified as "problem wolves" associated with depredations (Harper et al., 2008). This can include incremental removal (usually 1-2 wolves killed at a time, as is generally practiced in Washington state), or removal of a full pack. Wolf removal can also include harvest (hunting) and translocation, though these practices have not been used in Washington.

Table 1: Tools and techniques of wolf-livestock conflict mitigation

Approach	**Mechanism**	**Examples**	**Responsible Party**	**Geography of Use**
Reconnaissance *(Monitoring wolf populations)*	Knowledge of wolf presence and movements allows land managers and/or livestock producers to proactively avoid interactions and reduce overlap between wolf populations and livestock.	Radio and/or GIS collars, wildlife cameras, howl surveys, public reporting of wolf sightings.	More comprehensive monitoring efforts are generally conducted by state-level wildlife agencies. Support and collaboration with residents, NGOs, and other parties varies by location.	Individual pack territories are mapped by state wildlife agencies in OR, WA, and CA via monitoring of collared wolves. Use of collars has declined following delisting in ID, MT, and WY, in part due to resource-intensiveness (Ausband, et al. 2014).
Husbandry *(Livestock management techniques)*	By changing approaches to managing livestock, producers may be able to reduce attractants to wolves and minimize likelihood of conflict.	Herding or range riding to protect livestock, removal of livestock carcasses and bone piles, protection of calving/lambing areas, prompt removal/treatment of sick or injured livestock, changes to timing of turnout onto grazing allotments, relocating herds or changing pasture use, techniques of "low-stress livestock handling" (Bangs et al. 2006; Barnes 2015; Stone, et al. 2017).	Generally the responsibility of livestock producers, often supported/advocated by NGOs (e.g. Stone, et al. 2016), local collaboratives, and/or in collaboration with state wildlife agencies or USDA APHIS Wildlife Services. Land managers (e.g. USFS or BLM) play a role in permitting timing and order of pasture use on grazing lands.	Variable. Some approaches, such as the removal of bone piles in areas with wolf populations, have been widely adopted; others remain relatively little-used.
Deterrents *(Non-lethal hazing and distancing technologies)*	Various tools and techniques have been developed to deter wolves from attacking livestock. Mechanisms include direct disruption of attacks; efforts at aversive conditioning of wolves; and spatial interventions such as fladry or fencing to physically enclose livestock areas (Wilkinson, et al. 2020).	Livestock guardian dogs (Gehring et al. 2010); fencing, fladry, and electrified “turbo-fladry” (Davidson-Nelson and Gehring 2010; Lance et al. 2010; Iliopoulos et al. 2019; Young et al. 2019); noise-makers, non-lethal munitions; automated devices such as Foxlights or radio-activated guard boxes (Bangs, et al. 2006; Barnes 2015; Stone, et al. 2017).	Generally the responsibility of livestock producers, often supported/advocated by NGOs (e.g. (Stone, et al. 2016), local collaboratives, and/or in collaboration with state wildlife agencies or USDA APHIS Wildlife Services.	A subset of these approaches has been deployed in each state researched, but which tools, in what combination, and with what level of effectiveness varies widely.

Lethal control *(Targeted removal of wolves)*	Removal of wolves in areas where conflict occurs; arguably the removal of "problem wolves" that have learned to attack livestock will reduce future depredations. Removal may be incremental (one wolf targeted at a time) or full pack removal. (effectiveness debated: see (Bradley, et al. 2015; DeCesare, et al. 2018).	Aerial shooting (from helicopter), trapping, or issuing kill permits to affected livestock producers.	In most states, targeted removal is conducted by USDA APHIS Wildlife Services at the request of affected producers, generally after authorization from the wildlife managing (state or federal) agency.	Frequently used in ID, MT, and WY. Restricted in WA and OR by state policies that require use of nonlethal measures first, and permit lethal removal only after repeated depredations. No control actions allowed in CA, where wolves remain protected under CESA.
Hunting *(Generalized wolf removal / population reduction)*	Killing of wolves reduces or limits population numbers, and works to increase wolves' fear of humans / prevent habituation.	Regulated, legal hunting seasons; designation of wolves as a "shoot-on-sight" species.	General public and/or affected residents, as regulated by state and/or federal law and wildlife agencies.	Legal hunting seasons for wolves exist in ID, MT, and WY; wolves are protected as a state endangered species in OR, WA, and CA.

i. How the tools work

Recognizing that wolf predation on livestock is an ecological interaction shaped by the biophysical landscape, livestock ecology, and carnivore ecology (Miller & Schmitz, 2019; Wilkinson et al., 2020), I understand husbandry tools as those aimed primarily at affecting livestock behavior and landscape use, while deterrence and removal are aimed more directly at influencing predator (wolf) ecological dynamics. Different interventions are also targeted at specific steps in the ecology of predation, which John Linnell et al (2012) describe as a six-step process: search, identify, approach, attack, kill, consume. This process is also often simplified in terms “proactive” tools, deployed in advance of predation events, versus “reactive” tools used after the fact.

Reconnaissance is generally proactive, and does not directly prevent or reduce predation, but instead is mainly used to inform how and where other interventions are implemented via

knowledge of wolves' spatial use patterns. Data obtained from wolf monitoring allows for many other deterrence techniques to be more effective; for instance, radio collars are necessary for the use of radio-activated guard boxes, but data obtained from these collars can also be useful for informing where range riders patrol, where and when livestock are released on the landscape, where tools such as fladry are used, or for finding wolves to implement lethal removal. However, wolves' ability to traverse large areas rapidly makes predicting movements to avoid conflict a difficult task. In addition, the sharing of detailed, real-time or recent data about wolf presence with livestock producers or the public is cause for hesitance on the part of wildlife agencies and wolf advocates, who worry that poachers might use it to track down wolves. Monitoring is also time and labor intensive and expensive to maintain (Bangs et al., 2006), and states with established wolf populations have tended to move away from monitoring on the level of individual wolves or wolf packs in favor of more cost-effective techniques (Ausband et al., 2014; Martin, 2021a).

In general, husbandry practices also tend to be proactive, aiming to intervene in the search/identify phases of potential predation, by reducing spatial overlap or making livestock less attractive to wolves. As Lorna Smith et al (2014) write, "producers experienced less predation loss when they hauled away sheep carcasses, lambed during particular seasons, confined flocks of sheep to corrals, and maintained large flock sizes" (see also Breck & Meier, 2004). Deterrence measures, on the other hand, can span the range of predation interactions, from the predator's initial search for prey to even during the act of consumption. Many are generally understood to be most effective if implemented proactively (for example, fencing, fladry, and foxlights all aim to prevent wolves from approaching livestock use areas), but others

are generally only applied once wolves are "caught in the act" of attacking livestock (for example, manual scare devices and other forms of harassment).

While a few tools, such as fencing, rely on physically separating wolves from livestock, most deterrence techniques are based on manipulating wolves' risk-aversion behavior, inducing fear "to increase perceived costs of preying on sheep [or other livestock], redirecting predation onto wild ungulates instead" (Martin, 2021a, p. 6). In this way, reduction of wolf-livestock conflict is often done through management of the "ecology of fear" (Gaynor et al., 2019, 2020; Miller & Schmitz, 2019; Wilkinson et al., 2020; see discussion of this literature in section 6a below). Fear-inducing tools fall into two categories: those that must be continuously or repeatedly applied as "disruptive stimuli," scaring wolves every single time they approach or attack, and those that are intended to work as aversive conditioning tools, using a negative stimulus associated with approaching or attacking livestock to change behavior more permanently. The first category includes automated tools (such as RAG boxes and motion-activated lights) that simulate or "back up" human presence. However, many such tools stop working when wolves become habituated to the stimulus (Linnell et al., 2012; Shivik, 2006; Shivik et al., 2003). The latter category, on the other hand, is actually reliant on wolves' capacity for learning and high behavioral plasticity – i.e., that wolves will learn to consistently avoid, rather than becoming habituated to, a particular stimulus. This category includes electric fencing and electrified "turbo-fladry," and may arguably also include hazing/harassment practices if applied effectively and consistently enough (Shivik, 2006; Smith et al., 2014).

Wolves are known to learn rapidly from experience, including recognizing new food sources such as livestock as prey, developing fear deterrent stimuli, and becoming accustomed to those stimuli, making disruptive tools ineffective again. Wolf-livestock conflict deterrence

through behavioral conditioning thus raises complex questions of animal learning and psychology that are not well understood, despite ongoing biological study (Edelblutte et al., 2022; Snijders et al., 2019). Unfortunately, many deterrent tools tend to be deployed only after depredations have already begun, which generally reduces their effectiveness. Non-lethal tools applied after wolves have adapted to livestock predation are much less effective at deterring predation in the approach-identify phase (Much et al., 2018), and if deterrents are applied in a way that is not clearly connected to the act of livestock depredation wolves are more likely to become habituated to them (Breck & Meier, 2004). Moreover, even if a particular deterrent appears to work locally, it may just displace the issue somewhere else: "some believe a wolf with a hunger for domestic animals continues searching for such prey after being deterred from its first effort" (Treves et al., 2019). Wolf deterrence thus exemplifies the challenges of predator management in general, where tools are "often applied far from a domestic animal loss and long afterwards, or applied pre-emptively to predators that cross paths with a human… the functional effectiveness of these indirect actions for preventing future threats is unclear and often not directly measured" (Treves et al., 2019).

ii. Lethal removal as a conflict mitigation tool

Removal of wolves is among the most used techniques for addressing wolf-livestock conflict. As a broad category, removal includes public harvest (hunting), translocation, and targeted lethal removal, usually conducted by a wildlife management agency. Although some stakeholders call for using hunting, which is currently illegal in Washington, as a tool for reducing conflict, a recent study (DeCesare et al., 2018) found that while hunting reduces the wolf population overall, there is no correlation to reducing livestock depredations. Translocation may be viewed more favorably than lethal removal by the public but appears to have relatively

little other benefit: translocated wolves frequently die, return home, or continue to depredate livestock where they are relocated (Bradley et al., 2005). Moreover, translocating wolves risks playing into social fears that the state is actively reintroducing the predators. For these reasons, Washington state has used only targeted lethal removal strategies. Targeted removal is usually reactive, employed after livestock have already been killed, though some advocates of more aggressive control actions argue for removal's deterrent effects on other wolves, such as killing one wolf to scare others off.

Adrian Treves et al (2019) offer two hypotheses for how predator removal works: the "turning down the heat" hypothesis suggest that control of predators leads to fewer and/or more fearful predators, and thereby reduces conflict with people and promotes coexistence. On the other hand, the "turning up the heat" hypothesis suggests that new predators are likely to move in, or surviving ones will struggle to hunt and increasingly turn to livestock prey, leading to increased conflict. The latter hypothesis may be particularly true in the case of incremental removal of wolves – as social animals, killing one pack member stresses others with poorly-understood results, possibly leading to more rather than less livestock predation (Imbert et al., 2016; Poudyal et al., 2016; Santiago-Avila et al., 2018). For predators in general, the current scientific consensus is that removal tends to be a short-term solution at best, which may solve the problem temporarily at a local scale but often must be repeated over and over, and may become costly, as predators continue to return (Eklund et al., 2017; Lennox et al., 2018; Miller et al., 2016; Moreira-Arce et al., 2018).

Even as targeted lethal removal remains the go-to tool for wolf-livestock conflict in many parts of the western US, its effectiveness is debated. For wolves in the Rocky Mountain region specifically, the science on lethal removal has become controversial and politicized. Notably,

Wielgus and Peebles (2014), studying lethal control actions between 1987-2012 in Idaho, Montana and Wyoming, found that depredations increased after lethal removal. Soon after the study was published, however, Dr. Robert Wielgus became personally embroiled in controversy in Washington state after publicly criticizing ranchers for allegedly baiting wolves to attack livestock by placing salting sites near their dens. In the ensuing controversy, Wielgus resigned and his research lab at Washington State University was shut down. Wielgus's supporters claim that this was done at the demand of rural state legislators aiming to suppress his conclusions, while his critics claim that the science was biased by Wielgus's political stance. Reanalysis of the same data (Kompaniyets & Evans, 2017; Poudyal et al., 2016) later found the opposite result, challenging Wielgus and Peebles' findings (Treves et al., 2019). Meanwhile, Bradley et al (2015) found that depredation decreased the year after lethal removal: recurrence of depredation slowed from 19 days without removal, to 64 days with partial removal, to 730 days after full pack removal. DeCesare et al (2018) similarly found that "targeted removal… significantly reduced the recurrent presence of depredations" in the local area. However, Bradley et al. found that depredation still tended to recur by a new pack moving into the territory left vacant within about 18 months. These conclusions thus are often cited to support the use of lethal removal, but simultaneously as evidence for the argument that "killing depredating wolves without addressing the underlying causes of depredation *only temporarily* eliminates depredation attacks on livestock" (Stone et al., 2017, emphasis added; see also Harper et al., 2008).

iii. The infamous question: "do nonlethal tools even work?"

The question of whether and how nonlethal tools work to effectively deter livestock predation by wolves is of great importance, especially in the context where the use of lethal removal is predicated on demonstrated prior efforts at nonlethal deterrence. Unfortunately,

sufficient research on the efficacy of many methods to reduce predator-livestock conflict is lacking, leading to decision-making based on other factors such as convenience, cost, or untested assumptions about efficacy (van Eeden et al., 2018). Multiple recent reviews of predator-livestock conflict, including wolf-livestock conflict specifically, agree that only a handful of existing studies meet desired criteria for demonstrating rigorous scientific proof of effectiveness (Eklund et al., 2017; Miller et al., 2016; Treves et al., 2016, 2019; van Eeden et al., 2018; van Eeden et al., 2018). As Treves et al (2016) jokingly conclude, predator control largely remains "a shot in the dark." With regard to wolves specifically, the current scientific consensus is that effectiveness has been conclusively demonstrated for just for a couple of specific nonlethal interventions: fladry (Davidson-Nelson, 2010) and livestock guardian dogs (Gehring et al., 2010), and only in the particular contexts where they were applied in those studies. In the context of this gap in scientific evidence (and with the recognition that the topic is under ongoing study in the field of wildlife ecology), the perceptions of qualified field practitioners with experience deploying nonlethal tools is a valuable contribution to the literature.

Practitioners and scientists agree that in most cases, no single method of deterrent is likely to work on its own: there is "no silver bullet" for reducing depredations (Martin, 2021a) and instead, the emphasis should be on an integrative approach that uses a suite of methods together. Evidence from applied cases suggests that nonlethal tools tend to be more effective in combination than alone (Bangs et al., 2006; Stone et al., 2017), though little scientific study has been done on how tools are often used in combination (Moreira-Arce et al., 2018). Stone et al (2017) offer an example of a case study, the Wood River Wolf Project in central Idaho, that demonstrates that "proactive use of a variety of nonlethal techniques applied conditionally can help reduce depredation on large open-range operations" (see also Martin 2021a), and argues that

"nonlethal tools and techniques have been shown to be effective, efficient, and reliable: properly applied, deterrence can reduce depredation over significant time and spatial scales and thus the need for lethal control" (cf. Much et al., 2018; van Eeden et al., 2018).

Practitioners and scientists also largely agree that the efficacy of nonlethal methods may vary with, and should be adapted to, local geographic conditions. Depredations often tend to recur in the same places on the landscape (DeCesare et al., 2018; Musiani et al., 2005) with correlated factors that include higher density of (and overlap between) wolf and livestock populations, higher levels of forest cover, and seasonality. From this perspective, it may be possible to attempt to predict where conflict is likely to occur and plan proactively, though this is by no means a clear-cut science. Sheep also tend to be at higher risk for predation than cattle (Breck & Meier, 2004; Muhly & Musiani, 2009), and sheep producers may experience "surplus killing" of sheep in excess of wolves' food needs, though sheep may also be easier to protect with livestock guardian dogs, herders, or other techniques due to their herd behavior. Practitioners recommend site-specific planning on a case-by-case basis for ranches and grazing allotments (Smith et al., 2014).

iv. "The social side" of wolf-livestock conflict deterrence

Amidst the ongoing debate over the effectiveness of both lethal and nonlethal tools, stakeholders in wolf-livestock conflict increasingly recognize that deterrence is not just a question of finding the most effective management tools for reducing depredation, but must also encompass what's frequently described as "the social side," managing public opinion and building tolerance for wolves as a key step to wolf recovery (Bangs et al., 2006; Mech, 1996; Naughton-Treves et al., 2003; Treves & Karanth, 2003). As I have noted, so-called "human-wildlife conflict" is often actually conflict over wildlife management between people (human-

human conflict), where the wildlife become a lightning rod for other cultural, political, and/or economic issues (Bruskotter et al., 2010; Dickman, 2010; Martin, 2021a; Treves et al., 2006). As John Shivik argues, "while technological advances may well lead to further improvement in predator management, ultimately some of the tools that are most desperately needed are social ones" (2006, p. 257). While land and wildlife managers are often trained in the biological sciences, their work increasingly falls into the realm of the social sciences, with management tools and policies aimed at increasing social tolerance for wolves at the same time as (and sometimes via) reducing livestock depredation.

The effectiveness of tools and techniques for conflict mitigation can therefore be understood not only in ecological terms, such as their effects on wolf behavior, but also in social terms such as their effect on tolerance for wolf return or producers' willingness to cooperate with deterrence efforts. However, such effects are not easily measured, and raise increasingly complicated questions about "what works" in these intertwined social and ecological dimensions. As Omar Ohrens et al. (2019) note, the "functional effectiveness" of a given tool or technique is not the same as its' "perceived effectiveness" (see also Treves et al., 2016). The gap between the two may sometimes be the result of an information deficit (e.g., lack of awareness of existing scientific research) among producers or practitioners, perhaps reinforced by prejudices toward or against certain approaches. However, it may also be the result of remaining uncertainties and valid scientific questions about what tools work, under what circumstances, and why. The fact that many tools (such as fladry, RAG boxes, or telemetry) also may have a "psychological benefit to users" (Lance et al., 2010), providing a sense of security to some producers that may be disproportionate to their demonstrated functional effectiveness, is often cited as a challenge for measuring effectiveness – but it simultaneously may be a useful effect of these tools in

reducing social conflict, if not wildlife conflict per se. Finally, monitoring of functional effectiveness, which is often lacking, can sometimes be useful to encourage participation in nonlethal efforts (Young et al., 2019), but it also may be controversial or even detrimental in the context of the existing polarized debate, where measuring something may be taken as akin to endorsing its validity – and of course, some livestock producers are quite blunt about the fact that their opinions are not likely to be swayed by scientific evidence anyway. Lara Volski et al (2021), noting this complex of challenges, offer the concept of "social effectiveness," recognizing that the adoption of tools has "as much to do with their social acceptability and implementation feasibility as with evidence-based measurements of tool effectiveness" (p. 1). In this context, all scientific research on questions of effectiveness must be understood as deeply politicized – not only in the sense that researchers may bring their own biases to the research (though that may sometimes be the case) but also in the sense that even when they are able to avoid doing so, the questions that are asked and the ways in which analyses are formulated are deeply and inescapably political processes.

The debate over lethal versus nonlethal tools (often framed as a choice between two distinct and opposing approaches, even as many experienced practitioners advocate integration of the two) thus also has significant repercussions on the "social side." Some argue that lethal removal "turns down the heat" by establishing a (perceived) useful tool for addressing conflict, thereby building trust in wildlife management agencies and increasing tolerance and cooperation (Santiago-Avila et al., 2018; Treves & Bruskotter, 2014); as I will further examine in Chapter 5 below. Others argue that killing wolves, even when done by official agents, only normalizes wolf killing and may potentially increase poaching. Moreover, the emphasis on non-lethal tools and the modification of husbandry practices as a prerequisite to lethal removal may can also lead to

the perception that producers are responsible, or even blamed, for depredations when they do happen (Bangs et al., 2006), and this perception of blame, or that producers bear the costs of coexistence, may also contribute to the social conflict.

b. Tools and techniques for mitigating human-wolf-livestock conflict on the Colville National Forest

Numerous tools have been applied to attempt to reduce wolf-livestock conflict in the region of northeastern Washington around the Colville NF. According to local land managers (USFS staff) and wildlife managers (WDFW staff) and producers, these include: monitoring wolf populations (by radio-collaring and with wildlife cameras); the provision of data about wolf presence and movements to livestock producers; the presence of range riders equipped with nonlethal deterrent tools; the removal and disposal of carcasses and sick or injured animals from the landscape; efforts to protect heavily-used livestock areas such as calving pastures, including with tools such as foxlights, RAG boxes, and fladry; and the lethal removal of "problem wolves" when depredations do occur, among others. Wolf advocates suggest that livestock producers should be trying "every strategy that's been tested across the planet," particularly emphasizing the nonlethal solutions to reduce depredations, and argue that the state should not be killing wildlife at the behest of livestock producers who already benefit from the use of public lands for grazing. Meanwhile producers argue they already have tried all the tools, describing a major investment already being made in non-lethal deterrents, and lamenting that they are the ones "burdened with the effort" (observation, Cattlemen's Association meeting) of solving a problem they feel they didn't cause. In the context of tensions between livestock producers and wolf advocates, land managers in the region largely support the former, arguing that permittees have been responsive and "trying to do their best" to avoid conflict, and that "when conflict has

occurred, to the extent that cows have been in the wrong place, it was by accident" and not "willful conduct" by the permittees. In the words of one Forest Service range manager, "there's been a lotta development as far as the nonlethal approach, being proactive… we know what nonlethals work. We know all the different techniques that have been presented and are on the table."

