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Managing Wolf-Livestock Conflict on National Forests in the Western United States

Jeff Vance Martin, Robert M. Anderson, Kathleen Epstein, and Susan Charnley



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Authors

Jeff Vance Martin was an Oak Ridge Institute for Science fellow and social science researcher and is now a research social scientist, U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA 95521, jeffrey.martin4@usda.gov. **Robert M. Anderson** was an Oak Ridge Institute for Science fellow and a social science researcher and is now a research geographer, U.S. Department of Agriculture, Forest Service, Northern Research Station, 5523 Research Park Drive, Suite 350, Baltimore, MD 21228, robert.anderson3@usda.gov. **Kathleen Epstein** was an Oak Ridge Institute for Science fellow and a social science researcher, U.S. Department of Agriculture, Forest Service, and is currently the director of conservation science, The Nature Conservancy in Maine, 14 Maine Street, Suite 401, Brunswick, ME 04011, katie.epstein@tnc.org. **Susan Charnley** is a research social scientist, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 3200 SW Jefferson Way, Corvallis, OR 97331, susan.chnley@usda.gov.

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Abstract

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Since the reintroduction of gray wolves (*Canis lupus*) in the Northern Rocky Mountain region of the Western United States in the mid-1990s, wolves have spread to occupy suitable habitat in several Western states, most notably Idaho, Montana, Oregon, Washington, Wyoming, and recently California. Much of this suitable habitat is on federal lands, including those managed by the U.S. Department of Agriculture, Forest Service. The Forest Service manages lands for multiple uses, including grazing, and many national forests in these states now harbor both wolf and livestock populations for at least part of the year. Where wolves and livestock overlap, negative interactions can result, including stress and predation on livestock (affecting the livelihoods of producers), and lethal removal of wolves in response. These interactions create social conflict among livestock producers, wolf advocates, and other stakeholders over how wolves and livestock ought to be managed to promote coexistence on federal lands. Between 2020 and 2022, we investigated how national forest managers on six national forests located in the six

states noted above have addressed wolf-livestock conflict. This report presents the results of our research, providing in-depth case studies of wolf-livestock management on six national forests, drawing mainly on data from semi-structured interviews with managers and other stakeholders. We contextualize our findings within the context of wolf management policy in each state as well as the larger landscape of wolf-livestock conflict in the American West. We also provide a cross-case comparison, identifying common themes, insights, and lessons learned, as well as management implications from which managers on national forests, working with both wolves and livestock, may benefit.

KEYWORDS:

Coexistence
Federal land management
Gray wolves
Human-wildlife conflict
Livestock grazing
U.S. Forest Service

Summary

Wolves and livestock have co-occurred on National Forest System lands in the Western United States for more than three decades. The regional return of wolves constitutes a significant success for advocates of wolf conservation. However, the overlap of wolf restoration and livestock production on federal lands has also posed serious challenges for management on federal grazing allotments, particularly associated with livestock stress, wolf predation, and control of wolf populations, all alongside a variable landscape of stakeholder perspectives and engagement. Furthermore, where wolf populations are expanding their range, social conflict has often increased, bound up with predation and economic impacts on producers. This raises questions about the human dimensions of wolf-livestock dynamics as well as the role of federal lands and land managers in stewarding multiple-use landscapes that hold value for wildlife conservation and rural livelihoods.

This report summarizes research conducted on wolf-livestock dynamics on national forests in the Western United States from 2020 through 2022, by social scientists affiliated with the U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. The goal of the study was to characterize wolf-livestock interactions on western national forests and examine how range managers on national forests with both wolves and livestock address wolf-livestock conflict. We focused on six national forests in California, Idaho, Montana, Oregon, Washington, and Wyoming to provide a wide-ranging and comparative perspective on wolf-livestock dynamics. This report contains six chapters that detail these dynamics on each case-study national forest and how managers are addressing them, while situating each case within the broader social and policy context of the state where it is located. Findings provide insights and lessons learned for managers on national forests that are facing wolf-livestock conflict so that managers can learn from each other about efforts to mitigate conflict and address stakeholder concerns.