Monitoring of the wolf population is done by WDFW, and data about wolf presence and movements are sometimes shared with permittees and/or range riders. WDFW staff say they routinely share the best information they have: "if we know where a den site is or a rendezvous site is, we relay that information to them, so [they can] not put any cattle out right on top of anything." Some producers, however, feel that information is sometimes withheld: "we would like to be using wolf collar data more" but are not getting the information they need, perhaps due to concern about poaching or wolf-baiting: "[WDFW] are, I believe, purposefully not giving us the information." Some producers argue for collaring more wolves to have more comprehensive data on their locations, while wolf advocates are concerned that collars become a tool for killing wolves rather than protecting them, producing "Judas wolves" that can be used to track packs for the purpose of lethal removal. Meanwhile, WDFW is working on new approaches to wolf monitoring that will reduce the financial investment involved in trapping and collaring wolves, as documented in a recent promotional video ("How to count a wolf;" Washington Department of Fish & Wildlife, 2020).

Husbandry techniques that have been applied include: prompt removal and disposal of livestock carcasses; prompt removal and/or treatment of sick or injured livestock; use of low-stress livestock handling techniques; delaying turnout of livestock onto allotment; protecting calving area; calving outside of wolf territory; changing grazing allotments, changing the timing

or order of pasture use, or taking temporary non-use of allotments in order to avoid wolves; and reducing livestock numbers in grazing allotments with possible wolf presence. WDFW advocates a "suite of activities" approach that includes many of the above techniques in combination with nonlethal deterrents (discussed below).

WDFW staff highlight the importance of timing, correlating livestock depredation to ungulate prey availability: "delayed turnout until wild ungulates are born [is] a huge [factor]," since the presence of wild prey provides "a buffering impact" for livestock, and "undersized calves born on the range" are particularly vulnerable to wolves. Forest Service range managers are skeptical, though: "turning out late, turnin' out larger calves… I really don't know if…that's gonna make a difference." Wolf advocates often argue for moving livestock to different areas, suggesting that the USFS should be more active in being proactive about avoiding conflict on their lands. USFS managers counter that wolf presence is ubiquitous and impossible to avoid: "there's no place to take 'em… we can't offer relief from a pack that's causing depredation by simply changing a pasture rotation. It just doesn't work like that." USFS staff argue that once wolf-livestock conflict begins, changes to animal husbandry have minimal effect on preventing further depredations from occurring (personal communication, USFS staff).

Advocates of nonlethal approaches also often argue for gathering cattle together more, including with fencing or fladry in high-use areas such as calving pastures, with herders or dogs, or via the use of "low-stress livestock handling" that promote herding instincts in livestock. Many producers agree that fencing and fladry can be effective on a small scale but are not applicable to the vast landscape of NF grazing allotments. Herders and livestock guardian dogs have been used effectively to reduce wolf depredations on sheep (Stone et al., 2016), but are widely seen as inapplicable to cattle. As one WDFW manager put it, comparing the Colville

situation to more successful mitigation efforts ongoing in Idaho, “key difference is that [they have] 100 percent sheep allotments, and sheep are easier to control than cows.” Tensions also arise between the goal of wolf conflict mitigation and efforts to reduce the ecological impacts of grazing, as one producer described: “the Forest Service wants your cows… dispersed out across the countryside, spreading the impact out… when you bring the wolf into that, [the cattle] bunch up… what happens is the riparian areas can get overused because the cattle won’t go out as individuals.” From this perspective, sustainable ecological management to reduce the impact of grazing on the landscape is arguably at odds with reducing wolf-livestock conflict.

Deterrence techniques, aimed at keeping wolves away from livestock, that have been used include electric fencing, fladry (also sometimes electrified), foxlights, radio-activated guard (RAG) boxes, and nonlethal munitions, among others. WDFW often supports producers and range riders in deploying these techniques, emphasizing the strategic use of multiple tools in conjunction, based on specific landscape conditions. Many tools have been automated, since contact between people and wolves to provide the opportunity for hazing or harassment is actually quite rare, as one range rider tells me: “if wolves come in the vicinity of cows, you chase them away… [but I’ve] never been in that situation with wolves.” Though many land and wildlife managers agree that these tools can be useful, some livestock producers are often skeptical: “all those non-lethal kind of deterrent type things, I haven't seen any of them be successful,” and some go so far as to consider cooperating with WDFW on deterrence tantamount to accepting wolves: “they’re not really buying into a nonlethal discussion,” per one WDFW manager. Others return to the argument that livestock depredations relate to the lack of a wild food source for wolves, suggesting that deterrents would work if wolves had other options: “I think you can have a fairly effective, nonlethal deterrent effort as long as there is a... native

food source for those predators… when that balance falls apart, I don't think it matters what you do. I think that you're fightin' a losin' battle." Some land and wildlife managers suggest that the deterrence approach, while useful, but may be given too much emphasis or unreasonable expectations: "there's a lot of money and a lot of effort put toward non-lethal deterrence... they are somewhat effective [but are not] ever going to remove the risk of depredations," one tells me. Those who support deterrence tools recognize that their effectiveness is often short-lived, so they must be rotated or used in combination, as one WDFW conflict specialist explains: "you can't simply throw everything at wolves at one time and then expect those tools to be static and in place and to remain effective on the landscape."

Perhaps the most widely used, and among the most controversial, of nonlethal tools is range riding, which includes elements of animal husbandry, deterrence, and reconnaissance. Range riders patrol the landscape, often on horseback or ATV, monitoring livestock and watching for wolf activity. Multiple organizations are currently involved in range riding efforts, with some riders paid directly by WDFW, and others hired directly by producers or by local organizations such as the Northeast Washington Wolf Cattle Collaborative (NEWWCC), an organization with ties to the conservation group Conservation Northwest, or the Cattle Producers of Washington (CPOW), a local organization of cattle producers. Funding for range riders is often supported by the state through cost-sharing agreements from WDFW. WDFW has been strongly supportive of range riding, describing it as "one of the best tools to minimize the chance that you will have livestock conflict" and "the most effective tool that we have," especially for larger allotments. USFS managers, though, are more equivocal: though one allows that range riding is "on the list of things worth trying," others point to how much range riding is already happening, with limited result: "There's a… lot of money and effort put toward range riding," "I

think it's safe to say there's no lack of range riding going on" and yet, "I'm doubtful that it does very much… it's not as important as the public or the Department of Fish and Wildlife would lead you to think."

Even as it is widely used and advocated by many, there is ongoing debate over what range riding means and how it should be done. WDFW describes range riding largely in terms of proactive husbandry, aiming to "bunch [the] cattle… out in the allotments, look for injured, sick, or anything like that to remove them off the landscape" and "specifically looking for changes in livestock behavior, changes in the condition of cattle." For others, range riding is more directly oriented toward wolf presence and deterrence: one USFS manager describes range riding as "the mothership of tools" because "all these other nonlethal tools, they come offa this range riding," and therefore suggests that range riders should be supplied with collar location data to effectively implement deterrents in the right places. For some producers, the presence of riders on its own is seen as a tool to deter wolves by maintaining fear dynamics: "havin' the human presence around there makes the wolves… more leery" and less likely to approach livestock, though for others "human presence doesn't really mean anything" (observation, Cattlemen's Association meeting).

Some believe the most effective thing a range rider can do is to "find the dead stuff," meaning evidence of wolf depredations. The Cattle Producers of Washington (CPOW) reject the term "range rider," describing themselves instead as "conflict monitors" working to collect better information about when and where cattle have been killed, with implications including payout of compensation funds, WDFW authorization of lethal removal, and public awareness of the number of wolf depredations. This stands in contrast to the idea of range riding as a useful deterrence tool, as it is framed by both WDFW and the other major local organization involved in range riding, the Northeast Washington Wolf-Cattle Collaborative (NEWWCC). The tension

contributes to some bad blood between the organizations involved in range riding, and the producers who work with them. Though WDFW supports the work of both CPOW and NEWWCC, the two organizations are sometimes in competition for funding, and hold competing notions of how the work should be done. Some conservation advocates argue that range riding should be done by someone neutral, not the producers themselves, suggesting that CPOW's objective is not actually to reduce conflict at all ("they just thought it was a waste of time and money") but simply to provide increased evidence of the need for wolf removal. One CPOW range rider, describing his work, aims to fend off this criticism raised by wolf advocates, while simultaneously acknowledging that his goal is primarily to find, not prevent, depredations: "I don't wake up every morning thinking, man, what can I do to get some wolves killed today. That is not my goal. But my goal damn sure has been to try to see that we live by the rules… that said, if you suffer these kind of losses, this [level of lethal removal] is what we can do, and we'll get to… where [producers] get some relief." He goes on to criticize other range riders: "a lot of the people that are [range riding], they're very nice people, well-meaning, [but] they don't know shit about what they're doing… they're more or less just going for a trail ride. How many of those other organizations have found any depredations so far this year?"

Regardless of how range riding is understood, many stakeholders agree that the scale of USFS grazing allotments is often unrealistic for range riders: "there's one allotment that we're riding that's 59,000 acres... There's no way just to aggregate cattle so that you can get more human eyes on cattle every day." One local leader of range riding efforts describes a conversation he had with a Montana rancher with years of experience in nonlethal deterrence: "I said, "We have like one rider per allotment, and some of the allotments are 29,000 acres," and she just said, "Well, you're wastin' money." [Laughter] That kind of hit me." Wolf advocates

therefore argue that this is simply not a reasonable landscape, due to rugged terrain and dense vegetation as well as the size of allotments, on which to allow grazing: some places are just "not defensible" and "you [would] need an army of range riders out here to keep track of your cows." Many suggest that human presence as a deterrence tool can be reasonably effective only when livestock are contained in small areas like calving pastures. Even producers who use range riders, and believe it works, are skeptical that this is a sufficient solution to the problem, pointing to the stress and intensity: "we have a range rider… seven days a week…putting in 14, 18-hour days," and "we don't have the stamina" to keep up that pace. Advocates of the approach suggest that range riders ought to be out on the allotments in the mornings and evenings to be effective, since "no self-respecting wolf is out there running down prey in the middle of the day," but some range riders themselves reject that idea: "that ain't going to happen with me… I've got livestock at home to take care of…[and] I'm very partial to dinner… What [that] seems like to me is, more requirements put on somebody like me that is going to drive me away from doing the job."

As with so much about the wolf issue, the question of range riding has become deeply politicized. Wolf advocates and supporters (including some who work as range riders themselves) suggest that many other range riders are not actually particularly committed to deterrence. They point to a 2020 controversy in which some range riders allegedly falsified time cards to be paid for hours they were not on the range (Francovich, 2020) as evidence of the cattle producers' community's insincerity and lack of real commitment to the effort. Advocates of the range riding approach argue that it shouldn't just be business as usual for producers: "riders should do something different besides what you would do if wolves weren't around." However, they also acknowledge that that perspective only inflames the social conflict, contributing to producers' perception that the state is overstepping its role by dictating how they manage their

cattle: “that has a tendency to anger people to bring that up, that instead of the state managing the wolves to protect cattle, that the ranchers are being asked to manage their cattle to not be affected by wolves as much,” one range riding advocate tells me.

Finally, lethal removal of wolves, used by WDFW as a last resort when other efforts are unsuccessful, has become the center of a heated debate in Washington state. Lethal removal of wolves has occurred in Washington state in 7 out of 9 years during the period 2012-2021, including every year since 2016, with a total of 34 wolves removed. Lethal removal has been and authorized by WDFW in at least 9 distinct pack territories, all but one of which is in northeastern Washington. Though environmental groups raise concern about the frequency of these removals, with some going so far as to argue against killing wolves at all, wildlife and land managers generally agree that lethal removal is a necessary “tool in the toolbox” of wolf management, and that there will always need to be a baseline number of removals to manage conflict. They often point to states such as Idaho and Montana as models for wolf management, using, as one land manager puts it, a “holistic approach” that includes hunting and lethal removal aimed at population management “like wildlife managers should do.” Yet there is also widespread recognition that “this is Washington, and we’re different”: public opposition to lethal removal is especially strong here compared to other states, and environmental groups see the state’s political environment as an opportunity to push for a more protective wolf policy.

In this context, the threshold for “going lethal” that is laid out in the Protocol is a major point of social conflict, as I will discuss in greater detail in Chapter 5. Livestock producers, and even some conservation groups, frequently argue that doing lethal removal faster would lead to fewer lethal removals: “I think they would end up killing fewer wolves if they would move to lethal removal more quickly.” Land managers therefore suggest having a lower bar for the use of

lethal removal, with quick removal targeted at a specific "problem wolf" or wolves that prey on livestock. The conservation community, though, is divided over this practice, with some supporting removal when necessary while others argue that the use of lethal removal only normalizes killing wolves. There is also widespread disagreement about the purpose and function of removal. To summarize, some see lethal removal as a simple tool for eliminating a problem wolf, others describe it as a tactic for "changing pack behavior" by reducing the wolves' caloric needs and/or hunting capacity, and still other describe it in terms of "sending a message" to the wolves, with effects beyond just the targeted individuals: "if you shoot one...the others see that." In the context of these competing conceptualization of the lethal tool, the science on wolf removal has become deeply politicized, with groups frequently appealing to competing scientific studies on wolf removal to support their claims. In this way, lethal removal has become the flashpoint for the political polarization over wolves. The ensuing social conflict over the practice in Washington specifically dwarfs the scale of the actual removal program: even as hundreds more wolves are routinely killed by Wildlife Services and other agencies across states such as Montana, Idaho and Wyoming, Washington is often the center of efforts to shift lethal policy because of the social context.

c. Key barriers and constraints to mitigating conflict on the Colville NF

This difference in social and political context from state to state underscores the point made by Bill McIrvin: "the wolf is not the problem – it's the laws and policies around the wolf" that ultimately drive the heated social conflict. This is not to say that wolf behavior does not matter, or that the various (lethal and nonlethal) tools and techniques used to influence predation behavior cannot play a significant role in mitigating conflict. But as McIrvin and others (including both livestock producers and conservationists, with otherwise divergent views) have

observed, the level of social conflict *over* wolves in a "hotspot" like the Colville National Forest does not necessarily have a clear correlation with a substantially increased level of livestock depredations compared to other similar landscapes elsewhere in the American West. That is, the social dimension of human-*human* conflict over wildlife may have significant causal factors independent of human-*wildlife* conflict. Though wolves, wolf predation of livestock, and related social conflict all exist in numerous places across the West, the unique challenges of addressing them in Washington are often driven by the effects of state policy around wolf management.

This is not necessarily to support McIrvin's conclusion that Washington *should* follow in the footsteps of other states with hunting seasons and more aggressive lethal actions, but merely to recognize that staking out a different path on wolf management has important effects on the social and political, as well as ecological, dimensions of wildlife management. The premise that "this is Washington, and we're different" contributes to a strong sense that management is driven by west-side "liberal values," adding to an already-polarized political division within the state. In this context, efforts to encourage the use of nonlethal tools and techniques can backfire. As one local resident put it, "they [WDFW] come over here and talk to us about [nonlethal approaches], but it's much easier to do that when you're not the state telling ranchers how to manage your cattle... It just doesn't go over well to have the bureaucracy telling you how to manage your cattle when the lethal control is much more regulated." The prevailing sense that wolves are WDFW's responsibility, and wolf-livestock conflict therefore "their problem" to solve, is reflected in widespread rhetoric placing ownership of wolves in the hands of the state, often contrasted with the producers' private property rights with regard to their cattle: "the department has no business managing livestock -- they should be managin' their animals… *their wolves*." Producers (and many land and wildlife managers) hope that delisting of wolves at the state level

may reduce conflict and "help bring more normalcy to wolf management," including lowering the bar for lethal removal, but delisting is unlikely to happen very soon under the current criteria for dispersal.

For wolf advocates who support the state's unique path, on the other hand, the barrier to successful coexistence is not the state's policy but the producers' unwillingness to change their practices in changing conditions. "Some people just don't want to adapt," they argue, "…in other businesses you learn to adapt to changes, or you go out of business... I don't understand why this particular business is entitled to such an intensive government response to keep them in business." The state wildlife agency, working to encourage a shift in behavior on the part of producers, is therefore straddling the line between a mandatory approach, requiring certain actions to be taken (where they have the legal authority to do so), and a supportive approach, based in education and financial support for adapting practices. WDFW describes their efforts as aiming to increase producers' "acceptance of nonlethal tools as a way of doing business," but simultaneously acknowledge that "it's hard to change something… they've been doin' for 50 years...the same way." The ongoing debate over the use of range riding, which is both widely recognized as a key tool in use in the region, but also as a source of conflict within the community, is illustrative of the challenging social dynamics involved in wolf-livestock conflict mitigation. Producers who have embraced the concept, working with WDFW and/or NEWWCC, report a social backlash from their neighbors: "we've received a lot of criticism because we've had a range rider – from our peers." In the context of political polarization and anti-government sentiment, they report, the neighbors see their efforts at range riding as a collaboration with the enemy (environmental organizations or the state), and/or an implicit endorsement of wolf return.

Understanding conflict mitigation as a fundamentally social and political challenge, entangled with questions of state authority, land use change, rural identity and history, and political polarization, adds layers of complexity to the technical question of which tools and techniques work best for addressing wolf-livestock conflict. Ongoing scientific research into "what works" for wolf-livestock conflict mitigation, though certainly valuable, faces a very difficult challenge of controlling for the complex social and ecological variables of the real world, as evidenced in the Colville case. Tools and techniques do not operate in isolation but are often used in tandem; lethal and nonlethal methods are not necessarily "alternatives" but may support each other, and perhaps most importantly, efforts to reduce the number of livestock depredations may ultimately be secondary to efforts to increase human tolerance and/or cooperation around the wolf issue. Indeed, many residents and stakeholders argue explicitly that the key barriers to achieving coexistence are not the ecological questions of landscape conditions, wolf or livestock behavior, or mitigation tools – instead, they see that the issue is ultimately one of "conflicting social values," and ultimately "an identity issue."

In the context of polarizing conflict over the role of state management and the competing social values the state must try to balance, the question of state policy regarding lethal removal has come front and center in the debate. In the following chapter, I turn to directly examine this question and the complex social dynamics it engenders.

5. Killing for the common good: lethal removal as conservation environmentality

NOTE: a modified version of this chapter was published under the title "Killing for the common good? The (bio)politics of wolf management in Washington State," Elementa: Science of the Anthropocene, 9(1): 00179 (2021).

In this chapter, I draw on the framework of multispecies political ecology (De Silva & Srinivasan, 2019; Margulies & Karanth, 2018; Sundberg, 2011) to examine how conflict over wildlife reflects "deep-seated questions about identity, belonging, and access resources" (Hennessy, 2019, p. 14). That is, Washington's wolf controversy is not just about wolves but about human relations, not only with one another but also with land, animals, and resources (Martin et al., 2019; Wilson, 1997). Conflict over wolves represents competing underlying social values, deeply rooted in people's ways of life and social identities, that inform very different management actions, such as when and how to kill wolves to mitigate livestock losses. I draw here particularly on ethnographic research (participant-observation and interviews) on the state's Wolf Advisory Group (WAG), which consists of stakeholders from different social and political groups across Washington and provides guidance and recommendations to the Washington Department of Fish and Wildlife (WDFW). More than simply a group of advisors, the WAG represents a process of participatory governance aimed at reducing conflict through the collaborative engagement of stakeholders with opposing views. The empirical data emphasized in this chapter includes 25 qualitative interviews conducted in 2019-2021 with WAG members and other stakeholders, including livestock producers, conservation NGO representatives, and state and federal agency staff, among others. It also includes field notes and transcripts from participant-observation, including attendance at WAG meetings (which are open to the public) in the period 2018-2020 and minutes from earlier meetings made available by WDFW.

I focus on the ongoing debate and negotiation at the WAG over when the state should "go lethal," meaning, step in to kill an otherwise-protected wolf when non-lethal measures aimed at deterring wolves from preying on livestock do not succeed. I frame the negotiation over the use of lethal removal through the lens of *conservation biopolitics*, a concept drawing on the work of Michel Foucault, as well as more recent work in human geography and animal studies, that examines how conservation works to foster and care for certain forms of life while making others disposable. I argue that lethal removal works as a biopolitical intervention to promote the life of the population, at the expense of the individual wolves that must be killed, on the basis of social norms regarding what is acceptable wolf behavior that humans can "live with*"* (Peltola and Heikkilä 2018; Lorimer 2017a). The WAG negotiations over lethal removal amount to a social process of negotiating shared norms regarding wolves' lives, and deaths, at the hands of human wildlife managers. In this way, conservation biopower functions through what Foucault called governmentality, or the "conduct of conduct": environmental governance is enacted through the reproduction of competing narratives about human-wildlife relations**,** which differently emphasize biosecurity via eradication of threat**,** or the value of biodiversity as source of ecological health and resilience.

In contrast to the prevailing idea that the objective of lethal removal is to change wolf behavior to prevent livestock losses, I examine how killing wolves is used to change human behaviors, norms, and values. Lethal removal is used to create what WAG members commonly refer to as "social tolerance" for the presence of wolves on the landscape, based on the expectation that livestock producers will be more tolerant of wolves if lethal management tools are available when needed. Notably, (in)tolerance for the presence of wolves on the part of livestock producers is mirrored by (in)tolerance for killing wolves on the part of

environmentalists. A significant, though often unstated, objective of the practice of lethal removal is to shift values and attitudes regarding the killing of wolves, normalizing increased tolerance (on both sides) for population management conducted by the state wildlife agency. Here, I bring insights from the critical geography literature examining practices of "commoning," used here to refer to the production of mutually shared values and norms regarding the management of environmental systems. As the objective of "producing social tolerance" for wolves shows, human attitudes toward wildlife are not fixed or inherent, but continually reproduced through processes of subjectification by which people come to understand themselves in relation to landscapes and animals, with the potential to produce a set of values held in common.

I frame the WAG as such a (potential) site of commoning – or more precisely, of reexamining taken-for-granted imaginaries of land and wildlife as commons. Through this process, tolerance toward wolves is reproduced via the normalization of shared values and practices, including the use of lethal removal to address repeated depredation situations. Drawing together the commoning and environmentality literatures provides a joint framework for examining the complex processes of social construction of norms regarding wild animals' life and death. This relational, multispecies approach to the construction of shared social values toward wildlife – as part and parcel of the construction of the self as an (environmental) subject – adds depth to existing scholarship on human attitudes toward wildlife. In conclusion, I argue that wolf conservation is just as much about reproducing shared human values to produce subjects willing to coexist with wildlife as it is about reproducing animals.

a. Conservation environmentality and the governance of the commons

As discussed in section 1d.vi (above), conservation amounts to the exercise of biopower beyond the human, making desirable animal populations live while making others killable. Here, I examine how conservation biopower operates through the reproduction of cultural values, and the construction of social norms of behavior around the choices of when and how to kill animals or make them live. Wildlife governance is inherently normative, accomplished through "technologies of the self" (Foucault, 2003) that "mobilize human subjects to discipline their own behavior" (Biermann & Anderson, 2017). This process of governance through normalization and social regulation of shared values (which Foucault called "governmentality") has been applied to environmental governance as "green governmentality" or "environmentality" (Fletcher, 2010, 2017; Rutherford, 2007; Srinivasan, 2017). This analytic frames contemporary environmental governance as the production of environmental norms and values, upheld by the "environmental subjects" who act on behalf of the natural world (Agrawal, 2005; Robbins, 2012; Rutherford, 2007; Srinivasan, 2014).

Recent scholarship has brought the environmentality perspective to bear on practices of managing and governing shared resources, or "the commons" (e.g. Singh, 2017). In contrast to Garrett Hardin's infamous "tragedy of the commons" thesis, which argued that commonly held resources were inevitably abused or destroyed because people had no incentive to manage them sustainably (Hardin, 1968), more recent work on shared resource management has shown that people are not necessarily motivated purely by self-interest, and that social values and norms often play a significant role to produce reciprocal cooperation within communities (e.g. Ostrom et al 1999). As Neera Singh puts it, "local residents, or the commoners, do not stand as silent

spectators in the face of an unfolding 'tragedy' but rather devise rules to self-govern and avert the tragedy through a 'bottom-up crafting of institutions'" (2017: 756).

As John Wagner notes, the term "commons" is widely and inconsistently used across both academic and public discourse, and may refer to land itself ("common property"), natural resources ("common-pool resources"), institutional structures for management of land and resources, and/or shared social imaginaries around collective use and management of land, resources, and even technology, knowledge, or other "new commons" (Wagner, 2012). The latter sense of "commons-as-social-imaginary" – that is, a shared understanding of access, ownership and belonging, which is constitutive of a socio-political community – aligns with an emphasis on "commoning" as a verb, rather than a noun, describing collaborative actions of governance through the negotiation of collective social norms and values. Though "commoning" is often used to describe the articulation of counter-hegemonic values in opposition to global capitalism (Bollier & Helfrich, 2015), here I follow Andrea Nightingale (2019) to take the term more broadly to refer to the construction of shared social imaginaries that shape how people recognize and think about themselves, especially regarding the management of the landscapes and socio-natural systems they rely on. In this broader sense, a commons is "a set of more-than-human, contingent relations-in-the-making that result in collective practices of production, exchange and living with the world" (Nightingale, 2019, p. 18) and thus may encompass land and resources, the community and shared norms of governance organized around them, and the social imaginary that constitutes them as collectively-held. I draw together the concepts of "commoning" and "governmentality" to examine the collective social processes of environmental governance which include the biopolitical dilemmas of wildlife management. Such processes are not necessarily choices negotiated between (pre-existing) rational actors, but

instead processes of relational subjectification, whereby "environmental subjects" are continually (re)produced by and through their affective relations with places, animals, and one another.

Of course, scholars of conservation have long recognized that human cultural and social values play a critically important role in processes of wildlife conservation and management, including wolves specifically (e.g. Kellert et al., 1996; Mech, 1996; Nie, 2003). Wildlife conservation and the mitigation of human-wildlife conflict are increasingly recognized to be as much social as ecological challenges (Baruch-Mordo et al., 2009; Dickman, 2010), and predator conservation in particular requires promoting social tolerance (Chapron et al., 2014), especially in contexts where the recovery of predator populations is supported by human constituencies that are geographically removed while negative impacts are borne locally (Lute & Carter, 2020; Treves & Bruskotter, 2014). While much of the public in the United States supports the use of nonlethal tools to promote human-predator coexistence (Slagle et al., 2017), rural residents and ranchers may remain more likely to favor lethal removal (Dietsch et al., 2011; Responsive Management, 2019; Treves et al., 2013).

Social research has demonstrated strong correlations between categories of social identity (such as "environmentalist" or "livestock producer") and attitudes toward wolves, including willingness to kill them or support their killing by the state (e.g. Carlson et al., 2020; Lute et al., 2014; Naughton-Treves et al., 2003; van Eeden et al., 2021). However, such social identity categories are typically self-identified by respondents, and their meaning often goes unexamined by either respondents or researchers. In this way, the existence of differing cultural "identity" groups (with shared values toward predators such as wolves) may appear as the pre-existing ground upon which human-wildlife conflict is built. By contrast, an analysis of wildlife management as a mode of environmentality treats human attitudes toward wildlife not as pre-

formed and stable, but part and parcel of the production of knowledge about wildlife – and indeed, the production of wildlife itself – in a contested political terrain (Robbins, 2006; von Essen, 2017). In this way, the politics of the environment is not merely a question of struggles played out between interest groups (over pre-existing resources, land, and/or nonhuman beings), but also the production and renegotiation of social and political identities, constituted in relation to particular places, ecological relations, and both human and nonhuman lives and bodies (Castree, 2003; Hobson, 2007; Mansfield et al., 2015; Sundberg, 2011; Whatmore, 2002).

This work is attentive to the sociocultural formations and processes through which categories of social identity and related social imaginaries of land and wildlife as commons are produced. This approach adds complexity and nuance to the study of social dimensions of wildlife management, building upon recent work in the predator conservation literature. For instance, in a recent analysis of how attitudes toward predators correspond with social identity categories, Lily van Eeden et al. argue that social identity "can be thought of as a process" and "provides a means of defining the self" (van Eeden et al., 2020, p. 907). Attention to the production of collective social imaginaries, through the lenses of commoning and environmentality, brings deeper nuance to understanding the processes through which the self is defined, not only as an individual but in the context of socionatural relations. Understanding conservation not as the straightforward, objective protection of nature, but as the simultaneous and intertwined (re)production of embodied animals, scientific knowledges, and the various "environmental subjects" who act on behalf of the natural world calls into question the normative, value-laden, biopolitical objectives of conservation, such as biodiversity conservation or endangered species preservation. As Taru Peltola and Jari Heikkilä ask, "what populations

should be conserved in a world consisting of entangled lives rather than clear-cut categories?" (2018, p. 211)

b. Washington's wolves, from eradication to return

The anti-wolf sentiment that characterized the era of wolf extirpation in the American West represents an imperialist biopolitical mode of state control over animal life, under which predators such as wolves were perceived as threats to be eliminated due to the imperative to improve human life and wellbeing. The shift to making wolves live, by contrast, can be described as part of a more "probiotic" mode of socio-environmental governance that seeks to promote biodiversity and embrace wildness on scales ranging from the microbial to the continental (Lorimer, 2017). This cultural shift is unevenly distributed across social and geographic strata, though, and far from universal or complete. The various parties to the controversy over wolves in Washington draw on competing cultural discourses that still frame wolves quite differently: as an endangered form of biodiversity and a charismatic emblem of conservation efforts, or as a dangerous, bloodthirsty predator that threatens rural lives and livelihoods, especially cattle ranching.

Despite the libertarian political views espoused by many rural landowners and livestock producers, the way of life they seek to protect is dependent on access to common resources, specifically the use of public lands for grazing cattle. These public lands (mainly in the Colville National Forest) are managed under a multiple-use doctrine that includes both grazing livestock and promoting wildlife, as well as recreational and other uses, and tensions that arise between these uses cause significant challenges for the agencies charged with their governance (Martin et al., 2019). In this way, wolf-livestock conflict in Washington represents a conflict between competing social imaginaries regarding two perceived "commons": the wolves themselves, and

the national forest lands on which they live. A social imaginary of wolves as a commons is reflected in the management of the wildlife of the United States as a public trust that cannot be owned, but is managed by the federal government in trust for its citizens (McTaggart-Cowan & Geist, 1995), and in the broader idea that biodiversity represents the "common heritage of mankind" (see Ranganathan, 2016). Wolf advocates frequently appeal to both ideas to position wolf conservation as a "public good" that benefits people far-removed from the local community. Meanwhile, access to public lands for livestock grazing across the Western United States has been described as a "new American commons" (Worster, 1993, p. 104; see also Sheridan, 2005), and many livestock producers interpret their access to grazing as a fundamental right, rather than a privilege permitted under the legal ownership and management of the federal government. Access to grazing lands are not only essential to their economic model, but deeply intertwined with ranchers' sense of identity, including a widespread sentiment that they act as "stewards" of the landscape. In this way, both ranchers' and environmentalists' arguments regarding which people, animals, and economic and ecological processes belong on the shared landscapes of rural Washington's wolf country amount to the construction of competing "socio-natural subjectivities" (Nightingale, 2019), rooted in deep-seated (and more-than-human) imaginaries and practices for living in the world. The two perceived "commons" exist within the same geographic territory, but do not neatly correspond, since wolf populations defy human-constructed boundaries, migrating and spreading across borders and property lines on a patchwork of public and private lands. Significantly, the wildlife and the land are governed by different institutions: WDFW manages wolf policy, while the U.S. Forest Service issues grazing permits, via different processes with relatively little coordination. Competing social expectations about the public's rights vis-à-vis these resources – such as who has access for grazing, or

whether and when wild animals can be killed – represent very different imaginaries of "the commons," and those differences in social imaginary are the basis of the underlying human conflict that wolves have quite literally wandered into.

c. The Wolf Advisory Group and the (bio)political controversy over killing wolves

Aiming to reduce human-wolf conflict and ease tensions over the issue, the state of Washington convened the "Wolf Advisory Group," a committee of stakeholders representing diverse interests from around the state, to advise WDFW on wolf policy. Initially created in 2013, the WAG was revamped in 2015 in consultation with Francine Madden, whose "Conservation Conflict Transformation" approach draws on peacebuilding techniques to overcome deep-seated, identity-based conflicts over conservation issues (Madden, 2015; Madden & McQuinn, 2014). The WAG works via a process of participatory, collaborative governance and problem-solving, built on a model of "sufficient consensus" in which participants hash out their differences in often-extended conversations until they can coalesce around a shared set of recommendations to offer back to the state. Recruited and appointed by WDFW, each member of the WAG is identified as belonging to one of three distinct stakeholder groups: livestock producers, hunters, or environmentalists. By bringing these groups with strong disagreements together to discuss the issues, the WAG is intended to overcome cultural differences to develop collaboration and consensus, with representatives communicating the conclusions reached by the group back to the communities they represent.

One of the major tasks before the WAG over the last several years has been to develop a protocol for WDFW to decide when to kill wolves in the case of repeated wolf-livestock conflict. The WAG collectively wrote what was originally called a "lethal control protocol," which has since evolved into a "wolf-livestock interaction protocol" that emphasizes the use of non-lethal

methods to deter depredation (WDFW, 2017). Per protocol requirement, livestock producers "are expected to proactively implement at least two deterrence measures," in collaboration with WDFW. Such measures include the presence of range riders, techniques for "hazing" wolves to frighten them away from livestock, the use of scare devices such as radio- or motion-activated lights or sirens, and barriers such as fladry, among other tools. When such efforts fail, however, the state turns to "lethal removal," or targeting killing of the "problem wolves" that have repeatedly preyed on cattle.

The question of what the criteria should be to justify the shift from these preferred "non-lethal deterrence tools" to the practice of lethal removal – that is, when to "go lethal on them," as it is often described in discussion – has been a challenging sticking point in WAG conversations. Many livestock producers suggest that the state should be aggressive in killing wolves that have demonstrated any interest in livestock, while conservation advocates aim to reduce and minimize wolf deaths. The current iteration of the protocol (written in 2017, and revised by the WAG through a contentious process over the course of the 2019 and 2020 grazing seasons) lays out the requirements for consideration of lethal removal of wolves, which include confirmation of "at least three wolf depredation events within a 30-day rolling window of time, or at least four wolf depredations within a 10-month rolling window of time," despite ongoing proactive deterrence measures, at which point the head of WDFW may choose to authorize lethal removal (WDFW, 2017). This is accomplished either by setting traps for wolves on the ground or using a spotting plane to find the wolf pack in question, working in tandem with a sharpshooter in a helicopter to chase down and kill the targeted wolf or wolves.

Under current policy, lethal removal of wolves has become a normalized, semi-routine practice, though still a source of controversy and anger each time it occurs. Three wolves were

killed by WDFW in 2020, nine in 2019, four in 2018, three in 2017, and seven in 2016. This pattern of repeated removal is decried by many environmentalists, who call for increased efforts at non-lethal deterrence and a higher threshold for "going lethal." Both pro- and anti-wolf groups tend to portray their opponents on the issue as holding extreme views. Cattle producers frequently characterize the environmentalist objective to be not only a complete ban on lethal removal, but also to use the wolf issue as a wedge to push for an end to public lands grazing across the western United States. On the other side, environmentalists describe lethal removal as a continuation of the historical project and mentality of wolf extermination and describe ranchers as calling for a return to the "bad old days" when they could shoot wolves indiscriminately.

While there are certainly individuals who do hold these positions and can thus be pilloried by their opponents in press releases and opinion columns, in-depth conversations with people closely invested in the issue reveal more nuanced positions than this black-and-white framing would suggest. Livestock producers in northeastern Washington repeatedly emphasize that they accept (if grudgingly) that "the wolves aren't going away," and that the goal is coexistence rather than extermination. [5] Their frustration and anger are often aimed not at the wolves themselves so much as at WDFW, for what they as "insufficient management" of the wolf population. In areas with healthy wolf populations, they argue, wolf management in Washington should follow the model established in states like Idaho and Montana, where wolves that prey on cattle are routinely killed (without an apparent negative effect on the viability of the population) by the U.S. Department of Agriculture's Wildlife Services program.[6] This approach

[5] Unless otherwise attributed, all quotations from WAG members and community members throughout this paper are drawn from anonymous, semi-structured, qualitative interviews, conducted by the author during late 2019 and early 2020, and represent repeated themes evoked in these conversations.

[6] As cattle producers are quick to point out, lethal removal is widely used across other states where wolves and livestock co-occur; in Washington, it has been considered a "last straw" effort to be used only when other nonlethal methods fail.

allows for fast, decisive action, which is arguably more effective for reducing depredations (Bradley et al., 2015), though the effectiveness of lethal removal for changing wolf behavior remains a topic of debate among both practitioners and scientists.[7] It stands in contrast to Washington's process, which requires proof of multiple wolf-caused depredations, evidence of prior use of non-lethals, a recommendation for lethal removal from the state's wildlife biologists, and the final go-ahead from the head of the state agency.

On the opposite side, the question of whether to support (some level of) lethal removal has become a dividing line for the environmentalist community. Among the groups representing the "environmental" perspective at the WAG table (which include representatives from Conservation Northwest, the Humane Society, and Wolf Haven) many are quick to say that they do support livestock grazing on public lands, and even the use of lethal removal when necessary to allow coexistence of wolves and livestock. However, they call for increased requirements and standards for nonlethal measures to be implemented first, with the objective of avoiding the use of lethal removal whenever possible. By sitting "at the table,"[8] however, these groups have effectively signed off on a policy that allows for killing wolves, a compromise that is anathema

7 Competing scientific evidence is cited by opposing sides of the debate, with the objectivity of scientists producing that evidence also sometimes called into question. As DeCesare et al (2018) put it, "Studies of targeted lethal control have been controversial regarding its effectiveness for reducing depredations by wolves" (see Wielgus and Peebles, 2014; Bradley et al., 2015; Kompaniyets and Evans, 2017). Meanwhile, the question of whether judicious use of lethal removal actually leads to fewer wolves dead in the long run – a social question as much as an ecological one - has yet to be empirically tested. A recent review of the scientific literature on predator control more generally (Treves et al., 2019) formulates this unresolved question in terms of whether removal amounts to "turning up the heat" or "turning down the heat" on the conflict, and calls for further study.

8 Though this phrase is used frequently by members to describe the choice to sit on the WAG, there is not actually a table at meetings. Prior to 2020, WAG meetings were typically conducted in a seated semi-circle arrangement, with a second "outer circle" of additional advisors who may be asked to weigh in on questions relevant to their expertise but do not have a say in final decisions. Members of the public, including this author, sit in a gallery of seats at the back, and participate only during the daily public comment period (capped at three minutes per speaker). In 2020, all meetings were moved online due to COVID19, with a format in which members and advisors appear onscreen while the public can dial in to watch and listen.

to some of their supporters and has caused them to lose members and financial support over the issue. Meanwhile, other prominent environmentalist groups (such as Defenders of Wildlife, the Center for Biological Diversity, and WildEarth Guardians) do not have representatives on the WAG, either because they have not been invited or chose not to participate in the process. These groups have frequently turned to the courts as an alternative, suing WDFW to demand that they stop killing wolves. This position recently seemed to gain support from the state's governor, Jay Inslee, who wrote in a 2019 letter to the director of WDFW that the "status quo of annual lethal removal is simply unacceptable" (Inslee, 2019). While carefully worded so as not to take lethal action completely off the table, this letter served as a rebuke to the WDFW for being too quick to "go lethal" and called for a deeper commitment to non-lethal measures.

The letter re-sparked an already contentious debate over the issue within the WAG, with livestock producer representatives arguing that Inslee was "politicizing the issue," and undercutting their work toward consensus, by putting a thumb on the scales on the side of the environmentalist lobby. The governor's intervention into the lethal removal debate points to the geographic divide that underlies the wolf controversy in Washington. Much of the state's environmentalist lobby is located on the more urban west side, which tends to dominate policy at the state level, while wolves exist mainly in the rural eastern part of the state. The Democratic Party currently holds the trifecta of the state's governor's office (continuously since 1985), the state House of Representatives (since 2002) and the state Senate (since 2018), and environmental policies in general have strong support in state government. In contrast to the idea of following in the footsteps of states like Idaho or Montana about the wolf issue, many environmentalists see Washington as the opportunity to do things differently, and to set an example for a coexistence approach based in nonlethal measures. (The phrase "this is Washington, and we're different" has

been repeated enough times at WAG meetings that it is now mainly used by livestock producers as a sarcastic shorthand for environmentalist intransigence.) Meanwhile, cattle producers argue for local authorities such as the county sheriff to be authorized to use lethal control, with lower requirements than the rules set by the WAG allow. In so doing, they frame the wolf issue as a case of governmental overreach, in which bureaucratic requirements are imposed by outsiders lacking in understanding of a local issue.

d. Lethal removal as biopolitical governmentality

The debate over lethal and non-lethal methods for deterring wolf-livestock conflict in Washington is emblematic of the biopolitical character of wildlife conservation. As Foucault noted (again, speaking of human life), biopolitical efforts to foster the life of particular populations are entangled with modes of power that aim to control and punish, including through public displays of the state's power to kill (Foucault, 2003, p. 242). Regarding the behavior of wolves themselves, many of the practices of wolf management are best described as the deployment of disciplinary forms of power aimed at an animal population, explicitly attempting to use wolves' own perception of risk to elicit behavioral changes in the population. For example, non-lethal deterrent and "hazing" techniques aimed at conditioning wolves to behave in acceptable ways are disciplinary tools to control the wolf population, through repeated negative interactions with humans that inculcate fear in the wolves themselves (Miller & Schmitz, 2019; compare Rinfret, 2009). When such tools fail, lethal removal aims to eliminate wolves with learned behaviors such as preying on cattle –- justified by the identification of individual "problem wolves" and/or wolf packs, distinguished from the population being fostered as a whole. The combination of lethal and non-lethal deterrence techniques functions to eliminate wolves that prey on livestock while conditioning "normal" predation behavior (targeting wild

prey such as elk) in surviving wolves. These are practices explicitly aimed at disciplining wolf behavior through violence, or the threat of violence, to reinforce wolves' "natural" fear and avoidance of people.

The stated goal of Washington's wolf-livestock interaction protocol is to "influence/change wolf pack behavior to reduce the potential for recurrent wolf depredations on livestock while continuing to promote wolf recovery" (WDFW, 2017, p. 2). Deterrence is accomplished through a combination of disciplinary and biopolitical techniques aimed at controlling the wolf population: wolves that behave in a particular way are allowed to live, while those that do not are killed. Conservation biopower thus works to reproduce desirable wolf behaviors – what Håkon Stokland (2020) has described as "conserving wolves by transforming them" – even as popular discourses about conservation emphasize increasing the population of "wild" wolves.[9]

Significantly, these disciplinary and biopolitical techniques for managing animals depend on the (re)production of the human social norms that justify wolves' life and death, making some animals recognizable as the objects of conservationist protection while others are understood to be killable. As biologists Marco Musiani and Paul Paquet put it, "societal values ultimately determine the survival of species such as the wolf" (2004, p. 50). The competing discourses that frame the coexistence debate (presenting wolves as either deadly predators and threats, or crucial and valuable drivers of biodiversity) are reiterative of social norms that define whether (and when and how) wolves can and should be killed. Such norms are part of the broader biopolitical project of conservation to determine which populations and circulations of nonhuman life are protected, disregarded, or made killable. In this way, the conservation of a living, breathing,

[9] See discussion in chapters 6 and 7, below.

material wolf population is entangled with the discursive (re)production of cultural values about wolves. Though wolves are often seen to epitomize "wildness," they are in fact socially *produced*: their presence is the direct result of the shifting human values and subsequent actions and policies that have allowed, or even required, their population to be fostered in the 21st century after being exterminated in the 20th (Chapron et al., 2014; Manfredo et al., 2009).