The research followed a mixed-methods case study approach that was informed by consultation with a project advisory board of Forest Service range program staff from the Forest Service's Pacific Northwest Region. Data collection included the following:

- A survey of range program specialists on national forests and grasslands in six Forest Service regions—Northern (Region 1), Rocky Mountain (Region 2), Southwestern (Region 3), Intermountain (Region 4), Pacific Southwest (Region 5), and Pacific Northwest (Region 6) (n = 42)—inventorying wolf presence, conflict levels, and mitigation and management approaches
- A review of policy and research documents associated with wolf management, wolf-livestock conflict, and collaborative conservation and coexistence
- Sixty-nine semi-structured interviews with Forest Service staff and other stakeholders associated with wolf-livestock interactions across six case study national forests chosen at the recommendation of regional range program managers

We analyzed data to synthesize key themes across case study contexts and consulted interdisciplinary literature on human-wildlife conflict and emerging insights from global wildlife conservation.

Key findings from each case-study national forest are detailed in their respective chapters. We also identified six crosscutting themes from our cases:

1. Physical geography matters. National forest grazing allotments are expansive landscapes characterized by rugged and remote conditions. This makes it difficult to quickly find killed or injured livestock and renders many nonlethal tools and techniques for wolf-livestock conflict mitigation impractical or ineffective. The conditions present on federal lands thus pose special and underappreciated challenges for coexistence.
2. Wolf-livestock conflict is embedded in broader social and political dynamics at state and regional scales. These include tensions around the respective role of federal and state authorities to manage wildlife and land as well as antifederal sentiments and distrust of government agencies. Wolf conflict also occurs amid socioeconomic transformations occurring in rural communities and may reflect rural-urban divides in social values and economic orientations. Managing wolf-livestock conflict thus takes place within a broader social context that complicates solutions for coexistence.

3. Economic pressures and labor shortages may constrain the ability of livestock producers to adapt to wolf presence. Some producers are better positioned to adapt than others, creating a need for programs that promote capacity building. A consideration of economic factors at multiple scales is thus necessary when designing interventions for conflict mitigation.
4. Wolf management policy is highly variable across Western states, with different levels of protection for wolves, widely divergent policies regarding recreational hunting of wolves, and varying approaches to the use of lethal removal to address conflict situations. These differences result in different options for conflict mitigation on national forests that may not be transferable across states.
5. Conflict mitigation interventions have significant social and psychological aspects and implications. People's perceptions of whether and how interventions (both lethal and nonlethal) work to reduce wolf-livestock conflict can be as important as the environmental outcomes of those interventions in promoting coexistence.
6. Forest Service managers often lack clarity about their role and authority in wolf-livestock conflict mitigation. There is a need for improved guidance around what actions fall within the Forest Service purview, such as what managers can ask or require permittees to do to avoid wolves, and how flexible they can be in support of adaptive grazing management. Given the multiagency and cross-jurisdictional nature of wolf management on federal lands, it is widely seen as important for Forest Service managers to "stay in their lane" vis-à-vis other agencies, yet this lane is not always clearly defined in practice.

The report concludes with a consideration of findings from across our cases and offers lessons for Forest Service resource managers derived from the experiences of their colleagues who have been involved in managing wolf-livestock interactions on the national forests we studied. These include normalizing wolf presence, being proactive around conflict, building collaborative relationships, serving as an intermediary for information sharing, and striving for flexibility in grazing management, as well as managing expectations around the role of Forest Service managers in conflict mitigation.

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Chapter 1: Introduction

Return of the Wolf

Gray wolves (*Canis lupus*) were historically among the most widespread species of nonhuman land mammals, ranging across much of the northern hemisphere (Mech 1970, Mech and Boitani 2010). During the 19th and early 20th centuries, however, gray wolves were removed from most of the contiguous United States through government-funded programs to shoot, trap, and poison wolves and other large predators. Under the authority of the Bureau of Biological Survey (which would later become the U.S. Fish and Wildlife Service [USFWS]), wolves were extirpated from the American West in the interest of securing land for livestock grazing and settler-colonial expansion (Coleman 2004, Wise 2016).