In the social context of these shifting and contested cultural values about wolves, lethal removal must be understood as a biopolitical intervention aimed not only at the wolves themselves, but also at the human populations whose actions co-produce the wolf population. Apart from its effect on wolf behavior, lethal removal also works to provides reassurance to people whose livelihood may be threatened by the changing cultural and political-economic landscape, reassuring concerned rural residents that wolves remain killable in the eyes of the state. This "social tolerance" for the return of (well-behaved) wolves is widely considered to be the key ingredient in successful reduction of human-wolf conflict. One rural resident tells me that "you gotta buy some social tolerance" for wolves in the rural communities of northeastern Washington, and that to do that, "you have to be willing to kill at least some of them." This position was echoed by one of the environmentalist representatives on the WAG, who tells me that "the Department [of Fish and Wildlife] has no choice but to kill wolves" because they "have to get social buy-in from ranchers." In this way, social tolerance for killing wolves on the part of environmentalists is prerequisite to achieving social tolerance of living with wolves on the part of cattle ranchers. The decision to "go lethal" not only functions to make otherwise-protected animals killable, but even goes farther to frame their deaths as necessary in order to sustain support for the protection of wolves in general.

Though the debate over lethal control at the WAG originally emphasized its effects on wolf behavior, the group has increasingly paid attention to this issue of social tolerance, and more broadly, to the human effects of the management policies they recommend, often referred to as "managing the social side" of wolf conservation. Conversations about lethal control have tended to shift away from engaging with the controversial question of whether lethal removal actually works to effectively deter depredation (see section 4a.ii above), instead focusing on whether and how "going lethal" helps, or hinders, the production of social tolerance. This easy slide from the ecological to the "social side" was evidenced at a recent WAG meeting, where a brief discussion of lethal removal changed gears when one environmentalist representative said, "the *social* thing is, people just don't like to see wolves killed year after year, especially when it's on public lands," prompting a cattle producer to quickly respond that "people" don't like seeing livestock killed repeatedly, either. Searching for a middle ground, one representative offered the idea that the "public perception" of lethal removal is the issue, even more than lethal removal itself, and that "it might be more socially acceptable for having lethal" if the process for approving it, when needed, moved more quickly.

Another environmentalist representative on the WAG tells me, "If lethal wasn't on the table, ranchers would walk away from using proactive deterrents," and conservationist advocates should be "doing everything we can to assist ranchers to adapt to wolves being on the landscape." For this reason, while state officials and conservationists are quick to say that "no one likes seeing wolves get killed," they increasingly accept that conservation of the wolf population as a whole requires that the state kill some wolves in order to keep ranchers on board with non-lethal approaches to deterrence, as well as to discourage poaching. Wolf advocates who have supported the WAG's decision to continue using lethal removal argue that more wolves'

lives are, in fact, at risk if the state is unable to secure rural residents' cooperation and support. Referring to lethal removal, they tell me, "Ultimately this is better, not only for the cattle and the people, but also for the wolves," explaining that they believe that there will be fewer wolves killed in the long run if the WAG can find a set of practices to create sufficient social tolerance for their presence. As a biopolitical intervention, then, the practice of lethal removal appears to serve a social tool, working to influence public perceptions and attitudes toward the wolf conflict, as much or even more than it is an ecological tool aimed at affecting wolf behavior to reduce livestock depredations. From the perspective of wolf advocates willing to endorse the lethal policy, the use of lethal removal is in fact part of the continued normalization of the cultural shift toward treating wolves as a desirable form of life to be fostered and building willingness on the part of livestock producers to cooperate in coexistence efforts. This includes normalizing both the need to kill some individual "problem wolves", and the idea that judicious use of lethal removal works for the benefit of the wolf population.

While the idea that killing wolves promotes social tolerance has also been debated in the conservation literature (e.g. Santiago-Avila et al., 2018; Treves & Bruskotter, 2014), its social role in this specific context is made clear in the demands of many cattle producers, who say they are willing to continue to use nonlethal measures and practice "coexistence" if and only if WDFW will move toward faster, more decisive action to kill wolves when those measures don't succeed. As one local resident describes it, livestock producers feel like "everything [is] being shoved down their throats," and that producers' willingness to cooperate would be improved if they "had some ownership of this… if you can get people to some level of 'I own this issue,' then they start tolerating the outcome." One livestock producer tells me directly, "if you did try things people over here ask for and bring up, *whether it worked or not*, you'd have a better

relationship" (emphasis added). In this way, lethal removal appears to be effective on the producers' "social side," at least in the present moment, based on its perceived effectiveness as a behavioral management tool. While recent scientific reviews agree on the need for further evidence-based research on the effectiveness of lethal and nonlethal tools for reducing predator-livestock conflict (e.g. Treves et al., 2016; van Eeden et al., 2018), this case demonstrates the need for further social science research on the social impacts of such tools, and the policies and policy-making frameworks that guide their implementation.

The ongoing debate over lethal removal as a tool for social tolerance in rural Washington is demonstrative of how wolf conservation operates by managing and normalizing particular social values – that is, it exemplifies biopolitical environmental governance through processes of social discipline, or environmentality. The prevailing justification for lethal removal as a biopolitical intervention is that it promotes the life of the population, at the expense of a few individuals – making certain wolves killable in the service of broader human-wolf coexistence. The use of lethal removal thus hangs on the balance between competing pre-existing values toward killing wolves, but the discourse and debate over lethal policy also influences and reshapes those values. The recommendations that have been developed by the WAG in the wolf-livestock protocol, while explicitly described as aiming to manage wolf behavior, are increasingly understood by decision-makers as being about managing the human values and attitudes to build social tolerance. Doing so requires the state to walk a fine line: on the one hand, taking action to kill wolves responsively enough to convince residents that the state agency is acting to keep wolves in line, and thereby to build trust for the state's continuing authority in wolf management, while not killing so many wolves as to inflame public opinion among the broader (largely environmentalist) public in Washington State. Put another way, lethal removal

amounts to killing wolves to demonstrate that wolves remain killable, and thereby, to help wolves survive.

e. "Social tolerance" and the making of the coexistence imaginary

Significantly, the production of social tolerance for wolves, and the normalization of lethal removal as a tool for producing that tolerance, are happening simultaneously around the WAG table as across the state more generally. While WAG members frequently refer to "managing the social side," it is not clear to what extent they recognize the social shifts involved in their own ongoing negotiations. Though debate and conflict will no doubt continue, the WAG has reached a tenuous compromise and consensus around the limited use of lethal removal. One member describes it as a "fragile social compact" in which wolf advocates are willing to sign off on lethal removal, implemented by the state only as a last resort, as long as livestock producers agree to attempt non-lethal deterrence first. In other forums and media across the state, both pro- and anti-wolf groups continue to argue for more extreme policy positions (an end to lethal removal entirely, perhaps accompanied by an end to public lands grazing, on the environmentalist side, or the right of citizens to shoot wolves themselves, or at least for the county sheriff's office to do so when needed, on the cattle producers' side). Around the WAG table, though, the parameters for debate are based on the shared expectation that no wolf policy can reasonably expect to completely prevent depredation of livestock, and that lethal removal conducted by the state agency will necessarily remain a necessary tool in the toolbox of conflict deterrence measures.

One longtime participant in the WAG explained this process of normalization and moderation of values, saying that when members initially join the group they might "come to war" with extreme views – on the one hand, those who want "every wolf shot and killed," and on

the other those who want to see wolves "frolicking around, doing whatever" with no human interference whatsoever. Those perspectives are quickly toned down, though: "most people on the WAG aren't saying those things anymore." In this way, despite its stated intent to represent the diversity of perspectives across the state, the bounds of acceptable discourse at the WAG are significantly narrowed by their shared commitment to developing consensus. Polarized attitudes (toward wolves in general, and specifically about lethal removal) have yielded, with angry voices that used to argue for more extreme positions giving way to the expectation that WDFW, and the WAG itself by extension, be the arbiters of when wolves should be allowed to live or be killed in the name of improved future coexistence. The existence of the group itself, under the aegis of WDFW and with the cooperation of livestock producers, hunters, and environmentalists, effectively works to promote this compromise as the "mainstream" view, such that dissenting voices from both sides can be framed as extreme viewpoints.

From this perspective, the negotiations taking place within the WAG amount to a practice of commoning, in the sense of developing collective norms and values based on a shared commons imaginary that includes both wolves and livestock on the same landscape. This imaginary incorporates elements of the competing concepts of the "commons" that characterize the wolf debate, envisioning both wolves and the lands they live on as ultimately belonging to the public, despite complex processes of state and federal governance. Importantly, though, the "commons" here is not only the resource or the place, such as the wolf population or the land where livestock grazing occurs, but also the collection of socio-natural relations that allow a shared way of "living with the world" (Nightingale, 2019, p. 18; see also Singh, 2017). Such a way of living with the world – including its predators – is often articulated as "coexistence," frequently described by WAG participants as a key goal of the state's wolf management efforts.

The concept of coexistence has varied meanings in the ecological and human dimensions literatures, and does not always sit well with land managers and livestock producers (Martin et al., 2021). Indeed, some livestock producers still tell me that "coexistence with wolves is just not possible;" on the other hand, some wolf advocates contend that lethal removal should not be considered coexistence: "you can't just keep killing wolves and call that coexisting." Yet these viewpoints are largely articulated from the sidelines of Washington's wolf policy discussions, while coexistence is broadly accepted as the objective of management. As several members tells me, everyone at the WAG table is increasingly in agreement that whatever policy they come up with, "lethal removal will be part of it," but that it should be minimized and used as a last resort. In this way, the idea of "coexisting" with wolves – and specifically, the practice of targeted lethal removal as a means for coexistence – is central to the "fragile" but increasingly prevalent consensus that the WAG has been able to achieve.

Although it has not been previously described via the language of "commoning," the WAG is explicitly aimed at overcoming cultural and political divides, bringing stakeholders with conflicting views together to find shared values and to understand one another's perspectives on how Washington's wolf population should be managed. And although the atmosphere of meetings remains somewhat combative, numerous members of the group say that the WAG has had a significant degree of success improving relations, as its members have learned to see the issue from one another's perspectives and modified their own position in response. Yet when asked about how their work promotes social tolerance, WAG members frequently point to communities external to the WAG itself, suggesting that the issue is how to get cattle producers to use non-lethal deterrents, or to bring urban environmentalists on board with the judicious use of lethal removal. Such comments demonstrate little recognition of how the WAG itself

functions as a process of normalization of shared values, the seed for a broader project of coexistence. While the group is frequently described as "advisory" to WDFW, its objective of "conflict transformation" is explicitly aimed not only at *hearing* diverse stakeholders' perspectives, but also at *transforming* those perspectives through the process of discussion and negotiation, to reduce conflict between stakeholders. The increasingly-recognized goal of "producing social tolerance" makes clear that the biopolitical norms and values that shape human-wolf relations are not necessarily fixed or inherent to particular social groups, such as "ranchers" or "environmentalists," even as attitudes toward wildlife may be found to correlate with such identity categories (e.g. van Eeden et al., 2020). Instead, these norms are continually produced through processes of subjectification and self-identification by which people come to understand themselves in relation to their social and ecological surroundings, making identity itself the product of social relations that are power-laden and continually renegotiated. As Singh (2017) argues, by sharing and negotiating a commons, one "becomes a commoner," part of a collective subjectivity rather than an individualized identity category. Wolf management practices to produce "social tolerance" – that is, to normalize the values that underlie willingness to tolerate both having wolves on the landscape and killing wolves when needed – are thus processes of negotiating and (re)producing new socio-natural imaginaries, actively remaking how people recognize themselves, their place in the world, and their relations with wild animals.

The framework of commoning, taken to mean not only the governance of commonly-held resources but also the development of a shared "commons imaginary," brings attention to the processes of negotiation over social norms which represent different biopolitical regimes of relations with nonhuman animals. Developing new, shared practices for living in a world that includes predators must include coming to terms with the biopolitical norms and processes that

govern animal life and death under regimes of environmental management. The concept of "commoning" has often been used to examine how such relations are constructed "from below," or through the collaborative efforts of commoners, while analyses of environmentality frequently emphasize more top-down processes of subjectification through which power works to shape social values for purposes of governance. Both dynamics are at play in the WAG, as in many processes of collaborative, stakeholder-based environmental governance. The tension between these dynamics is essential to understanding how such governance is simultaneously a process of representing diverse perspectives and values, and a tool through which "transformation" of those values can be achieved.

The process of negotiation conducted by the WAG works to change social values to produce a particular kind of environmental worldview that might be described as the "coexistence imaginary," rooted in a belief that people, wolves, and livestock can share landscapes with (relatively) little conflict. Advocates of coexistence argue that it is possible to have wolves on public lands that are also used for livestock grazing, and to come up with tools to protect both populations of animals in the name of the public good. But to live with wolves in this way requires both environmentalists and ranchers to revise their own relations with the land and animals: coexistence depends on adherence to collaborative and communally held norms of behavior and practice, including specifically the biopolitical norms that govern the killing of wolves. The ongoing debate over lethal removal is a discursive formation through which power is internalized and re-expressed to shape relational, socio-natural subjectivities, with the goal of reconciling competing values toward the multispecies assemblage that includes wolves and national forests. The competing identity categories of "environmentalist," "livestock producer," and "hunter" that lend the original structure to the WAG itself are being (re)constructed and

(re)produced – indeed "transformed" – through the WAG's conversations, toward an increasingly recognizable subject position that coheres around the concept of "coexistence." In this way, not only animals but also humans are (re)made by conservation biopower, which works to normalize particular values regarding nonhuman lives and construct norms of behavior that support human-wolf coexistence based on state authority over wild life and death.

f. Killing for the common good

The controversy and conflict over wolf conservation in Washington provides a study in biopolitical wildlife governance: the administration of animal life accomplished through the proliferation of norms and values that govern human relations, attitudes, and actions toward a wild species. In the case of wolves, political conflict is enacted and reproduced in competing discourses about human-wolf relations**,** which differently emphasize the need for biosecurity via eradication of a perceived threat, or the value of biodiversity as a source of perceived ecological health and resilience. The ongoing debate in Washington's Wolf Advisory Group over whether and when to "go lethal" on wolves that have killed livestock is a social negotiation that both draws on (and reproduces) these competing discourses, even as the group's values increasingly coalesce around a shared set of biopolitical norms that justify lethal removal of wolves when necessary. While lethal removal officially and explicitly aims to change wolf behavior to reduce livestock depredation, I have shown how its significant purpose as a biopolitical intervention is to also change human behaviors and values, creating increased "social tolerance" for the presence of wolves.

Importantly, this "social tolerance" is a cultural value that represents a deep-seated part of people's identity and subjectivity. The debates over lethal removal in Washington demonstrate how values and attitudes toward wildlife are (re)produced through processes of subjectification

by which people come to understand themselves in relation to landscapes and animals. The framing of wolf conservation in terms of biopolitical governmentality and commoning – the latter understood not merely as a process of sharing natural resources but as the production of socio-natural imaginaries – thus offers important insight into the human dimensions of wildlife conservation, revealing the complex processes through which values and norms regarding wild life (and wild death) are produced and contested.

This analytic lends nuance to framings of human-wildlife conflict as rooted in social (identity-based) conflict by examining the processes of *production* of socio-political and socio-ecological identities and relations, rather than taking them as pre-existing. As Neera Singh writes, commoning amounts to "finding a way to produce alternate subjectivities and alternate worlds" (2017, p. 762) based on shared values and socio-natural relations. If Washington's approach to wolf-livestock interactions is successful in producing social tolerance for wolves, then wolf conservation is at least as much about reproducing and normalizing human subjects versed in the practices of coexistence as it is about reproducing animal populations. The paradox of this form of wolf conservation governance is that achieving the social tolerance necessary for long-term recovery of wolves requires that the state be willing to kill wolves in the name of a shared common interest and responsibility.

6. The socio-ecology of fear

NOTE: a modified version of this chapter is currently under peer review for publication under the title "The socioecology of fear: a critical geographical consideration of human-wolf-livestock conflict," written with coauthors Susan Charnley, Katie Epstein, Kaitlyn Gaynor, Jeff Vance Martin, and Alex McInturff, intended for publication in a special issue of The Canadian Geographer on the theme of Critical Physical Geography in Practice.

a. Introduction

Conflict over wolves (*Canis lupus*) is a preeminent example of human-wildlife conflict (HWC) and a major challenge for conservation around the world (Musiani et al., 2009; Treves & Bruskotter, 2011). Even as the return of wolves to landscapes where they were previously eradicated is celebrated as a conservation success, opposition to wolves remains—especially on multiple-use landscapes where livestock predation poses challenges for producers and resource managers alike (Muhly & Musiani, 2009). Efforts to reduce wolf-livestock conflicts, and thereby ease the social tensions that accompany them, are widespread across the growing range of the species in the American West (Martin, 2021a; Mech, 2017). However, while many agree on the goal of promoting "coexistence" between people and wolves, there is little agreement about exactly what this means (Lute et al., 2020; Martin et al., 2021; Peterson et al., 2010; Pooley et al., 2021), and conflict mitigation approaches can vary widely across jurisdictions. This paper focuses on one such ongoing effort in the state of Washington to demonstrate how wildlife policy and practices reflect complex and co-produced social and ecological relations.

Washington's approach, described as an attempt to "influence/change wolf pack behavior to reduce the potential for recurrent wolf depredations on livestock" (Washington Department of Fish and Wildlife, 2017), places a significant emphasis on the manipulation of fear dynamics, using various tools and techniques to cultivate wolves' fear of people. Interspecies fear dynamics are well known to be an important driving mechanism of the structure of ecological communities

and are the subject of an extensive literature explicating the "ecology of fear" in the ecological sciences. Yet human-wolf relationships are also strongly characterized by fear. Moreover, even as wolves' fear of people is commonly described as "innate," it is simultaneously inculcated and manipulated by livestock producers and wildlife managers deploying tools to "influence/change" wolf behavior. What is often described as coexistence is thus predicated on sustaining relations of fear: people and livestock can (arguably) share landscapes with wolves with minimal conflict, *as long as wolves are adequately afraid*.

In this paper, we extend the concept of the "ecology of fear" from the natural sciences to critically examine and interpret social science data regarding human-wolf interactions drawn from an ethnographic case study of wolf management in Washington state. Although the study of wild animal behavior conventionally falls to the natural sciences, there is increasing recognition that human-wildlife coexistence is simultaneously a social and ecological issue (Baruch-Mordo et al., 2009; Dickman, 2010; Manfredo et al., 2019; Margulies & Karanth, 2018), and that wolf behavior is directly affected by human processes and politics. This recognition has resulted in calls for more attention to the human dimensions of conservation conflicts and growing transdisciplinary dialogue between the social and natural sciences (Bennett et al., 2017; Charnley et al., 2017; Drury et al., 2011; Frank et al., 2019; Harrison & Loring, 2020; Martin, 2021a; Woodroffe et al., 2005).

We see human-wolf-livestock conflict as a prime opportunity for integrative, critical science and cross-disciplinary dialogue, raising ecological questions about animal behavior alongside social and political questions of how people demarcate space for particular uses and intervene to influence ecological processes and outcomes. We build from existing frameworks in wildlife ecology that understand animal behavior as linked to human activities, and work in

human geography and political ecology analyses that explicate the complex social dynamics of those activities. Accordingly, we understand wildlife management as a *socionatural process*, requiring a transdisciplinary approach spanning social and biophysical sciences. We thus align our work with the project of critical physical geography, which draws on the integrative strengths of geography to bring social and biophysical theories, methods and data together to "investigate material landscapes, social dynamics, and knowledge politics together, as they co-constitute each other" (Lave et al., 2014, p. 3), in the context of the fundamentally socionatural world of the Anthropocene (Biermann et al., 2020). Through critical dialogue and collaboration between natural and social scientists, we explore this controversial case of human-wildlife conflict and coexistence with an applied orientation to contemporary, on-the-ground management challenges.

In what follows, we offer a critical investigation of the material landscapes, social dynamics, and politics of knowledge at play in efforts to "change wolf behavior" in Washington State. We begin with an integrative review drawing together disparate disciplinary literatures addressing fear dynamics in human-wolf-livestock systems. Next, we describe the collaborative analytical process through which we brought these literatures to bear on our case study, which we offer as an effort at developing more critical wildlife science. We then turn to our empirical research examining Washington's wolf management, emphasizing discussions about how, why, and where wolves are (or should be) afraid. Our analysis shows how efforts to mitigate conflict involve managing complex socionatural fear dynamics with the intent to produce desired risk-avoidance adaptations in animal behavior. The social (re)production of discourses of animal fear serve to normalize relations of chronic fear between people and wolves, with cascading effects on human management interventions, wolf behavior, and the potential for human-wolf

coexistence. Drawing on this analysis of interwoven social and ecological dynamics, we conclude by developing the concept of the "socioecology of fear," a framework for understanding the complex social and ecological dynamics of human-wildlife fear relations relevant to our case study and other instances of wildlife management.

b. Fear dynamics in human-wolf-livestock socioecological systems

Fear is often a major theme in stories about wolves and their re-establishment in the American West. The return of wolves to Yellowstone National Park, for instance, is described as the driving force in a oft-celebrated process of "rewilding," via cascading trophic effects triggered by the fright wolves give to the region's ungulate populations (Klein, 2018; Ripple & Beschta, 2004). This narrative emphasizes the behaviorally-mediated effects of predators, evocatively described by ecologists as the "ecology of fear" (Brown et al., 1999; Gaynor et al., 2020). Even as recent evidence suggests that the role of fear in the ecology of Yellowstone is more limited and more complicated than early studies indicated (Kohl et al., 2018; Mech, 2012; Middleton et al., 2013), this narrative has remained a powerful illustration of the importance of fear dynamics in shaping the structure of ecological communities.

Meanwhile, the human-wolf relationship has also long been characterized by fear, as wolves are "downgraded from ultimate to penultimate predator by humans" (Oriol-Cotterill et al., 2015). Wolves have long recognized people as a threat and avoided them, even as they may be tempted by the presence of livestock as a food source (Mech & Boitani, 2003). The fear is often mutual: the extermination campaign conducted by settlers across the United States in the 19th and early 20th centuries was significantly motivated by human fear—both mortal fear of a (perceived) savage, rapacious beast, and pragmatic fear of the impacts of livestock losses amid the landscape's conversion to a (settler colonial) socio-ecosystem emphasizing animal husbandry

(Coleman, 2006). Even as wolves' return from the brink of eradication is often ascribed to a cultural reevaluation of the species (Kellert et al., 1996; Nie, 2003), significant human fear of wolves remains.

Fear is thus a boundary concept across the social and ecological sciences, but with different connotations for scientists, wildlife managers, and stakeholders. Social science scholarship on HWC recognizes fear as an important psycho-social dynamic influencing perceptions, values, attitudes, and behaviors towards wildlife (Houston et al., 2010; Johansson et al., 2012). Negative emotions like fear interact with socio-ecological dynamics across social and spatial scales, and influence individual and collective actions and identities related to resource governance (Egge & Ajibade, 2021; Epstein et al., 2021; González-Hidalgo & Zografos, 2020; Sultana, 2011). In the ecological literature, meanwhile, fear is often synonymous with "risk perception," referring to animals' capacity to perceive stimuli associated with threats such as predators, shaping risk avoidance behaviors (Gaynor et al., 2020; Lima & Dill, 1990). In this sense, fear dynamics are observed even in animals that may not experience emotion per se, referring to instinctive responses of vigilance and anti-predator behavior.

As wolves have returned to multiple-use and working landscapes across the American West —including expanding their range well beyond the protected areas where ecological fear effects have largely been described—they enter new sociopolitical contexts dominated by human land uses, governance structures, and social processes. Here, human impacts on ecosystems can outweigh "natural" predator effects (Ciuti et al., 2012), raising questions about the transferability of scientific conclusions about interspecies fear dynamics. Although strongly supported by conservation NGOs and species restoration advocates, wolf return remains a source of contention, as wolves present material and symbolic challenges to resource users and rural

residents. Wolves transgress the boundaries of spaces assumed by some human communities to be "safe" from predator presence (Buller, 2008; Collard, 2012; Philo & Wilbert, 2000), which in turn reduces tolerance and support for conservation (Miller et al., 2016; Treves & Karanth, 2003).

Political debate over wolf conservation and belonging is overlaid on a backdrop of human fear, including emotional responses (for example, fear of wolf attacks), as well as broader anxieties around the American West's ongoing economic, social and ecological transformations (Nelson, 2001; Robbins et al., 2009). Where wolf recolonization overlaps with shifting local economics demographics—particularly a declining emphasis on the "traditional" extractive economic basis of the region—the return of wolves has generated social conflict, with wolves frequently interpreted as symbolic of a loss of local control over or access to landscapes and resources, or the extension of governmental power (Gosnell & Travis, 2005; Haggerty et al., 2018; Martin, 2020; Walker & Fortmann, 2003; Wolters & Steel, 2020; Yung & Belsky, 2007). Wolves thus exacerbate pre-existing conflicts over land use and regional futures, with "rewilding" conceived as a threat to "heritage landscapes" and "place identity" (Buller, 2008; Drenthen, 2018; Foreman, 2004; Wuerthner, 2019). Critical engagements with the human dimensions of the wolf question, drawing on insights from political ecology and more-than-human geography, complicate questions of "tolerance" through an attentiveness to history and social context (Clark et al., 2013; Coleman, 2006; De Silva & Srinivasan, 2019; Margulies & Karanth, 2018; Nie, 2003; Robbins et al., 2014; Sundberg, 2011).

The much-touted concept of "coexistence" offers an optimistic vision of people, livestock, and wolves sharing the same landscape while minimizing impacts on one another (Carter & Linnell, 2016; Lute & Carter, 2020; Martin et al., 2021). Since reintroduction, and

particularly in the wake of the 2011 species delisting across the Rocky Mountain region, the reduction of conflict has often been sought through targeted removal of "problem wolves" that attack livestock (Bangs et al., 2006). The effectiveness of lethal predator control to reduce conflict, however, is contested (DeCesare et al., 2018; Miller et al., 2016; Treves et al., 2019; van Eeden et al., 2018), with public disapproval of lethal wildlife control (Bruskotter et al., 2007; Slagle et al., 2017)—especially in states like Washington with strong environmentalist constituencies (van Eeden et al., 2020)—contributing to increasing emphasis on non-lethal solutions (Frank et al., 2019; Martin, 2021a; Naughton-Treves et al., 2003; Stone et al., 2017).

Many widely promoted non-lethal deterrents (Smith et al., 2014; Stone et al., 2016) aim to support coexistence by deterring livestock predation via the manipulation of wolves' fear (Hodgetts & Lorimer, 2018; Rinfret, 2009). These employ sensory cues that wolves associate with risk—either due to the novelty of the cue or its association with predation risk over evolutionary history—to prevent livestock predation (Gaynor et al., 2020; Miller & Schmitz, 2019). For instance, human presence and livestock guardian dogs are used based on the expectation that wolves fear and avoid them; herders or range riders haze wolves away using lights, noisemakers, and non-lethal munitions; automated (radio- or motion-activated) lights or sirens "stretch" the effects of hazing when people are absent; and wolf-deterrent flagging (fladry) relies on wolf neophobia (and can be electrified for additional injurious effect) (Miller et al., 2016; Wilkinson et al., 2020). While lethal removal is usually framed as reducing conflict via population reduction, it is also often also discussed as inducing fear: "surviving predators [may] be deterred from threatening human interests by sensing the loss of conspecifics was caused by humans" (Treves et al., 2019, p. 3).

Research is ongoing around the effectiveness of these various tools and techniques for reducing livestock predation (Eklund et al., 2017; Miller et al., 2016; Stone et al., 2017; van Eeden et al., 2018; Volski et al., 2021; Wilkinson et al., 2020). Many fear-based deterrence tools and management interventions rely on disruptive stimuli and aversive conditioning – scaring wolves off in the moment of attack, or associating negative stimuli (for example, the electric shock of "turbo fladry") with attacking livestock in order to change behavior patterns (Shivik et al., 2003; Smith et al., 2014; Snijders et al., 2019). These are often explicitly spatial, creating a "landscape of fear" in which wolves perceive risk in specific places and, hopefully, avoid them (Gaynor et al., 2019; Laundre et al., 2010; Miller & Schmitz, 2019). Although the "ecology of fear" framework has thus been conceptually extended to include the effects of active human management of wildlife (described as the "applied ecology of fear," Gaynor et al., 2020), further research is needed to understand the processes by which wolf fear is produced and sustained in practice.

We treat animal fear as a socionatural phenomenon, produced through imbricated processes that cannot be divided into "natural" and "social" categories. The critical human geography concept of "socionature" (Braun & Castree, 1998; Swyngedouw, 2004; Whatmore, 2002), akin to the framework of socio-ecological systems, signifies integration across the often-divided realms of human (social) and nonhuman (natural/ecological) processes and phenomena. While "socio-ecological" is widely used in the environmental sciences to refer to linkages between these systems, which are still often conceptually discrete, "socionature" signifies a non-binary framing in which the two are never ontologically distinct in the first place (Mansfield & Doyle, 2017; Nightingale, 2019; Sundberg, 2014). Framing animal fear as the *socionatural* product of human-nonhuman interactions—and thus, a crucial aspect of the *socioecological*

dynamics of human-wolf livestock conflict—aligns with the growing body of work in critical physical geography that emphasizes the entangled production of biophysical phenomena and processes by and with human social dynamics.

c. Our collaborative research methodology for more "critical" human-wildlife science

This paper combines qualitative data collection activities and findings with a collaborative, multidisciplinary analysis and collective reflection on social and ecological approaches to questions of HWC. Ethnographic fieldwork was conducted by the lead author examining social controversy over wolf management in Washington, including specifically the ongoing debate over lethal and non-lethal techniques for reducing conflict. Fieldwork included participant observation (for example, attendance at the state's Wolf Advisory Group meetings); informal conversations and formal semi-structured interviews with parties including scientists, state and federal agency staff, conservationists, livestock producers, and local residents; and textual analysis of documents related to wolf conflict and controversy. Our focus on Washington's wolf management is situated within the context of wolf return and human-wolf-livestock conflict dynamics across the western United States, where members of our team are engaged in multiple parallel social and ecological research projects examining human-wolf conflict and coexistence from a diverse range of (inter)disciplinary perspectives.

We approached data analysis and interpretation of our case study as a process of collaboration and critical engagement across disciplinary boundaries, which we offer as a methodological contribution to the growing field of Critical Physical Geography (CPG). This emerging subfield draws on Geography's integrative strengths as a source of "intellectual vitality" for addressing the socio-ecological challenges of the Anthropocene (Lave et al., 2014, 2018). CPG draws on and remains in dialogue with cognate fields including political ecology,

science and technology studies, and land use science (Lave et al., 2018; cf. Martin et al., 2019), bringing together natural and social science insights to consider eco-social transformation and co-production, and combining an attentiveness to power relations with a serious engagement with biophysical sciences and systems.

For our team, CPG represents not merely a more "critical" approach within the field of physical geography, or to the interpretation of biophysical data, but a broad call for research that "brings together natural and social science methods, concepts, and theories" (Biermann et al., 2021) to develop integrative understandings of ecological and social systems and processes, with attention to human power dynamics, social constructions of nature and knowledge, and the politics of knowledge production itself. In this way CPG is "not just a development for geography" but has aims that "apply equally in other disciplines, such as Environmental Sciences" (Lane, 2019, p. 52), including specifically those sciences relevant to wildlife conservation and management. As Simon (2018) and Goldman (2018) have both noted, resource management and wildlife conservation practices are inherently political, even as they are "de-politicized and obscured behind a series of scientific framings and policy debates," with particular places, processes, and patterns "'spun' as strangely natural and inevitable" (Simon 2018), insights that mirror long-standing arguments of political ecologists (Robbins, 2011).

Our work here builds from this existing body of research applying the insights of CPG to environmental science, as well as from a broader scholarship of increasingly critical interventions around human-wildlife conflict and coexistence (e.g. Buscher & Fletcher, 2020; Margulies & Karanth, 2018). The "foundational premise [of the Anthropocene] that the biophysical world is now profoundly social" (Biermann et al. 2020) challenges not only geographers but also ecologists, wildlife managers, and others to move beyond an emphasis on

"natural" landscapes and processes and pay attention to what are provocatively described as "crappy" landscapes blighted by anthropogenic forces (Urban, 2018), and the social processes that produce them. A logical corollary is the study of the similarly "crappy" animals, such as feral, hybrid, or invasive species, that Rutherford (2018) calls "animals of the Anthropocene." Yet as the example of wolf deterrence through fear aptly demonstrates, even emblematically "wild" species such as wolves are also the product of entangled socionatural—and thus inherently political—processes, deserving of critical interrogation.

According to Lave et al. (2018), what distinguishes CPG research is not a particular suite of methods for studying such socionatural processes, but rather the practice of "reaching across" disciplinary and methodological divides to interpret and understand them. Rather than simply analyze qualitative, ethnographic data within a theoretical framework drawn from the social sciences, as would be the norm in critical *human* geography, our lead author therefore invited an interdisciplinary team of collaborators to join in a series of synthesis-oriented, critical discussions of the case study. Our author team brought together essential theoretical contributions from our respective fields of the social sciences (human geography and political ecology) and natural scientists (wildlife and community ecology) to build the conceptual approach of this paper. We sought out generative cross-pollinations (cf. Blaikie & Brookfield, 1987; Martin et al., 2019), tracing connections between concepts and insights from social and ecological theory to interpret and explain our case study material. Our efforts to understand the role of wolves' fear of people, as a behavioral response that is simultaneously "natural" and anthropogenically produced, led us into conversations that promptly challenged the taken-for-granted assumptions of our various disciplinary backgrounds, demanding a re-examination of our

conceptual frameworks and thereby bridging our disciplines' frequent "mutual ignorance" (Lave et al 2018) and sparking innovative insights.

This process of ongoing, collaborative exchange between social and biophysical scientists goes beyond paying lip service to interdisciplinarity, making possible the integration here of theoretical work from human geography and wildlife ecology that have not previously been in conversation. Our practice of transdisciplinary integration required developing mutually intelligible vocabulary and seeking coherence across methods and concepts not traditionally combined (see Adams 2007; Drury et al., 2011; Martin, 2021a). Building from geography's unique strength as an "anti-disciplinary" discipline (Lane 2019), we aim to develop a more critical, transdisciplinary approach to the study of human-wildlife dynamics that have often been situated and theorized in the provinces of wildlife ecology and the human dimensions of wildlife management. While further integration is still needed on the level of methodology (for example, drawing together biophysical and social data), the integration of "concepts and theories" (Biermann et al. 2021) represented here paves the way for future research in critical, interdisciplinary geographies of wildlife. Moreover, this approach offers insights not only to wildlife managers around questions of human-wildlife coexistence, but to the development of research processes and methods for interdisciplinary work much more broadly. The CPG literature provides a useful guiding set of principles for organizing an interdisciplinary collaboration between social and natural scientists and developing practices for more critical and integrative science. Taking CPG as the spark for critical practices of environmental science, broadly construed, we explore the analytical and practical opportunities made possible for studying human-wildlife conflict and coexistence, and more generally environmental management in the Anthropocene, through intentional interdisciplinary synthesis.

d. Discourses of fear in Washington's wolf management

Washington State is a prime example of ongoing human-wolf-livestock conflict and provides a case study evocative of broader themes of such conflict elsewhere. Social conflict over wolves in Washington has simmered since the first resident pack was confirmed in 2008 and has flared repeatedly in northeastern Washington after multiple controversial lethal removals. Washington's approach to wolf-livestock conflict mitigation is laid out in the state's "wolf-livestock interaction protocol," a document developed by Washington's Wolf Advisory Group (WAG), which guides the Washington Department of Fish and Wildlife (WDFW) in implementation of both lethal and non-lethal measures. WDFW has aimed to make lethal removal a tool of last resort, requiring livestock producers to use non-lethal approaches and requiring evidence of repeated livestock predation before WDFW will step in to remove wolves. This approach contrasts with current wolf policy in Idaho, Montana and Wyoming, as well as on the lands of the Colville Confederated Tribes within Washington (managed by the tribes under a separate management plan; Colville Confederated Tribes Fish and Wildlife Department, 2017). In jurisdictions where the wolf population is considered "recovered," targeted lethal removal of wolves is often among the first tools used to address conflict situations. Washington's protocol, and specifically the state's limitations on the use of lethal removal, has long been the subject of heated debate by the WAG (as discussed in Chapter 5, above), a debate that has recently moved to the public: as of the writing of this paper, Washington is accepting public comments on a proposed rule that would formally encode the processes for lethal and non-lethal responses to wolf predation of livestock under Washington state law.

The wolf issue is entangled with political polarization in the context of a strong urban-rural divide in Washington. Wolf advocates who oppose lethal removal, supported by a

politically-progressive populace on the urban west side of the state (van Eeden et al. 2020), see Washington as an opportunity for a more protective wolf policy. Meanwhile many rural residents and especially livestock producers argue for more aggressive use of lethal removal and see state policies protecting wolves as government overreach. These social dynamics in Washington are a microcosm of the wolf issue nationally, entangled with broader questions of land use, urban/rural divisions, competing notions of identity and history, and questions of local control versus governmental authority.

We examine the social context of wolf conservation in Washington, specifically focusing on discussions about wolf fear of people in debates over lethal and non-lethal management tools. Wolves' fear of people is commonly understood to be a central dynamic of conflict mitigation, but different understandings of the wolf-human fear relationship proliferate, pointing to different ways of mitigating conflict. The pivotal debate over lethal versus non-lethal deterrence hinges on questions about wolf fear. We examine those debates to understand how "fear" is understood and deployed discursively and materially in the construction and normalization of particular human-wolf relations.

One widespread view is that wolves are "naturally" or "innately" afraid of people. In the words of one WDFW wildlife manager, wolves are "in general very shy and scared of people. That's naturally normal for wolves to be afraid of people." Maintaining this "natural fear of humans and human activities," as described in Washington's Wolf Conservation and Management Plan (Wiles et al. 2011, 233), is understood to be key to not only protecting public safety, but to protecting wolves themselves, since habituated wolves are likely to be killed. From this perspective, insufficient fear of people is what leads to problems with wolves. Paradoxically, wildlife management to "keep wolves wild" requires particular, intentional human interventions

(for example, hazing) to reinforce wolves' fear, understood as an "innate" or natural phenomenon even as it is (re)produced by human activities. As one Washington conservationist said, "we always tell people, shoot an air horn, do something to keep it afraid. Don't have a neutral experience with a wolf."

The logic of normalizing negative or threatening interactions to sustain fear of people is echoed in wolf-livestock conflict deterrence. The state's efforts to "influence/change wolf pack behavior" also include modifications to livestock husbandry practices to reduce spatial overlap and attractiveness to wolves, but strong emphasis is placed on fear-based non-lethal deterrents, often implemented by WDFW "conflict specialists" working in cooperation with livestock producers. Tools such as fladry, range riders, and manual or automated scare devices to "haze" wolves are emphasized both in the protocol and in the practical guide to "living with livestock and wolves" commissioned by WDFW (Smith et al. 2014). Non-lethal tools are framed as key to maintaining sufficient fear in the wolf population to prevent livestock predation (in the words of one WDFW employee, "if you get a chance to haze wolves away from livestock, by God, do it") and also as a means of avoiding "getting to lethal."

Fear-based deterrents are thus understood as setting "healthy boundaries" for human-wolf relations, again for the benefit of the wolves themselves. As one livestock producer told the WAG, "When wolves have a healthy fear of humans and those boundaries are set, it does help those wolves on the landscape survive." In some cases, such boundaries are literal lines on the landscape, such as a line of fladry (supported by human patrol or automated deterrents) to delineate secure space for livestock that wolves fear to enter. This approach amounts to the creation of spatially-explicit landscapes of fear where wolves perceive increased risk in particular locations. Often, though, the boundary is behavioral: wolves "cross the line" when

they repeatedly prey on livestock (understood to be off-limits regardless of where they are on the landscape). This boundary is set in the protocol's guidelines for lethal removal, done only after a certain threshold of confirmed livestock predation by the same wolf/wolves: four occurrences in 10 months or three in 30 days.

The idea that non-lethal fear-based tools work—including not only in the short term to disrupt attacks, but also as aversive conditioning to change behavior more permanently—is contested. Some wildlife managers are skeptical: one interviewee, experienced with deploying non-lethal tools, said that aversive conditioning of wolves isn't really possible – it's "just too hard [because] you would have to catch them every single time." On the other hand, a range rider explained his work on wolf deterrence to the WAG, saying "if this is done right you're conditioning those animals" (the wolves) to think "wow, every time I come in here there's a weird-looking guy on a horse… they can be conditioned like that," he insisted.

One point of widespread agreement among many stakeholders is that non-lethal deterrents are much more effective when used *proactively* rather than attempting to "change" behavior after livestock predation begins. While ranchers and wolf advocates find little common ground, they largely agree that it is easier to discourage wolves from switching prey in the first place than it is to get them to switch back once they become accustomed to attacking livestock. "You're not gonna teach wolves to change their diet," one WAG member said; you might as well "teach them to speak English [or] teach them to eat tofu." For many, this argument supports proactive changes to husbandry practices and the use of non-lethal deterrents to keep wolves and livestock physically separated, based on the expectation that spatial overlap often leads to conflict. However, the argument that wolves cannot be re-taught once they recognize livestock as a food source is also used to call for more frequent, faster use of lethal removal: as one producer

put it, there's "no way we're gonna non-lethal our way out" of the situation once livestock predation begins.

Significantly, lethal removal is also often described as a tool for "changing behavior," although stakeholders hold different views about its purpose. As one local resident of rural northeastern Washington said, "the joke out here is, if you shoot it [dead], you've changed its behavior." Indeed there is scientific evidence that eliminating the immediate threat of a specific "problem wolf" or pack can reduce livestock predation in the short term (as one wildlife biologist says, "that's what we know lethal can do"), though other wolves may quickly move in (Bradley et al., 2015). The state protocol goes a step further, explaining that the "strategy [of lethal removal] is to attempt to change pack behavior by removing a minimum but sufficient number of wolves before that behavior is reinforced by additional depredations on livestock" (WDFW 2017). State wildlife biologists describe this in terms of "disrupting pack dynamics," which may include eliminating the "problem wolf" within the pack before other individuals learn to target livestock, and/or reducing the overall food needs of a pack.