Over the 20th century, however, scientific and cultural reevaluation would lead gray wolves to become one of the first species listed under the Endangered Species Act (ESA 1973) (Bangs et al. 2005). Following decades of planning, public comment, and legal back-and-forth, the USFWS reintroduced wild-caught Canadian wolves into central Idaho and Yellowstone National Park in 1995 and 1996 (Bangs and Fritts 1996, Fischer 1995, Fritts et al. 1997). These initial individuals, combined with ongoing dispersals from Canada, provided the basis for subsequent repopulation and spread across the intermountain West. By the late 2000s, wolves were moving into Oregon and Washington and triggering processes of Endangered Species Act delisting in the Northern Rocky Mountain region (Jimenez et al. 2017). Today, wolves continue to expand into new ranges, including California (fig. 1.1), and reintroduction into Colorado is pending.¹

Although widely celebrated by conservationists as a success story and foundational instance of “rewilding” (Eisenberg 2010, Soulé and Noss 1998), the expansion of wolves in population and range has simultaneously resulted in social tensions and political conflict, particularly around predation as a threat to livestock production on shared

landscapes. Often presented as an emblematic instance of human-wildlife conflict (Frank et al. 2019, Woodroffe et al. 2005), the process of wolf return to the American West has included multiple, interrelated conflicts: between wolves and livestock, between wolves and people, and between different groups of people over what to do about wolves and livestock. In this report, conflict refers to various permutations of the above, but we aim to specify, wherever possible, the form and parties involved (e.g., “wolf-livestock conflict” and “social conflict”) (box 1.1).

Co-occurrence of wolves and livestock is a persistent feature of wolf recovery across the American West, particularly on public rangelands. The federal government manages 47 percent of the land area in the 11 contiguous western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming); most is managed by the U.S. Department of the Interior, Bureau of Land Management (247.3 million acres) and the U.S. Department of Agriculture, Forest Service (192.9 million acres) (Bui and Sanger-Katz 2016, Ruple 2020). National forests and grasslands, specifically, are managed for multiple-use following the Multiple-Use Sustained-Yield Act (1960), requiring the Forest Service to consider and balance timber, range, water, recreation, and wildlife concerns. Although wolves are primarily managed either by the USFWS (where federally listed) or the relevant state wildlife agency, their presence on National Forest System lands raises considerations for Forest Service managers as well.

Privately owned livestock (mostly cattle and some sheep) seasonally graze on Forest Service allotments throughout the American West (fig. 1.2)—generally from June to October—through a permit system based on a historically established geography of livestock grazing in the region (Rowley 1985). The most common permit lasts for 10 years, is renewable, and outlines the terms and conditions under which grazing is authorized on the associated allotment. In 2020 (the most recent year for which data are readily available), the Forest Service administered grazing permits for an estimated 5,492 permittees nationwide, authorizing 6.6 million head months²

¹ This report does not include the Mexican wolf (*Canis lupus baileyi*), a subspecies native to southeastern Arizona, southern New Mexico, and northern Mexico subject to its own recovery program (see Harding et al. 2016, Martínez-Meyer et al. 2021), nor does it cover gray wolf populations in the western Great Lakes region (see Wydeven et al. 2009), both of which have had sufficiently different historical trajectories to warrant their exclusion.

² One head month = one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

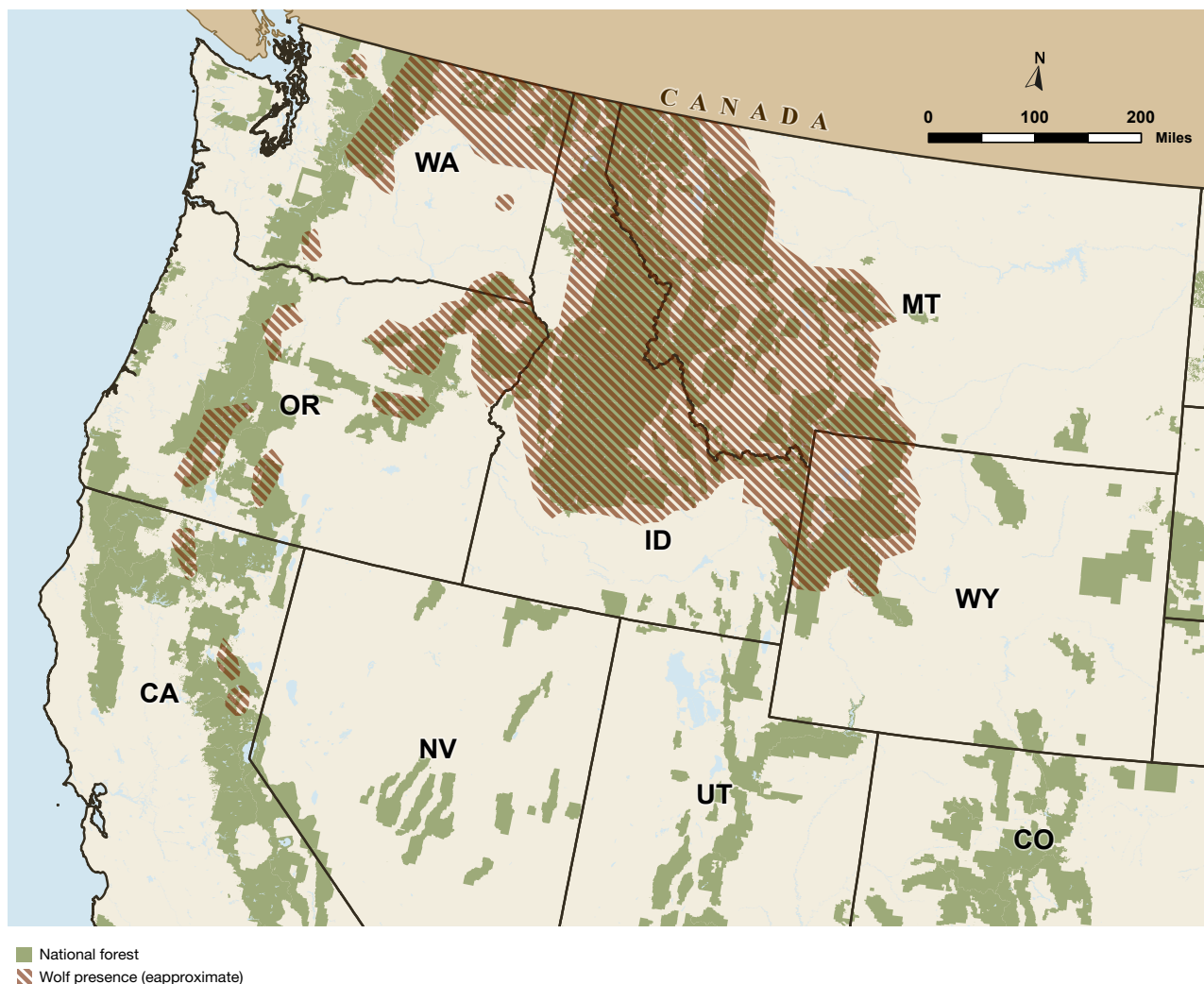


Figure 1.1—Estimated gray wolf presence in the Western United States. Map by Abigail Kaminski.



Figure 1.2—Livestock graze on National Forest System lands, Colville National Forest, Washington. Photo by Robert Anderson.

Box 1.1**Terminology**

Interactions between wolves, livestock, and human groups are often described under the umbrella of **human-wildlife conflict** (HWC) or **human-wildlife conflict and coexistence** (HWCC) (Fascione et al. 2004, Frank et al. 2019, Woodroffe et al. 2005). In both the scientific literature and efforts on the ground, the term “conflict” can take on a variety of meanings. It can refer to wolf attacks resulting in the injury or death of livestock and other domestic animals as well as sublethal effects, such as weight loss or behavioral changes—typically referred to as **wolf-livestock conflict**. Such effects often contribute to **human-wolf conflict**, which may take the form of fear and other emotional responses on the part of humans as well as concerns over the economic impacts of predation, leading to efforts to prevent wolf attacks through lethal removal, the introduction of nonlethal deterrents, or increased (legal or illegal) hunting. All this takes place amid significant **human-human conflict** over wolf management—between conservation advocates, livestock producers, hunters, residents, and state and federal managers—which may relate to social and political conflicts and differences that extend far beyond wolves (Nie 2003). This slippage is noted in the wildlife ecology and HWCC literature (see Eklund et al. 2023, Peterson et al. 2010, Redpath et al. 2015), as well as in critical scholarship that frames HWCC as a challenge of “biopolitical” management of nonhuman life (e.g., Anderson 2022, Biermann and Anderson 2017, Margulies and Karanth 2018). While HWC may include animal death (including predation of livestock by wolves and the killing of wolves in response), death is not a necessary condition for, nor equivalent with, conflict. Some forms of animal death are routinely framed as instances of conflict (e.g., the recurrent killing of