In contrast to these narrower goals, many livestock producers and even some WDFW staff describe lethal removal as a tactic for disciplining wolves via the threat of punishment. One WDFW staff member describes lethal removal via the analogy of behavioral conditioning: "It's just like training a dog," he explains, "if it takes two weeks [from livestock predation to lethal response], that dog's not gonna know what it's being punished for." Asked how a dead wolf can learn from its mistakes, he argues that "you're sending a message to the pack." Though wolf advocates question the premise that lethal removal has effects beyond the individual, saying "it's not like the wolf says, my brother or father got killed eating cows, so I won't eat cows anymore," many livestock producers suggest sending the message more directly, by leaving a livestock

carcass out and waiting nearby to kill a wolf when they return to it. As one livestock producer argued, “I think if you shoot one of those things, then the others see that. They’re intelligent animals... if they can find easier food sources, then they will do it.” Elaborating on this idea, another producer argues that the production of wolves’ fear is the basis for the success of other techniques of deterrence: “right now these wolves have no reason to be afraid of humans… if you gave them a reason, maybe other wolves would be a lot more receptive to non-lethals.” In this sense, they conclude, the “best non-lethal is a good lethal.”

e. The complexities and confusions of managing wolves via fear

Washington’s efforts to “influence/change wolf behavior” rely heavily on the manipulation of fear dynamics, even if they have not been explicitly framed as such by managers. The intertwined mechanisms of actively disrupting attacks, protecting certain spaces for livestock on the landscape via fear-based deterrents, using tools for aversive conditioning of wolves to prevent habituation and/or prey switching, and using lethal removal to eliminate wolves that do not learn to behave, collectively amount to managing wolf behavior through manipulating fear responses. What is often described as “coexistence” with wolves should be understood as the application of ecological knowledge about fear dynamics to manipulate wolves’ behavior to achieve desired ecological dynamics/outcomes, namely reducing livestock predation (Gaynor et al. 2020). Washington’s effort to achieve coexistence in a way that minimizes lethal removal (in contrast to most Western states where removal is routine), has made deterrence via fear a central aspect of wolf management. This focus on non-lethal mitigation has even led to a reframing of how Washington’s resource managers and livestock producers think about lethal removal, considering it too as a tool for producing fear, as opposed to primarily a population control mechanism. Complicating the idea that coexistence with

predators is achieved by reducing human-caused mortality risk (Oriol-Cotterill et al. 2015), coexistence here relies on increasing wolves' *perception* of risk (potentially including increasing mortality risk via lethal removal), cultivating fear of people to deter livestock predation. Conflict deterrence is thus accomplished through practices explicitly aimed at the production of normalized relations of chronic fear between species, using real or threatened violence to discipline wolf behavior.

Deterrence interventions based in fear are deeply rooted in underlying beliefs about the nature of wolves themselves, and the normalization of the human-wolf relationship of fear. Debates over wolf management are situated within a normative discourse in which wolves' fear is not only "natural," but "healthy," a desirable state to be maintained by management. Interventions to induce fear (for example, "do something to keep it afraid") fall into a paradoxical appeal to the innate nature of that fear, in which human intervention becomes necessary to produce this so-called "natural" condition. For many scientists and managers, this paradox is resolved by understanding livestock predation as the result of human transformation of wolves' perceived risk-benefit trade-offs, tempting them with an easy new food source; from this perspective, fear-based discipline simply reinforces wolves' "innate" fear (as an alternative to the more obvious return to "natural" conditions advocated by environmentalists, removing the livestock from the landscape). In this way "coexistence" between people, wolves and livestock can be framed as itself a natural condition—and thus a "win-win" solution, meeting human social and economic needs alongside conservation priorities—in contrast to ideas that either wolves or livestock are out of place, as argued by livestock producers and conservationists, respectively. In this context, the anthropocentric objectives of human management for a cascading series of desirable socioecological outcomes (reduced livestock predation leads to

reduced social conflict leads to successful wolf conservation) become clouded by appeals to Nature: it becomes possible to say (and many do) that wolves should be afraid because it is simply the "natural" state of things, as opposed to recognizing the anthropocentric goal of reducing human-wolf-livestock conflict.

Washington's ongoing, thorny debate over lethal and non-lethal approaches to wolf management is confused by multiple, largely unproven logics of "changing wolf behavior," amidst constant appeals to the "nature" of human-wolf-livestock fear dynamics. While many stakeholders talk about conflict mitigation in terms of creating fear in wolves, there is little clarity or scientific documentation about the mechanisms by which lethal and non-lethal tools create (or fail to create) fear, or their desired outcomes. For instance, for some stakeholders, lethal removal is an act of retribution, and efforts to change behavior must be based on non-lethal approaches. For others, removal is the last-ditch tool for changing the behavior of (by killing) a "problem wolf" that cannot be re-habituated, preventing future livestock predation. For still others, lethal removal is part of a broader suite of tools used to condition behavior, based on the expectation that wolves recognize and assess risk (and pass that behavior on to offspring, creating a "wolf culture" that includes the tendency to prefer wild game over livestock). The failure to distinguish between these different meanings of the concept of "changing wolf behavior" makes it difficult for anyone to clearly articulate precisely what conflict reduction efforts are intended to accomplish. Table 2 identifies multiple points of inclarity about the management of fear dynamics that are likely to lead to misunderstandings between managers and stakeholders in policy-making conversations. These questions aim to provide a stepping-off point for further ecological and social research to inform the management of wildlife via fear, as well

as a rich ground for discussion among policymakers and stakeholders applying fear-based deterrents on the ground.

Table 2: Management questions raised via an analysis of human-wolf-livestock conflict as the (socio)ecology of fear.

Is wolves' fear of humans as a species *per se*, or of particular stimuli/actions, and how do these relate to one another?	The oft-repeated idea of "innate fear" of people, even as human actions work to reproduce that fear, may lead to the perception of animal behavior as fixed or immutable, in contrast to wolves' actual behavioral plasticity and responsiveness to behavioral management. Recognizing wolves' ability to perceive, assess and respond to various forms of risk, including stimuli such as non-lethal deterrents that simulate human presence, and perhaps the threat of lethal removal, will help clarify the purpose and use of fear-based tools and techniques. Use of such tools by managers working toward coexistence via adaptation of wolf behavior should be understood in the social context of widespread ideas of human dominion over wildlife and the "naturalness" of the interspecies fear relationship.
Is the intent of fear-based interventions to achieve spatial separation of wolves and livestock, or to instill risk aversion to the act of attacking livestock?	Efforts to manage wolves' fear should distinguish explicitly spatial approaches that create "landscapes of fear," in which wolves avoid places they perceive as risky, from efforts to increase wolves' perception of targeting livestock in general as a high-risk activity. Such landscapes of fear are not only ecological phenomena, but intertwine with socio-political questions of land use for livestock grazing and producers' perceptions of risk vis-a-vis livestock predation.
Does "changing behavior" refer simply to preventing or disrupting attacks on livestock, or to long-term aversive conditioning?	Widespread but contested ideas about "teaching" wolves to behave frame deterrents as a disciplinary tactic that functions via permanent, chronic fear (rather than acute fear of a particular stimulus) that leads to learning new behaviors. This stands in contrast to the recognition that many tools must be rotated to maintain effectiveness and avoid habituation.
Do fear-based interventions target only individual animals, or do wolves have social learning mechanisms by which deterrence effects are passed along?	The idea that wolves in general "get the message" when deterrents are used, thereby changing "wolf culture" to prevent livestock predation in the long term, relies on unstated and untested assumptions about wolf social learning in a human fear context. For instance, the premise of WA's lethal policy, aiming to remove individuals "before behavior is reinforced," assumes wolf social learning of predation habits.

Does lethal removal of individuals have behavioral effects on other wolves, making its use part of the "applied ecology of fear"?	The premise of "lethal removal for fear," in which removal arguably works via a behavioral rather than (or in addition to) a population-reduction mechanism, remains underexplored in the scientific literature (see Treves et al. 2019). Conceptualizing lethal removal in this way makes the above questions applicable to lethal as well as non-lethal deterrence tools, and to their use in tandem, with lethal removal creating the mortal risk to "back up" the threat of non-lethal tools, thereby laying the groundwork of underlying wolf fear on which non-lethals play.

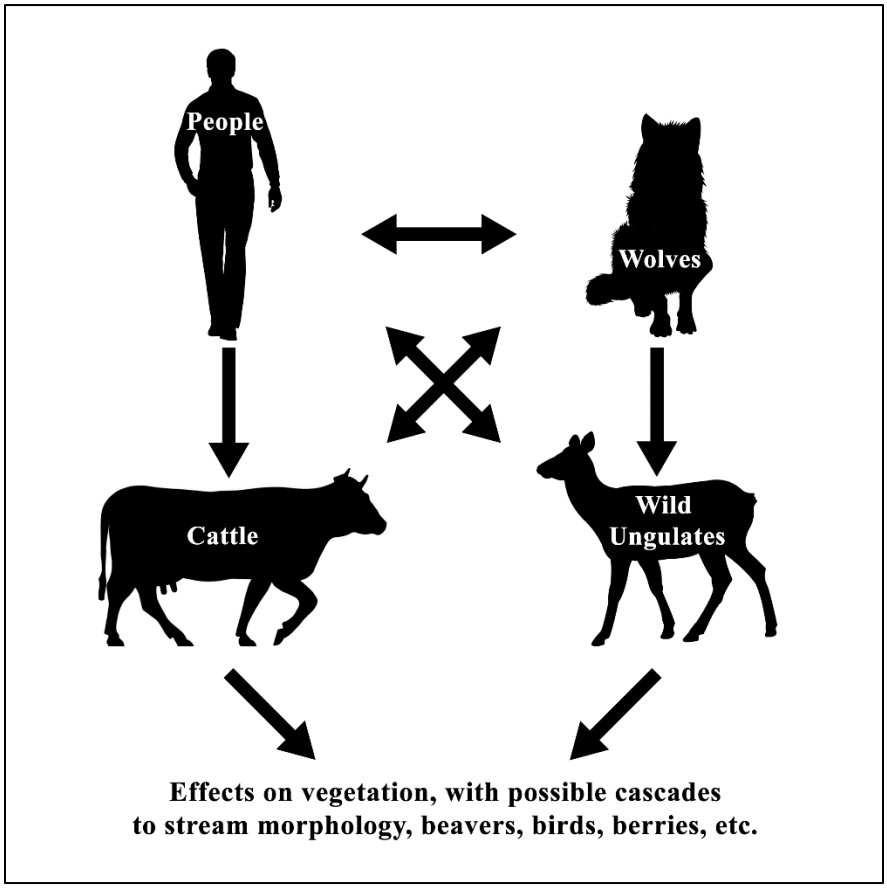
f. The socioecology of fear

As the Washington case shows, mitigating HWC involves managing complex socionatural dynamics that may lead to desired risk-avoidance adaptations in animal behavior. We describe these dynamics as the "socioecology of fear," which we offer as a conceptual framework for examining the complex interplay between ecological processes involving interspecies fear dynamics and human social processes, including logics and assumptions *about* animal fear dynamics, that play out in wildlife conflict management.

We intend the phrase "socioecology of fear" to evoke two related things. First, it refers in a general sense to the complex and multifaceted web of interspecies relationships, spanning humans and nonhumans (socio-ecological), in which fear dynamics between species play a significant role in mediating behavior (that is, extending the "ecology of fear" concept to include human processes and interventions). While our case study emphasizes wolves' fear of people, fear dynamics in human-wolf-livestock systems go in many directions: the presence of wolves generates fear among wild prey species, in livestock as potential prey, and perhaps most significantly, among people (Figure 5). The theme of "fear" thus slices across ecological and social relations, inviting deeper engagement and practices of interdisciplinary translation between scholars interested in human-wildlife fear dynamics. Research topics that would benefit from critical re-framing via the "socio-ecology of fear" concept include: trophic cascades

mediated by predator-prey fear; adaptations to predation risk by livestock producers (and even by livestock themselves, inasmuch as livestock anti-predator behavior is also a socionatural phenomenon influenced by human interventions such as low-stress livestock handling techniques); the complex socio-cultural and political implications of human fears of predators or predator return; and of course, predator deterrence via fear-based techniques (our focus here). Connecting changes in behavior (both human and animal) as the result of perceptions of increased risk as a common driver for dynamics that are often treated distinctly, this framework places multi-species, multi-directional fear dynamics played out in physical and symbolic space at the heart of the issue of human-wildlife conflict and coexistence.

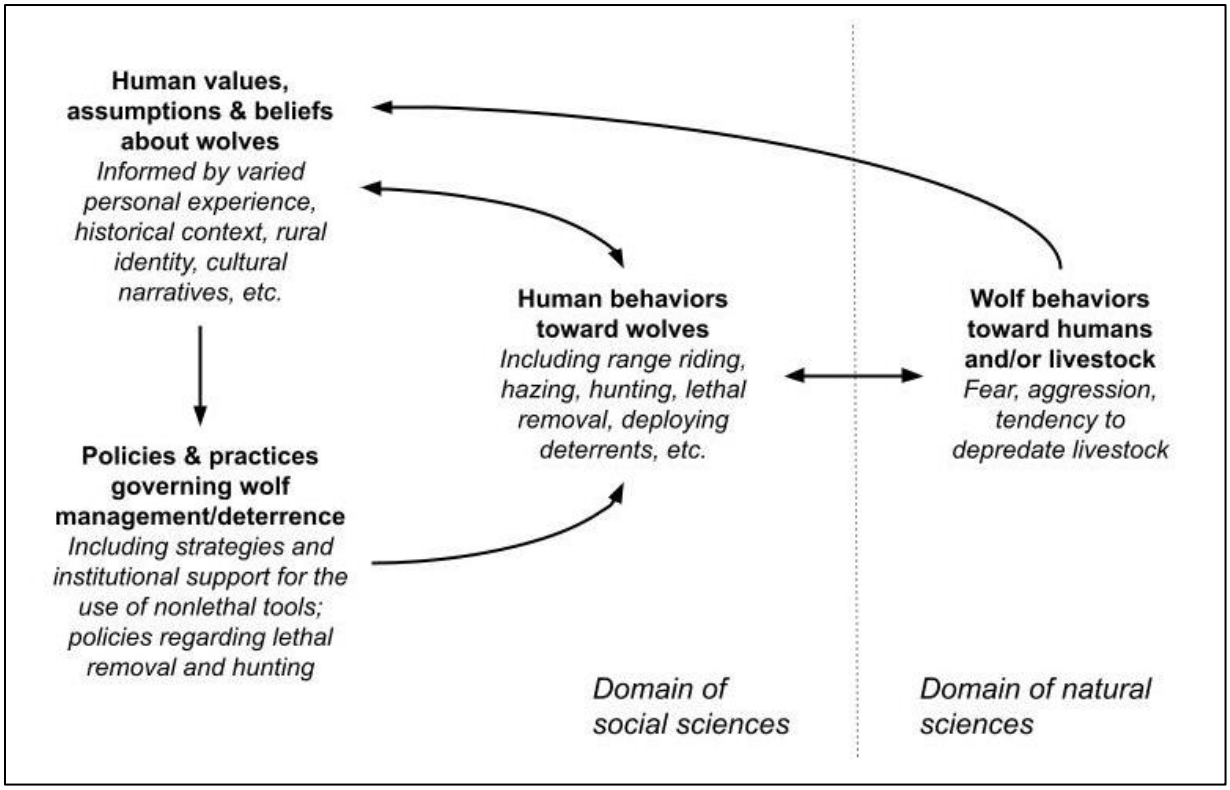
Figure 5: The socioecological "fear web" maps fear-based interspecies dynamics in human-wolf-livestock systems. The presence of a given species can be expected to lead to changes in the behavior and/or space use of the affected species (compare Ripple et al. 2014; Miller and Schmitz 2019; Gaynor et al. 2020; Wilkinson et al. 2020).



Secondly, the "socioecology of fear" refers to the production of animal fear itself (that is, self-protective behavior in response to perceived anthropogenic risk) as a multispecies, socionatural process. In contrast to ideas that wolf fear of people is simply "innate" and immutable, we recognize fear as the product of interspecies relations, (re)produced through a history of (often-intentionally) threatening human-wolf encounters. Such encounters are shaped by human laws, policies and social norms, which are in turn deeply influenced by social discourses about how wolves "should" behave (Figure 6). As we have shown in the case of

Washington's wolves, management practices to reduce wolf-livestock conflict by manipulating wolves' fear are deeply entangled in discourses about "normal" wolf behaviors and human-wolf relations. Whether or not people believe that wolves belong (a long-contested, shifting question of social norms and cultural values across the Western U.S.), and related ideas about acceptable wolf behavior, has had a significant influence on laws, policies, and practices of management, which in turn influence wolf behaviors, including predation. Human ideas about "innate" fear may therefore be used to justify the reproduction of that fear, via particular kinds of normalized fear-inducing stimuli and interactions, perhaps even becoming self-fulfilling. This sense of the "socioecology of fear" offers a non-dualist way of examining the tension between "natural" animal behavior and human efforts to "change" animal behaviors. By understanding animal fear as a socionatural phenomenon, in which animal behavior is co-produced by and with human social dynamics, we pay attention to the material effects of social discourses, which inform management decisions and interventions and thereby change wolf behavior itself. Understanding animal fear as socionatural helps to clarify the mechanisms by which fear does or does not function, and toward what ends.

Figure 6: The material-discursive co-production of wolf behavior with social assumptions and beliefs, and policies and practices, via social norms for human-wolf interactions. These complex social dynamics and feedback loops influence human behaviors regarding wolf interactions, often with the effect of reinforcing wolves' fear of people.



The "socioecology of fear" framework aligns with existing ecological studies of "applied ecology of fear" dynamics in managed ecosystems (Oriol-Cotterill et al. 2015; Miller and Schmitz 2019; Gaynor et al. 2020; Wilkinson et al. 2020). Importantly, though, not all human actions that affect animal fear dynamics are part of an intentional management effort. Actively "applied" interventions like hazing, scare devices, and lethal removal exist within a broader socio-cultural context characterized by socially-reproduced fear between people and wolves. As an interdisciplinary boundary concept between wildlife ecology and critical geography, the "socioecology of fear" framework offers attention to these complex social processes, connecting

the ecological literature on conflict deterrence via the manipulation of fear dynamics with a perspective from critical human geography on how wolves, and the landscapes they share with people and livestock, are socially produced through the circulation of cultural discourses, norms and values.

g. Conclusion

We hope that the framework of a "socioecology of fear" developed through this case study will inform policy debates and improve management efforts for wolf-livestock conflict and coexistence on the ground. Management of human-wolf conflict—not just in Washington but around the world—would benefit from a deeper examination of how coexistence relies on the (re)production and management of animal fear. As we have shown, fear is produced not only in specific animals and places for conflict deterrence, but as a normalized, chronic relationship between people and wolves via techniques such as hazing, hunting, and even lethal removal. Wolf fear is entangled with human social dynamics, reproduced through interactions shaped by human social processes. Managing the socioecology of fear to mitigate conflict includes applied environmental interventions (for example, deterrents), but also broader socionatural dynamics that produce normative interspecies relations of fear. In contrast to appeals to what is "natural" or "healthy" wolf behavior—in which fear of people is taken for granted as the basis for conflict deterrence—the recognition of wolf fear as socionaturally-produced opens questions around human-wolf dynamics that are otherwise sidestepped. Better recognizing the relationships between coexistence and management of wolf fear, and explicit articulation of the objectives and mechanisms by which this is done, should help clarify conflict management.

We further hope that our framework will open doors for scientific study, looking holistically at the web of fear dynamics between wolves, prey species, livestock, and people, and

how those dynamics are produced and managed. Washington's wildlife and land managers, in collaboration with other stakeholders—including livestock producers, hunters, and environmental advocates—are attempting to manage complex and intertwined social and ecological dynamics in the absence of much scientific evidence on what works (cf. Martin 2021b). Many interventions are based on preconceptions and politics rather than rigorous empirical observation and testing, and a lack of clarity about the intent, use, and mechanisms of techniques that play upon wolf fear pervades the conversation. A critical research need is to better understand how both lethal and non-lethal deterrents work to change wolf behavior, and how they can be deployed to effectively mitigate conflict and promote coexistence. Recognizing non-lethal measures as the manipulation of wolves' risk perception, we suggest taking an explicitly spatial approach to the study of non-lethal deterrence as the production of landscapes of fear and/or coexistence. For example, location data from collared wolves could be used to assess the effectiveness of non-lethal deterrents for altering wolves' use of space as the mechanism for reducing livestock predation. Research on animal movement in relation to deterrents on a landscape would fill an important gap in our understanding of their effectiveness and is well suited for further attention from critical physical geographers, integrating analysis of biophysical data on wolf movements with human social/power dynamics.

In addition to our emphasis on wolves' fear of people, we also hope that the socio-ecology of fear is a useful analytic for examining the "social side" of conservation. Humans' fears of wolves (including both emotional fear, and risk perception vis-a-vis the social and political-economic effects of wolf return) can also be affected, intentionally or not, by management policies, even as human dynamics are often rendered relatively static or intrinsic (rather than (co)produced and mutable) in the ecological and human dimensions of wildlife

literatures. Human adaptations to the return of wolves, including questions of social tolerance, landscape permeability, and the social practices and dynamics required for coexistence (see Chapter 5, above) are also part of the "socioecology of fear." Building tolerance for wolf conservation may require reducing human fear of wolves, even as mutual fear may also be the basis for landscapes of coexistence. Ongoing investments into tools and techniques to change wolf behavior should be mirrored by efforts to understand the effects and effectiveness of such interventions on social dynamics.

While our focus here has been on wolves, our framework is applicable not only to other instances of HWC, but to any dynamics where wildlife management is intertwined with social ideas about and manipulations of human and animal fear. In the context of socioecological feedback loops between interspecies fear relations, critical geography can be a key discipline to examine whether wildlife management efforts amount to "turning up or down the heat" on conflict, recognizing that that question contains intertwined social and physical aspects.