livestock by wolves), while others (e.g., the killing of wolves) are more likely to be described as routine or necessary wildlife management (see Anderson 2022).

Other terminology in use around wolves and livestock is likewise contested. Wolf advocates have expressed concern over the appropriateness of various terms associated with wolf impacts on livestock production and population management interventions, including **depredation**, **control**, and **harvest** (Endangered Species Coalition 2021). In this report, we use **wolf-livestock conflict** to refer to the killing, injury, and noninjurious effects of wolves on livestock, and where possible, we clarify which livestock species are involved and how. We use the term **predation** to refer to patterns of wolf attack, killing, and consumption of prey animals, wild or domestic. We use the term **depredation** only rarely (including in quotes) to refer to the unwanted predation of livestock from the perspective of producers—recognizing that this use is inherently value-laden. We continue to refer to “**removal**”, “**lethal control**”, and “**harvest**” where these are used by managers and other actors, while recognizing the problems that many conservationists may have with these terms (e.g., use of these terms is seen as an attempt to sanitize wolf killing). Finally, **coexistence** refers to a range of practices and perspectives that aim to reduce conflict where wolves and livestock co-occur and interact. Importantly, coexistence between people and wildlife or between wolves and livestock on a shared landscape does not, in our usage, entail the absence of conflict. Rather, we consider coexistence as complex and multidimensional, with spatial, technical, social, and institutional aspects (Martin et al. 2021).

of grazing by cattle, horses, sheep, and goats (USDA FS 2020). Ninety-eight percent of these permittees grazed livestock on national forests and grasslands in the six Forest Service regions of the Western United States—Northern (Region 1), Rocky Mountain (Region 2), Southwestern (Region 3), Intermountain (Region 4), Pacific Southwest (Region 5), and Pacific Northwest (Region 6) (fig. 1.3). Permitted livestock grazing occurred on more than 74 million acres of National Forest System lands across 28 states, representing about 38 percent of all National Forest System lands (USDA FS 2020).

Although the precise geography of wolf presence is not well known because of the complexity of wolf monitoring and movement, some of our interviewees³ have

estimated that as much as 75 to 80 percent of the western gray wolf population resides on National Forest System lands. Thus, particularly in the summer months, as new wolf pups are venturing away from the den and livestock are entering their summer ranges, a perfect storm of overlapping management jurisdictions and multiple-use tensions often emerges, with conditions ripe for wolf predation on livestock (for the latest on wolf ecology and reproduction, see Boyd et al. 2023). While wolf-livestock conflict is not unique to Forest Service lands, these lands represent a key nexus of encounter between wolves and livestock as well as an opportunity for intervention around the challenge of shared space and coexistence between livestock, wolves, and people (fig. 1.4).

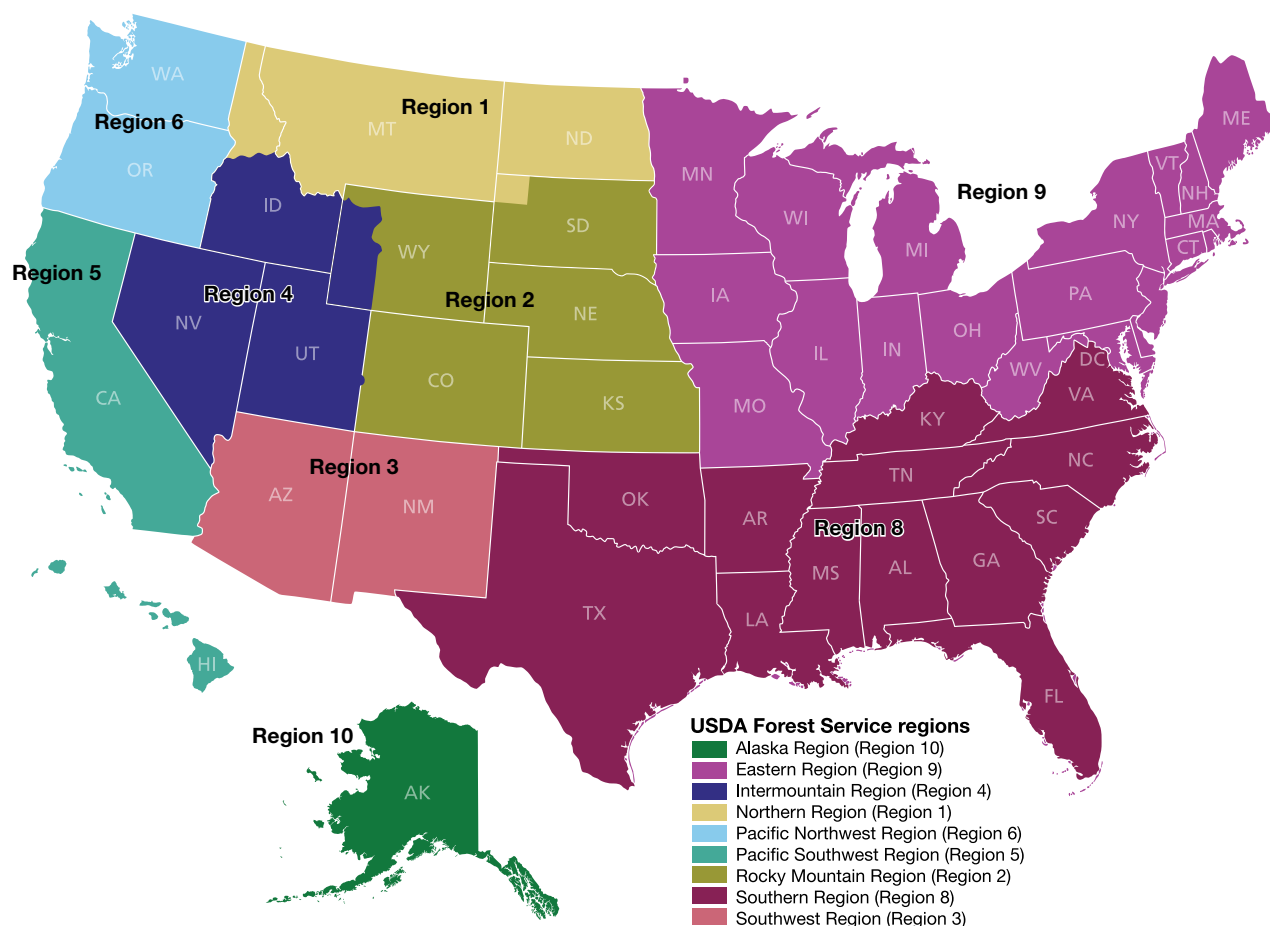


Figure 1.3—U.S. Department of Agriculture (USDA), Forest Service regions.

³ Interviews are described in detail in chapter 2, along with a discussion of methodology.