Finally, we hope this paper will spark further cross-disciplinary conversation between wildlife ecologists, managers, scholars of the human dimensions of wildlife, and critical human and physical geographers. Our efforts to draw together insights from the ecological and social sciences aim to pave the way for further transdisciplinary collaboration in the practice of critical, integrative science on the socio-ecological dynamics of wildlife management. In this way, we take up the challenge posed by critical physical geography to study the socionatural dynamics of the Anthropocene, while also extending the scope of this challenge to engage with the ongoing critical research already being conducted by wildlife scientists. Developing the concept of the "socioecology of fear" as a boundary concept between critical geographers and ecologists thus contributes to the expansion of critical physical geography as a project, by developing a critical

integrative approach to understanding the complex challenges of sharing space with wildlife in the Anthropocene.

7. "Something has to be done to teach wolves to be afraid of Man": conservation and/as the discipline of the wild

> "The goal of the tools and approaches described in this protocol is to influence/change wolf pack behavior to reduce the potential for recurrent wolf depredations on livestock while continuing to promote wolf recovery" - Washington Department of Fish and Wildlife "Wolf-livestock interaction protocol"

> "They're afraid of nothing. They say, 'Kill me. I ain't gonna change, though.' That's a wolf." - Douglas Smith, Senior Wildlife Biologist, Yellowstone National Park, in "The Trouble with Wolves" documentary

> "It's hard to make a wolf not act like a wolf. In fact, it can't be done." - Livestock producer, Washington state (anonymous interview)

At a meeting of Washington's Wolf Advisory Group on January 8th, 2020, as the group sat down to work on proposed revisions to the state's "Wolf-livestock interaction protocol," one member suggested that they ought to take a step back from the details listed on their daily agenda and think about the bigger picture. Highlighting the protocol's goal statement (the first epigraph above, which is emphasized in bold italics in the document), they asked the group, "is that really how we should describe it? Is [the goal] to 'change wolf behavior'?" In response to the question, a staff member from the Department of Fish and Wildlife shared their concerns about that language from a public relations perspective, saying that members of the public "have a hard time understanding [the connection] between lethal removal and wolf behavior," and that "it doesn't add up for people." Referring to prior versions of the document, they pointed out that the goal statement was previously to "stop depredations" of livestock by wolves, but that this language was changed because that statement "set ourselves up for failure" since it was not

possible to guarantee. Other members suggested alternative language: “to me, the goal is to reduce losses and injuries of livestock and to reduce recurrent killing of wolves,” offered one member; another suggested simply “reducing the interaction/contact between wolves and livestock.” Countering this last version, a third member stated that in their view, the protocol should be clear “that the contact between wolves and livestock [ought] to not be portrayed as a bad thing. Sometimes it is good for the wolves to learn how to act around livestock.”

Though there was no clear consensus on how to modify the language, many heads nodded around the room when one member attempted to summarize the discussion by saying, “no one loves the idea that changing pack behavior is the goal – it doesn’t entirely reflect what we’re trying to do.” Despite this agreement, though, the conversation soon moved on, and the language was never revised. The introductory paragraphs that include the goal statement remained the same in the updated version of the document.

During a break in the proceedings, I spoke with the WAG member whose original comment sparked the conversation about the protocol goals. Echoing the concern that “it doesn’t add up for people,” I asked whether they saw lethal removal of wolves as a possible tool for “changing wolf behavior?” They clarified that their argument was not that it is necessarily *impossible* to change wolf behavior, but that they hoped the group would “focus on what we have more control over,” which is to say, human activities. Sticking with the wolves a moment longer, though, I asked whether they agreed with the idea that “it’s good for the wolves to learn how to act” appropriately, and if so, is there a contradiction between that premise and the idea that these are “wild” animals? Wouldn’t teaching wolves how to act around cattle amount to a kind of habituation? Laughing a bit, they told me that in their view, “all wolves are habituated, just in different kinds of ways.” They explained that wolf behaviors – like human ones – are

passed down socially through generations, such as when wolf parents teach their offspring how to hunt. At the same time, wolves are smart and adapt quickly to lived experience, so behaviors that are reinforced by positive feedback (like avoiding humans, on the one hand, or going after livestock, on the other) are likely be quickly adopted and shared between these social animals. In this way, some wolves might become "habituated" in the sense in which the word is usually used – for instance, lurking uncomfortably close to human habitation, or looking for food in garbage dumps – but on the opposite pole, others are "habituated," in the sense of having formed a "habit," to fear and avoid people at all costs. Either group, though, might also form a habit of attacking livestock, which is what the actions described in the wolf-livestock interactions protocol aim to prevent.

In this penultimate chapter, I take up the question of "changing wolf behavior" – or more explicitly, "teaching wolves how to act" – as an objective of conservation management. As an empirical question, wolf behavior conventionally falls within the purview of the biological sciences, and certainly merits further study by behavioral ecologists, which is beyond the scope of this chapter to address. However, interrogating the discursive aspects of behavioral management – what is *meant* by "changing wolf behavior," by whom, and how do different parties understand it differently – raises deeply social questions. In the previous chapter, I contextualized "changing wolf behavior" to reduce livestock depredation within the scientific literature on the "ecology of fear." Here, I reframe it as a practice of "discipline," both in the sense of behavioral conditioning (disciplining behavior), but also in the Foucauldian sense of the biopolitical management of (human and nonhuman) life, as it has been developed in the field of critical (more-than-)human geography. I draw on literature from human geography, animal studies, and STS to frame efforts to *control* wolves – as a necessary step in *caring* for them – as

"technologies of discipline" deployed upon animal bodies and populations. Discipline is thus a boundary concept between extant approaches and theories in human-wildlife conflict, emphasizing aversive conditioning, and multispecies geography and political ecology, emphasizing Foucauldian disciplinary power.

In contrast to prevailing ideas of the wolf as a wild animal, whose innate "nature" is pure and uninfluenced by human activities, efforts to actively discipline wolves demonstrate how wolves themselves are transformed, or even produced, by conservation (Stokland, 2020; Peltola & Heikkilä, 2018). This is increasingly acknowledged by conservation scientists, who recognize that management actions that aim to reduce predators' impacts on human economies and societies can, in fact, alter the dynamics inherent to the ecosystems in question, at ecological, population, behavioral, and even genomic levels (e.g. Ordiz et al., 2013; Pena Rodrigues & Lira, 2019; Wallach et al., 2009). Yet even as ecological science increasingly frames human-predator coexistence as a question of "co-adaptation," in which both species adapt their behavior, or discipline themselves, in relation to the other (Carter & Linnell, 2016), human managers and publics rightly struggle to grapple with the premise of teaching wild animals how to act around human societies. Despite strongly negative societal norms around the idea of wolf "habituation," most scientists and managers would agree at some level that wolves are affected by, and learn how to respond to, human activities. By suspending the human/nature dualist perspective that frames such "habituation" in an automatically negative light, I aim to open ethical and political questions about the human role in shaping how wolves behave – and thus by extension, what wolves are. The recognition of wild wolves as "animals of the Anthropocene" (Rutherford, 2018), deeply shaped by human activities, and the related questions that the Anthropocene concept raises for social and natural scientists alike, are therefore deeply significant and useful

for the interrogation of contemporary wildlife management practices. Amid widespread cultural norms about "keeping wildlife wild," the recognition that wildness itself is socially constructed and produced demands a reevaluation of the taken-for-granted assumptions of the meaning of wildlife conservation in the Anthropocene.

a. Conservation as discipline and control

Though an extensive literature in the ecological sciences and the human dimensions of wildlife management addresses questions of predator deterrence, including the specific case of wolf-livestock conflict mitigation (see section 4.a above), the resonance between that literature and related work in human geography and related critical social sciences (for example, animal studies, STS, and political ecology) remains underexplored. Drawing on the Foucauldian lens recently popularized in critical human and more-than-human geography, I argued in chapter 5 above that wildlife conservation amounts to the exercise of biopower "beyond the human" (Collard, 2012), "making live" desirable animal populations while "making killable" others (Biermann & Mansfield, 2014; Connors & Gianotti, 2021). In Chapter 6, meanwhile, I emphasized the effects of this biopolitical wildlife governance on *human* subjects, where efforts to promote "social tolerance" for wolves amount to the construction and negotiation of human social norms about the management of nonhuman lives, which I describe as the creation of a shared "coexistence imaginary" among stakeholders in wolf management. In this way, my work aligns with a noted trend in more-than-human geographic research in which growing attention to "the analytical relevance of Foucault's notion of biopower in the context of regulating and managing non-human lives and populations" (Holloway & Morris, 2007, p. 82) nonetheless continues to emphasize the effects of biopower on and over *people*, not the animals themselves (see Chrulew & Wadiwel, 2016, pp. 8–10)**.** Chrulew and Wadiwel argue that "much of the work

that seeks to unveil the human management practices distorting so-called "wild" animals fails to articulate the specificity of the power wielded over nonhuman species, or its possible effects on their behavior and survival." Here, I aim to address that gap, examine the effects of biopolitical conservation governance on the animals (wolves) themselves, and joining other scholars "interested in the disciplining of the lives of an emblematically 'wild' animal" (Collard, 2012, p. 30).

Wolf management, and especially wolf-livestock conflict deterrence, frequently involves the disciplining of *animal* behavior, using behavioral conditioning to produce desirable (or prevent undesirable) behaviors such as predation on livestock. In Chapter 5, I framed this form of discipline in ecological terms, as an extension of the "ecology of fear" concept across the socio-ecological boundary to encompass the human-wolf relation. Here, I revisit that analysis via the lens of conservation biopolitics, drawing on the work of critical geographers who have framed wildlife conservation as a set of biopolitical and spatial practices, aimed at securing space for the forms of life deemed desirable: that is, conservation amounts to "selective interventions by humans into animals' mobilities to make certain animals live and to let other animals die," and thereby works "to govern the reproduction and circulation of aggregations of animals' bodies" (Hodgetts & Lorimer, 2018; see also Buller, 2008; Collard, 2012).

Hakon Stokland (2020) examines the spatial-biopolitical practices of wolf conservation in Norway, where humans intervene into animal reproductive processes by limiting and control breeding, and construct "wolf-zones" as spaces of security and protection through which the biopolitical objectives of preserving genetic and species diversity are accomplished. Stokland thus pays attention to the "proliferation of instruments and techniques" that he describes as "technologies of intervention" by which "wolves have been molded as objects of government"

(Stokland, 2020, p. 15). These technologies collectively make up the techno-managerial regime of wildlife conservation that constructs animals as members of populations to be defined, measured, and controlled, rationalizing impacts on individual animals (including killing them) as secondary to effects on the population or species. Stokland's analysis emphasizes what Foucault describes as "biopower," regulating wolves at the level of population and reproduction dynamics and by controlling circulation over space, as opposed to effects on the individual via disciplinary power or "anatamo-power." For Stokland, wolf conservation requires both "technologies of knowledge production," such as wolf collars and monitoring data, through which the population is known and measured, and "technologies of protection," such as Norway's "wolf-zone," a protected area within which the population's reproductive capacity is fostered. Significantly, for Stokland, wolf management leads to "conserving wolves by transforming them": he observes "significant transformations relative to the historic population" (p. 15) both in terms of population numbers and variability and genetics. He argues therefore that "the purpose of the protection is to keep the wolf population in a fixed state at the brink of survival," thereby accomplishing species conservation in the country while reducing impacts on human society.

Building on Stokland's argument in the North American context, I wish to emphasize that "transformation" occurs not only at the population level ("biopolitics"), in terms of which wolves are able to reproduce and where, but also on the individual level, through practices of disciplinary power aimed at affecting wolf behavior ("anatamo-politics"). The practices of conservation have significant effects directly on the animals at an individual level. Many scholars have noted concerns about over-extending Foucauldian ideas about discipline, which often rely on the production of social norms and processes of subjectification and self-regulation, to animals. As Hodgetts and Lorimer note, such "discursive technologies… are not usually

understood to operate on the animals directly: it makes little difference to a bear's sense of identity if a powerful human describes it as American, cute, or tasty" (2018, p. 15; see also Srinivasan, 2014; Youatt, 2015). Yet while Stokland similarly argues that efforts to conserve wild wolves "do not include interventions… aiming at self-governance" (2020, p. 5), this is countered by the expectation that wolf fear – not a discursive process per se, but nonetheless a "technology of the self" – is a driving force in behavioral change. Hodgetts and Lorimer explicitly emphasize the spatial aspects of such changes: "animal geographers have demonstrated how the mobilities of some animals are shaped by the disciplinary practices of training." Sara Rinfret (2009), drawing on a Foucauldian framework and emphasizing the role of disciplinary power, examines how wild animals (including wolves specifically) are actively disciplined by conservation practices: certain behaviors are rewarded, and others punished through deterrent techniques or even by death, leading to adaptive responses in behavior.

In this way, animal behavior is the product of multi-species relations. This is no surprise to ecologists, who frequently consider interspecies dynamics that affect animal behavior (e.g. competition, predation, or mutualism). The extension of such dynamics to include anthropogenic and technologized relations, though, challenges the expectation that animal behavior is simply a question of fulfilling "innate" or evolved biological cues. Lewis Holloway, examining dairy cows whose behavior is conditioned by their encounters both with people and technology such as milking machines, instead describes the "making of animal subjects" as a relational, multispecies process: there is "no essential bovine nature, but contingent and fluid bovine subjectivities [that] emerge in particular situations" (2007, p. 1045).This non-essentialist view considers animals not as bundles of pre-programmed instincts, but instead as the emergent, conditional product of interspecies, environmental and technological relations. While this perspective is perhaps most

obviously true of domesticated species like cows, “wild” animals like wolves are likewise subjected to intervention by human and technological relations. This recognition challenges the binary of “wild” and “domestic” animals in favor of relational, naturecultural thinking that emphasizes interspecies entanglement (Haraway, 2003; S. Whatmore & Thorne, 1998). As Thom van Dooren argues, animal species (including humans!) do not emerge pre-formed or in isolation, but are always “interwoven in rich patterns of co-becoming with others” (2014, p. 12)

In this context, disciplinary power in wolf-livestock conflict management represents the (necessarily incomplete) attempt at human control, based on established yet contestable social norms, over how wolf subjectivities emerge amid multi-species, technologized, naturecultural relations. Many scholars have examined how the biopolitical practices of conservation necessarily intertwine practices of care (*for* and *about* nonhuman lives) with practices of *control* over those lives (Biermann & Mansfield, 2014; Crowley et al., 2018; Srinivasan, 2014). Notably, such practices of control frequently include *lethal* control of nonhuman species, such as undesirable invasive species that compete with, or predators that prey upon, species of conservation concern. For instance, Paolo Bocci (2017), in a study of Galapagos tortoise conservation, shows how such killing can be taken as a form of care: caring for one species (tortoises) means "taking care of" another one (goats). Wolf conservation goes a step further, since conservation efforts sometimes entail killing the very same animal that is also the target of conservationist care. In this way, the biopolitical imperative to care for wolves also necessitates the development of *necro*political technologies of control and death. Where wolf control is premised on the establishment of relations of fear backed by the threat of death, as a technique for governance, conservationist care in thus entangled with the necropolitics of producing animal fear.

b. "It's hard to make a wolf not act like a wolf"

A wide array of tools and techniques are used to address or mitigate wolf-livestock conflict both across the American West, and in Washington state specifically.[10] In this final empirical section, I draw once more on interviews with livestock producers, range riders, and wildlife management agency (WDFW) staff to understand how these tools are used as technologies of discipline – that is, are they perceived to work to "influence/change wolf behavior," and if so, how?

The collection of tools deployed in Washington state include the use of radio/GPS collars on wolves, nonlethal deterrents, range riders, and (as a last resort) the act of lethal removal. Again, these tools are not typically used individually, but in conjunction as part of the "suite of tools" approach advocated by WDFW and others. Radio collars allow WDFW, and sometimes producers and range riders, to know where wolves are; they also can be used to trigger non-lethal deterrents such as radio-activated guard (RAG) boxes. Such tools, alongside other fixed-in-place tools such as flashing lights (for example, Foxlights™) and fladry, work to protect specific places on the landscape. However, collar data can also be used by range riders, who arguably function as mobile deterrents, moving across the landscape with livestock and responding to wolf threats in real time with other deterrents, such as nonlethal munitions or other "hazing" devices. Finally, collar data can also be used by WDFW to support lethal removal efforts when needed. In this way, the various tools are all linked together, and collectively work to support the effort to "change wolf behavior" to prevent livestock depredation.

The use of nonlethal techniques to "change wolf behavior" is debated and not well understood, even as these tools are strongly emphasized by WDFW agents working toward

[10] The array of tools and techniques are discussed in detail, with an emphasis on how they are applied on the Colville NF in Washington, in chapter 4 above.

coexistence (Smith et al., 2014). Many producers remain skeptical of their effectiveness: one told me, “All those non-lethal kind of deterrent-type things – I haven't seen any of them be successful.” Even the wildlife managers who support the use of such tools note that because wolves learn and adapt quickly, the tools must frequently be rotated or moved to maintain the novelty that triggers wolf neophobia. “The thing that you learn with wolves is you can't simply throw everything at wolves at one time and then expect those tools to be static and in place and to remain effective on the landscape,” one wildlife manager tells me. Another echoes: “if you have the opportunity to use hazing devices or things like foxlights, RAG boxes… to scare wolves away… that's good… [but] it's a very short-lived practice… Fladry [also] can be a wonderful tool at the appropriate time for short durations, and then [it needs to be] changed in its appearance and location.” In this sense, deterrents are generally recognized as a short-term solution, affecting wolf behavior temporarily, but not via behavioral conditioning with lasting effects. In fact, wolves’ capacity to adapt their behavior – to learn *not* to fear. (This stands in contrast to the implication of the protocol goal of “changing wolf behavior,” which perhaps-misleadingly implies a more permanent change than WDFW staff believe is possible).

Nonlethal deterrents are often used in conjunction with efforts to increase human presence on the landscape, often in the form of range riders who monitor livestock and may harass or “haze” wolves away. There is much debate over the purpose and usefulness of range riders, with some characterizing them primarily in terms of proactive husbandry (for example, one WDFW staff member tells me, “we want them to be… [primarily] looking for changes in livestock behavior, changes in the condition of cattle,” and not looking for wolves per se), while others suggest that their main use is to document, not prevent, livestock predation – that is, to “find the dead stuff”). For others, though, the range rider is the “mothership of tools” for

deterrence, actively deploying nonlethals on the landscape and simultaneously monitoring both livestock and wolves (and, as noted in chapter 6 above, arguably conditioning wolves to avoid their own presence). One range rider tells me "If wolves come in the vicinity of cows, you chase them away," though they also note that this is a rare occurrence, since wolves are infrequently seen – though this, of course, may be due precisely to the established "normal" relations of interspecies fear that range riders seeks to reinforce. Many cattle producers acknowledge, as one put it, that "havin' the human presence around there makes the wolves at least more leery," even if it cannot be counted on to prevent depredations. This effect of "making the wolves more leery" goes beyond creating a "landscape of fear" based on a particular location (for example, a grazing pasture) to emphasize the interspecies relationship, creating or reinforcing wolves' fear of people in a generalized way.

This generalized relation of fear is also arguably the objective of lethal removal, at least for those who frame it as a tool with useful effects beyond the individual animal killed. Many affected livestock producers and wildlife managers suggest that lethal removal should be targeted to the specific "problem wolf" or wolves. Producers suggest that WDFW should be "removing the bad ones as quick as it's proven that they are the bad ones," which one describes as a "common sense approach" to "deal with the problems." Though this is generally WDFW's approach as well, there have also been instances where they had the chance to kill a different wolf in the pack, and took it. For the biologists at WDFW, lethal removal aims at "changing pack behavior" by changing the pack's dietary needs or hunting capacity. The targeting of removals is thus a pragmatic question: which member of the pack do we need to kill to get this pack to move

on from targeting livestock?[11] The "common sense" appeal made by ranchers is often to the simple logic of eliminating the wolf causing the problem, framing lethal removal as a straightforward and pragmatic response to a known threat. At the same time, however, many producers also frame lethal removal as a question of retribution and even justice. "You've got to get the guilty one," one producer tells me repeatedly, because then "justice is done." This framing, in which depredation of livestock amount to a criminal act by wolves, and lethal removal is the hand of justice in response, raises questions about how both people and wolves respond to such an action.

For many observers of the process, there is also a "common sense" expectation that the lethal removal process impacts the behavior of other wolves as well, via what one producer describes as "the bad dog thing," comparing lethal removal to training a dog.[12] From this perspective, it is assumed that other wolves do clearly perceive anthropogenic risks and learn to "change their behavior" to avoid them – and that it is therefore possible to "send a message to the pack" via a lethal removal action. Some wolf experts agree with the premise that lethal removal triggers social learning on the part of other members of the pack. In a 2021 interview with KUOW radio in Washington, WDFW's lead biologist, Ben Maletzke reiterated the frequently-used language that "the goal of lethal removals is to change pack behavior," going on to say, "if lethal removal is going to be used, removing a wolf on a pasture right around the cows is probably one of the bigger impacts you can have to try and get those wolves to move out of there." WDFW staff argue that even an unsuccessful attempt at lethal removal, such as the setting of traps, can also be an effective form of nonlethal deterrence. "There are cases where

[11] This can sometimes include targeting pups, a highly controversial move, and one clearly detrimental to the objective of easing tensions between producers and environmentalists, even as it may make sense from a biological perspective.

[12] As discussed in section 6c, above.

we've been able to slow or stop depredation activity… by attempting to remove a wolf and not removing a wolf," one WDFW staffer tells me: "we initiated trapping, and within a short amount of time, the wolves moved significantly away from the area." In this way, "the presence of traps and/or helicopters may be a deterrent in itself."