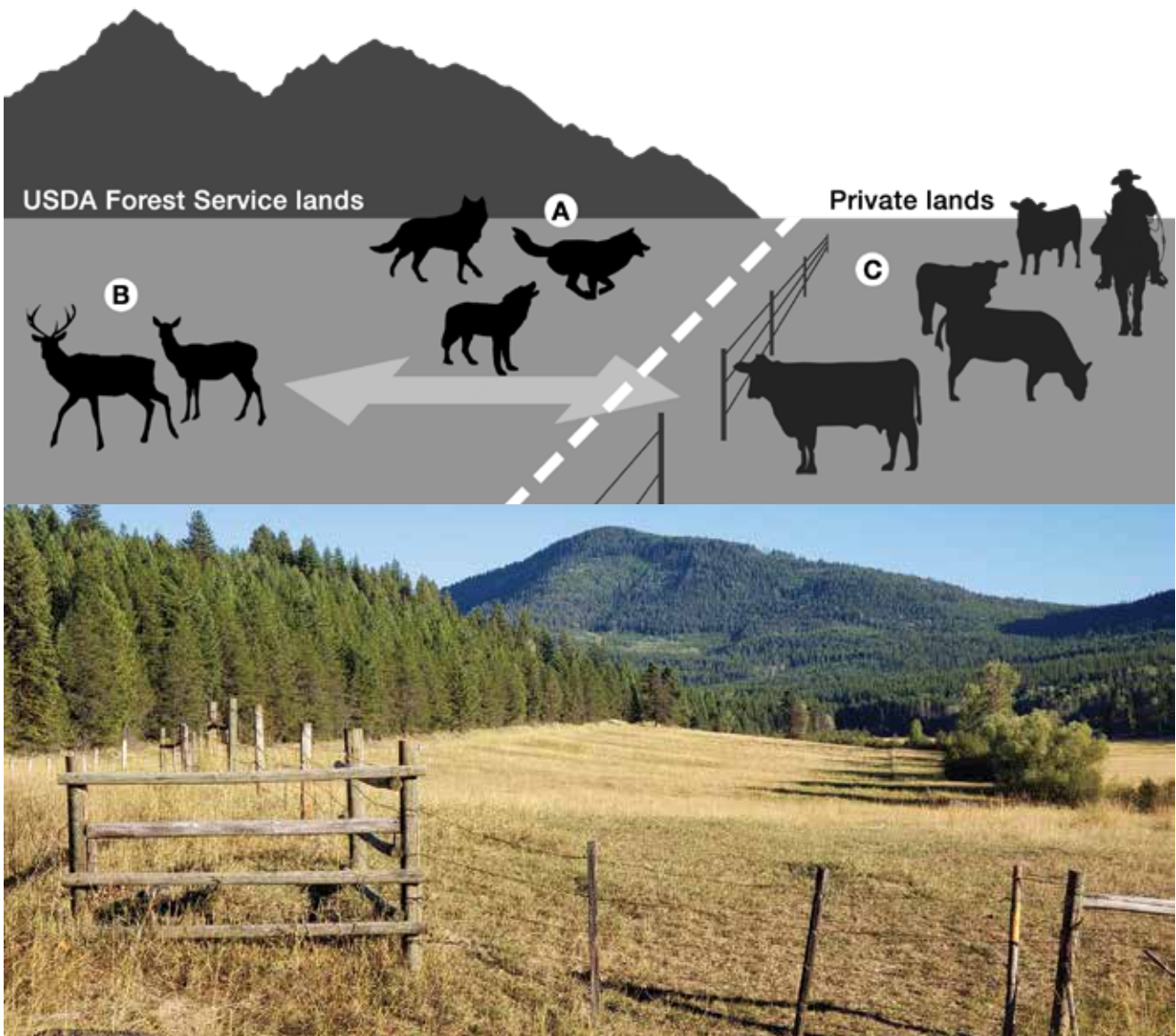


Figure 1.4—U.S. Department of Agriculture, Forest Service lands as a nexus of encounter. (Top) Seasonal grazing of privately owned livestock on federal lands puts them in contact with (A) wolves, which prey on both (B) wild ungulates and (C) livestock. Diagram from Martin et al. (2021), by Gretchen Engbring. (Bottom) A landscape similarly at the interface of open pasture and forested grazing lands on the Colville National Forest, Washington. Photo by Robert Anderson.

Transformations and Tensions

The Western United States is a region of varied geography and social and policy dynamics but also commonalities in terms of settlement patterns (and indigenous dispossession), a history of resource-based economies, and the ongoing importance of federal lands for rural livelihoods. Nationally, attitudes toward wolves have continued to evolve alongside shifting sociocultural dynamics. Predator protections correspond with a growing “era of mutualism” (Copeland et al. 2023, Manfredo et al. 2020), yet others have noted a “values gap” between wildlife managers and multiple publics at different scales (Bonnie et al. 2020, Sullivan et al. 2022)—a potential key driver of human-human conflict over wolves.