Though the premise of wolf social learning in response to lethal removal (whether attempted or actual) is thus shared by different stakeholders, producers reiterate that the "message" must be sent very clearly and directly, criticizing the current incremental approach in Washington as indirect, slow, and ultimately ineffective. "They go in and kill one wolf," one producer says dismissively, and then "it's common knowledge [that] the same pack have more depredations… the helicopter leaves and the wolves come back" (observation, Cattlemen's Association meeting). One producer tells me, "I'd like to see the animal carcass left there, and then shoot the wolf when it comes in… the ones that come back to it are the ones that killed it. Shoot one of 'em… I believe that would change wolf behavior." (This approach has not been tested in Washington, and most wolf advocates fiercely oppose it, suggesting that any model that involves baiting wolves with an animal carcass is simply asking for more trouble.) Producers challenge common assumptions regarding wolves' intelligence and learning capacity, with one taking the opportunity to gently tease me: "they are not after their doctorate or anything… they are not that advanced," and will not associate lethal removal with the act of depredation. In a common rhetorical ploy used to ridicule this premise, producers once again put themselves inside the mind of a wolf: "okay, we ate that calf and then our buddy died, we can't eat calves anymore." "They are not smart enough to figure [that] out," they argue, particularly when the lethal action comes after a delay: "when a helicopter starts chasing them two days after the last

kill… they're like, "Well, why did my sister fall over? I have no idea." It's completely disconnected."

For many ranchers, therefore, the current approach emphasizing non-lethal deterrents, with limited use of lethal removal only after depredation occur, is seen as ineffective as a disciplinary strategy. "I don't know if you're ever gonna change their behavior," one tells me, but "if that was ever possible, they're doing it exactly wrong… by the time they start doing it, every animal in the pack is learning to attack livestock." In this way, the actions of the "problem wolf" are not those of a deviant criminal individual, but part of a systematic problem: problem wolves are, in the words of one (Oregon) rancher, the "byproduct of a lenient state policy that allowed them to get away with killing cows without consequences" (Theen, 2017), leading to the expansion of that undisciplined behavior across the population. Washington producers reiterate a similar sentiment, that wolves are often "habituated before the department acts" (observation, Cattlemen's Association meeting), and the goal shouldn't be to "change the behavior" but instead, to "not allow it to start to begin with." Once again appealing to wolves' social learning dynamics, they argue that "wolves teach their pups how to kill" and "teach the next generation what their food source is," suggesting that depredation behaviors are cultural, passed along within pack family learning traditions, and that discipline must be applied on the level of this cultural learning, rather than simply to eliminate a single "problem" animal.

From this perspective, lethal and nonlethal approaches to wolf deterrence work in tandem, in contrast to their frequent juxtaposition (for example, by environmental groups arguing for nonlethal "alternatives" to removal). As one local expert, and advocate of coexistence efforts, tells me, "I'm trying to get away from [using] "nonlethal," the term, 'cause it's not like it's such a dichotomy." Though he doesn't go so far as to entirely agree with the producers who suggest

that "the best nonlethal is a good lethal," he does believe that the two approaches work together, and that nonlethal tools are more effective when wolves have more fear of humans, such as when they are hunted, or in the context of ongoing lethal removal efforts. Somewhat grudgingly, he admits "maybe a little more lethal removal would help," not as a single solution, but as part of the broader tool kit of disciplinary practices for changing wolf behavior.

From this perspective, lethal removal works as a tactic for disciplining wolves via the threat of punishment, where fear of punishment is the basis for the success of other techniques of deterrence. Of course, many are skeptical of this premise: echoing the WAG member who suggested that "you might as well teach them to eat tofu," one conservationist tells me, "you're not gonna change a wolf's behavior. You might change where they go.… but the idea that you're gonna reform that wolf, no." Notably, some livestock producers agree, suggesting again that it's simply "natural" for wolves, as carnivores, to go after the easiest available prey: "it's hard to make a wolf not act like a wolf. In fact, it can't be done." Yet for many others, "teaching wolves how to act around livestock" is the underlying premise of reducing conflict, and "giving them a reason to be afraid of humans" lies at the heart of that interspecies lesson. "Something has to be done to teach wolves to be afraid of Man," one livestock producer tells me, but "we've gone the opposite direction… they've allowed them to get so complacent, more and more acclimated so they're not afraid of nothing."

c. The bio- and necro-politics of wolf conservation

As seen here, wolf conservation efforts in Washington walk a fine line between *caring* for, and *controlling*, wolves, which are not contradictory but intertwined objectives. Caring for and fostering the survival of wolves – that is, the biopolitical "making live" of a desirable animal population – in fact requires a significant degree of control over wolf behavior to reduce conflict

with livestock. Such conflict deterrence is accomplished via a suite of technologies of intervention and protection (Stokland, 2020), which should also be understood as "technologies of discipline" inasmuch as they are used with the intent to "influence/change wolf behavior." Stokland's discussion of "conserving wolves by transforming them" emphasizes the impact of management on reproductive and spatial dynamics at the *population* level in Norway (and similar population-scale impacts may also be seen in Washington and elsewhere in the American West), but wolves are also potentially transformed on the *individual* level via WDFW's (and livestock producers') ongoing efforts to "teach wolves how to act around livestock." This enactment of disciplinary power, and the transformations that may be achieved via tools and techniques that affect individual animal behavior, are also worthy of close attention.

The disciplinary technologies of wolf conservation in Washington include the use of radio and GPS collars for geospatial monitoring of the wolf population, the efforts of range riders and others employing nonlethal tools for deterrence, and the act of lethal removal of "problem wolves," among other techniques. These tools go hand in hand to produce a particular set of human-animal relations, often characterized by fear, that allows the enactment of a degree of control over the wolf population (as often demanded by livestock producers, who call on the state to "control its wolves," in contrast to the environmentalist premise that the wolves are ultimately "wild," their behaviors beyond the reach of human intervention). Together, these technologies work via disciplinary power, allowing state managers to respond to wolf presence with the deployment of the right tools to "make the wolves leery" of humans, and either "move on out of there," leaving space for livestock to graze, or perhaps "teach their children" to target wild ungulate prey rather than livestock. When such tools do not suffice and livestock predations

continue, targeted killing of wolves is used, with the premise that it not only eliminates the "problem wolf," but potentially also "sends a message" to the rest of the pack.

Of course, the idea of conditioning wolf behavior is only one narrative around the significance of these tools, each of which has varied (and highly contested) applications and effects. None of these tools are *exclusively* used for animal conditioning, and as several WAG members noted, the premise of changing wolf behavior "doesn't entirely reflect what [they]'re trying to do." Yet these conservation technologies and practices are often characterized by a subtle slippage from being tools of scientific data collection, and/or tools of wildlife protection, to being tools of (sometimes deathly) discipline. For instance, radio collars are often framed primarily as a technology of knowledge production, used for the collection of scientific data about wolf movements, and generating geospatial information about the wolf population, such as the maps of wolf pack locations maintained by WDFW. Yet the collar can quickly slip from this role of information-gathering toward a parallel role as a technology of security: by knowing where wolves are, it becomes possible to try to move livestock to avoid them, to locate nonlethal tools such as fladry or RAG boxes to deter them, or to diminish risk by preventing inadvertent placement of salt blocks near known wolf dens or rendezvous sites, for example. Once the radio collar begins to be considered as a tool for preventing or deterring conflict, rather than simply producing knowledge, it is another short slippage to using collars as a technology of discipline and control: when lethal removal of a pack has been authorized, a collared "Judas wolf" can betray its kin by leading government hunters back to the rest of an identified "problem pack." Collars are thus a potential technology of enhanced state capacity to kill wolves, as well as a technology of knowledge production for the sake of conservation.

In an apparent paradox, the act of lethal wolf removal is also often framed as a technology of wolf protection and conservation: by eliminating wolves that attack livestock, it becomes possible for other wolves to survive, and even thrive, while simultaneously using the landscape for grazing. Killing wolves is thus recognized as itself a form of conservationist care, via the irony of "killing wolves to protect them," or even "killing them for their own good," in which individuals are sacrificed for the benefit of the population as a whole. Wolf conservation is thus predicated not only on the reproduction of violent or threatening interspecies encounters and relations of fear, but also on the punishment (including by death) of animal deviance – the "problem wolf" that must be killed for the sake of the populations' protection.

The making of the "problem wolf," as a subset of an otherwise desirable animal population that instead becomes the target of deathly intervention, illustrates the *necro*political character of wildlife conservation, where certain animal behaviors (attacking livestock) are punishable by death, lest the crime be copied by others. The construction of this "problem wolf" discourse goes hand in hand with the implementation of the suite of technologies for controlling animals, via techniques seen as "sending a message" to other wolves. Governance of behavior is achieved not just through the threat of death (as under sovereign power), or through the normalization of particular behaviors and self-regulatory systems (as under biopower), but through the differentiation of the population in question into those that are killable and those that are not, where the latter lives in terror of becoming the former. The rhetoric of criminalization and justice ("you've got to get the guilty ones") and its counterpoint, emphasizing the innocence of most of the population ("80% of the wolves don't cause any problems") enacts the division of the wolf population into valued objects of conservationist care, on the one hand, and "problem animals" to be destroyed, on the other (compare Margulies, 2019). The combination of nonlethal

tools and surveillance that tell wolves "how to behave," and the threat of lethal punishment for those who don't, work together to provide the necessary animal discipline and control that is necessary for successful conservation outcomes.

d. Disciplining the wild

Wolf conservation in Washington is thus a contested practice of care for an endangered form of nonhuman life that (somewhat paradoxically) serves as justification for killing that same life when it gets out of control. The differentiation of the wolf population into that which should be made to live (the target of biopower) and that which must be killed to protect the rest (the target of necropower), often relies on an appeal to the "nature" of wolves, a contested premise on which so much of conservation nonetheless relies. Technologies of discipline aimed at "changing wolf behavior," such as those laid out in Washington's wolf-livestock protocol, are premised (at least implicitly, and sometimes very explicitly) on the idea that wolf predation of cattle is not a normal or natural behavior (again, as opposed to simply an undesirable one). This idea of "normal" wolf behavior, in opposition to "habituation," is necessarily based in a human-nature dualism, in which anything influenced or altered by people can't be considered sufficiently natural: and "someone's got to teach these wolves to fear Man" to maintain this natural order of interspecies relations.

In contrast to these prevailing ideas about "normal," "wild," and "problem" wolf behavior, though, the claim that "all wolves are habituated, just in different ways" illustrates a view of animals' subjectivity as not essential or innate – with associated moral and practical implications – but instead as a relational, emergent quality produced through interspecies (human-wolf) interactions (Holloway, 2007). In this way, the conservationists' entangled efforts to care for wolves (including by killing them) amounts to efforts to manipulate wolf subjectivity.

Even as conservation stakeholders debate whether it is ultimately possible to "change wolf behavior," asking "is that really how we should describe it," they often miss the deeper question raised by what such changes, if possible, would mean for the practice of conservation. Practices of "disciplining the wild," as seen here, illustrate how Washington's emblematically wild wolves are indeed "Animals of the Anthropocene," entangled in and subjected to human management decisions that produce their bodies and ecosystems, and indeed the very future of their species.

8. Wolf conservation in the Anthropocene: provocations in lieu of conclusions

> "The Anthropocene, as a concept, prompts the question of how humans ought to intervene in the environment; how to live in a multispecies world." (Collard et al., 2015)

The much-discussed Anthropocene concept has sparked new thinking across the environmental sciences, often with the intent of integrating previously divided "social" and "natural" realms of analysis. The concept poses a challenge – not entirely new, but nonetheless surprising to many – to the epistemology of the sciences: the idea that there is a purely material, biophysical reality, external to and in contrast to human social activities or alterations, to be studied and known through science is called into question. If, in the Anthropocene, all of "Nature" is significantly shaped by humans, then the realms that scientific dualism has previously tried to classify separately as discretely human or natural are irretrievably entangled. Social scientists have long grappled with the "nature" of human beings, as biological entities, but the premise of the Anthropocene – problematic and contested as it may be– marks a shift for sciences that must go beyond the hyphenated linkage of "social" and "ecological" and strive to grapple with relational ontologies of nature and culture as co-constitutive.

For Stephanie Rutherford, the idea of "animals of the Anthropocene" draws on the posthumanist turn in animal research, which "decenter[s] the human while emphasizing animal agency, entanglement, and hybridity" (2018, p. 3). As Rutherford herself notes, it is a bit ironic in this context to make reference to the Anthropocene – which literally centers the human, *Anthropos,* in its very name – rather than the counter-formulation that might be expected to be a better fit for posthumanist thought, the "Chthulucene," in which "the human and nonhuman are inextricably linked in tentacular practices" (Haraway 2016). Yet despite her sympathies to Donna Haraway's critique of the "awfully self-centered and totalizing" narrative of the

Anthropocene, Rutherford defends her reiteration of the concept, arguing that "the notion of an epoch defined by human-induced change can be generative, implying both acknowledgment of asymmetrical harm and a responsibility to act. The notion gestures toward an ethical thrust" (Rutherford, 2018, p.3).

This ethical thrust, of course, requires the making of value judgments about human-induced ecological change. Which of our interventions as a species create harm, or conversely, amount to care? What are our responsibilities? Indeed, how do we live in a multi-species world? These are difficult, perhaps unanswerable questions, and I do not pretend to have the solutions in this dissertation. Nonetheless, I aim to foreground such difficult political and ethical questions at the heart of political debates over wildlife conservation and management. By placing wolves alongside the various hybridized, invasive, feral, or otherwise human-produced species that might be called the "animals of the Anthropocene," I gesture toward a *political* thrust, rejecting depoliticized appeals to Nature as a source of normative value in conservation; and interrogating the human values that ultimately drive so many human-wildlife dynamics.

* * *

Donna Haraway famously introduced the concept of "companion species" with reference to the dog (*Canis lupus familiaris):* a "domestic" species, living in the home, whose existence is irretrievably entangled with human society, and yet which shares its species name and much of its genome with the wild wolf. The *domestic*, of course, is complicated. As Anna Tsing points out:

> "Domestication is ordinarily understood as human control over other species. That such relations might also change humans is generally ignored. Moreover, domestication tends to be imagined as a hard line: You are either in the human fold or you are out in the wild. Because this dichotomisation stems from an ideological commitment to human mastery,

> it supports the most outrageous fantasies of domestic control, on the one hand, and wild species self-making, on the other. Through such fantasies, domestics are condemned to life imprisonment and genetic standardisation, while wild species are 'preserved' in gene banks while their multi-species landscapes are destroyed. Yet despite these extreme efforts, most species on both sides of the line—including humans—live in complex relations of dependency and interdependence." (Tsing, 2012, p. 144)

It is tempting to celebrate such interdependency (not only between humans and "domestic" species but with regard to all the planet's diverse creatures) via ideas of mutuality, flourishing, companionship, "*becoming-with*." Indeed, all human and nonhuman lives are "interwoven in rich patterns of co-becoming with others" (van Dooren, 2014), knotted up in multi-species entanglements, and mutually reproduced through diverse relations of encounter and exchange (Haraway 2016). Yet as Rosemary-Claire Collard notes, companionship and mutual flourishing are also not the most apt concepts for examining human relations with a predatory carnivore. The encounter between human and animal, much romanticized in Haraway's relations with domestic dogs, is in the case of wild predators "almost always lethal for one species," the predator (Collard, 2012, p.25). "What happens when human-animal encounter isn't convivial, but deadly?" asks Jared Margulies (2019). Despite their many similarities to dogs, wolves do not easily make "messmates," and there is little companionship to be found in predation, nor in lethal predator control. In fact, the act of encounter – whether with humans, or with their "domestic" livestock sometimes found in "wild" spaces – is precisely what serves to make wolves killable, leading not to mutual flourishing but instead to efforts at lethal extinguishment of wild animal lives.

* * *

Scientists believe that wolves and humans have been co-evolving together for many thousands of years. Following the herds of bison – another wild companion species – across northern latitudes, wolves and people are believed to have interacted at the margin of campfire illumination, perhaps sharing bones, perhaps benefitting from one another's hunting skills, or even learning to work together. At some point, or perhaps several discrete points in time, some wolves branched off from their wild kin, coming into the fold of human domesticates, developing the friendly relations and enabling the warm, saliva-thick interspecies encounters of Haraway-an companionship.

Meanwhile, wolves and people developed a different set of relations, premised on relations of mutual fear. Today, such interspecies relations are often taken for granted as a biological inevitability; dogs are friendly companions while wolves live in "innate fear" of people. Yet viewed on an evolutionary scale, these relationships might just as easily, and possibly more accurately, be described as a conditioned responses to repeated encounters, some friendly, others violent and even deadly, where learned behaviors gradually become adapted as part of the biology of the species. Dogs entered the human fold, and wolves learned to keep a safe distance. Contemporary wolf management efforts – and wildlife management practices more generally – arguably aim to "keep wildlife wild" by re-disciplining these relations, preventing habituation to humans (and in the case of predators, to livestock). Somewhat ironically, wildlife managers find themselves in a situation where protecting wolves requires violence against them, precisely because violence is the nature of the historical interspecies relationship. "Killing for coexistence" demands finding the right balance of interspecies violence that will maintain desirable interspecies relations that can allow for the reproduction of a sustainable, but ultimately not too threatening, population of "wild" wolves.

* * *

In the course of my research on wolf management, I frequently asked scientists and wildlife managers to consider the possible evolutionary impacts of such management practices. Might repeated aversive conditioning of wolf behavior, coupled with the selection pressure of killing non-conforming individuals, lead to evolution: "changing wolf behavior" not just on the individual but on the species or evolutionary level? A few were quick to reject the idea, downplaying or dismissing the idea that human management would have any meaningful impact on the genomic level. Others – in fact the majority – seemed surprised by the question, as if they hadn't thought about it before. Many didn't have a clear answer. Speaking with biologists, though, I was surprised to find that some not only believed that it was common sense to think this way, but that they were no less than certain that artificial selection by humans for particular wolf behaviors has happened before. As Diane Boyd, a wolf biologist working in Montana for thirty-plus years, has written:

> "The bold wolves were shot, the accessible wolves were poisoned, and the shy wolves survived in remote places… the elusive wolf of the extirpation era became the wolf of modern memory that people believe represents "normal" wolf behavior." (Boyd, 2005)

From this perspective, what we know as "wild" wolves are the product of decades or centuries of interspecies dynamics that led to a kind of anti-domestication, a driving away from the human fold via interspecies fear relations. Though it may be true that "it's hard to make a wolf not act like a wolf," in fact, we know that it *can* be done: co-adaptation with human society is precisely what led to the existence of the domestic dog. Whether or not the same (or reverse) processes were, and are, acting on the wolf population is up for debate, but the false dichotomy of domestic control in opposition to wild self-making that Tsing describes is clearly at work in

the expectations we place on "wild" wolves. The widespread language of "natural" and "innate" wolf behavior elides the complex ways in which wolf behavior is produced as a naturecultural phenomenon, intersecting across the realms of genomics (inherited, instinctive behaviors), animals' sociality (wolf culture), and interspecies relations (human-driven conditioning and co-adaptation). Today, wolves that live in landscapes shared with humans are profoundly controlled, often restricted to certain spaces, subjected to hazing and harassment practices, and killed when they engage in unacceptable behaviors such as livestock predation. It is hard not to ask how a species with a known high level of behavioral plasticity, and a demonstrated capacity for interspecies co-evolution, might respond to such conditions. As Emma Marris asks: "will tight control over wolves result in evolutionary adaptation to the human niche? Will some populations of wolves become synanthropes? Domesticates? Pets? Will they become a new kind of dog, one bred to fear humans instead of love them?" (Marris, 2020)

Such questions illustrate what Pablo Pena Rodrigues and Catarina Lira (2019) describe as the "bio-evolutionary Anthropocene," emphasizing human impacts not only on climate, or geology, but on animal evolution and biodiversity. They hypothesize that "species distributions, species richness, and novel organisms will diverge enormously from contemporary biodiversity" in such an epoch, as "anthropogenic-favored" organisms become dominant. Though their argument frames such developments as hypothetical – the bio-evolutionary Anthropocene is figured as a *possible* ecological future, not a given – one could argue that we are already living in this time. Wolves, for instance, have been "granted a temporary reprieve" from an apparent trend toward extinction (Simon, 2020), arguably by virtue of their newfound 20th-century status as an anthropogenically favored organism – a status that could perhaps be revoked at any time, as

recent renewals of efforts to aggressively hunt and even eradicate wolves in many parts of the American West illustrate.

* * *

Wolves have long been figured as monstrous and terrible creatures by the settlers who feared them. But they can also be understood as "monsters," in the sense offered by Swanson et al (2017), in the figuration of "monsters of the Anthropocene" as multispecies, cyborg, "symbiotic entanglements" across naturecultural bounds (p. M2). These creatures are monstrous not because of their difference from humans, but precisely because the role played by humans in their making defies the premise that they are truly nonhuman at all – they are, like Frankenstein's monster, ultimately our creation and responsibility. Domestic, wild, feral, hybrid, cyborg, all of the above: they trouble categories; they challenge preconceptions. At the acknowledged risk of alluding to anti-wolf stereotypes, I offer this in conclusion: wild wolves, too, are monsters of the Anthropocene, produced by, through and with human interventions, intentional and otherwise, in the past, present, and future. And if wolves are such monsters, so too is all so-called "wild" life. Conservation – not only of wolves, but of biodiversity and wildlife more generally – must stay and grapple with this brave new reality. What does it mean to reframe conservation away from its nostalgic impulses, aimed at reproducing imagined pristine ecosystems, or maintaining only extant biodiversity? What does it mean to jettison appeals to Nature as a basis for the ethics of environmental management, to embrace the idea of a domesticated future, a bio-evolutionary Anthropocene in which everything is part of the human fold? What does it mean to, in Bruno Latour's words, "love our monsters?" (Latour, 2012; Robbins & Moore, 2013). Are we prepared to grapple with future socio-ecological relations that are troubled, unstable, and monstrous? What is the future of "wild" life in that world?

* * *

“In the wolf we have not so much an animal we have always known as one we have consistently imagined.” (Lopez, 1979)

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