In the American West, wolf conflict is linked with long-standing federal-state tensions, cultural polarization around environmental issues, and other contested regional transformations—including the relative decline of extractive industries in the so-called New West (Hines 2012, Riebsame and Robb 1997, Robbins et al. 2009, Winkler et al. 2007). At the same time, however, since the late 20th century, the West has also seen the rise of collaborative natural resource management, landscape-scale conservation, and efforts to transcend polarization (Charnley et al. 2014, White 2017), including around wolf coexistence (Martin 2021b, Martin et al. 2019).

Wolves are adaptable habitat generalists, ranging widely and relying on different food sources at different times of

the year (Mech 1970, Mech and Boitani 2010, Musiani et al. 2010), yet in much of the West, they subsist primarily on large ungulates such as deer and elk. Where wolf range overlaps with domestic livestock (even seasonally), these can become an alternative food source—resulting in losses for producers through direct predation, injury, or stress-related effects (Steele et al. 2013), as well as potential habituation to livestock as a prey base. As one Idaho researcher noted in our interviews, “When wolves figure out cows are super easy to kill and there’s 800 pounds of beef, they tend to want to do it again.”

Research on wolf-livestock conflict and coexistence has emphasized interventions aimed at reducing predation on livestock, with on-the-ground efforts using nonlethal strategies for coexistence ongoing throughout the West (Stone

et al. 2017, Wilkinson et al. 2020). However, much of the literature pertaining to these strategies has focused on the tools and techniques themselves (table 1.1)⁴ and deals primarily with their use on private lands. There has been less focus on the use of these strategies in relation to the physical landscape and management of those lands where wolves and livestock interact (fig. 1.5). As noted above, federal lands represent an important nexus of interaction (and potential conflict) due to spatial and temporal patterns of both wolves and livestock there. At the same time, federal lands present challenges for management interventions and the deployment of various tools and techniques, a complication that remains underexplored (see chapter 9).

Today, gray wolves exist across an uneven policy landscape. The delisted Northern Rocky Mountain population

Table 1.1—A typology of tools and techniques used to address wolf-livestock conflict and coexistence in the Western United States

Approach	Mechanism	Examples
Reconnaissance	Monitoring wolf presence and movements allows land managers or livestock producers to proactively avoid interactions by reducing spatial overlap between wolves and livestock.	Radio or global positioning system collars, wildlife cameras, howl surveys, public reporting of wolf sightings
Husbandry	By changing approaches to livestock management, producers may be able to reduce attractants to wolves and minimize likelihood of predation.	Herding or range ridging, removal of livestock carcasses and bone piles, additional protection of calving/lambing areas, prompt removal/treatment of sick or injured livestock, changes to timing/turnout onto grazing allotments, relocating herds or changing pasture use, techniques of low-stress livestock handling
Deterrents	Nonlethal hazing and distancing technologies developed to deter wolves from attacking livestock; mechanisms include direct disruption of attacks, aversive conditioning, and spatial interventions to physically enclose livestock areas.	Livestock guardian dogs, fladry or electrified turbo fladry, noisemakers, nonlethal munitions, automated devices such as Foxlights, and radio-activated guard (RAG) boxes
Lethal control	Targeted removal of “problem wolves” in areas where conflict occurs; removal may be incremental (one wolf targeted at a time) or full pack removal.	Aerial shooting (from helicopter), trapping (often by U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services agents), issuing of kill permits to affected livestock producers
Hunting	Generalized (nontargeted) wolf population reduction; killing wolves aims to reduce or limit numbers, increase social tolerance, and/or prevent habituation.	Regulated, legal hunting seasons managed by state fish and wildlife agencies; designation of wolves as “shoot-on-sight” species
Compensation	Financial payments to affected livestock producers for wolf-caused losses with aims of reducing financial burdens and increasing social tolerance.	Payments to producers for confirmed losses, “pay for presence” schemes

Adapted from Martin et al. (2021).

⁴ The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.



segment includes wolves in Idaho, Montana, Wyoming, and the eastern portions of Oregon and Washington. Federal delisting in these areas paved the way for state wildlife agencies to take the lead on wolf management and for the development of unique and divergent wolf policies from state to state. In some states (e.g., California and Washington), wolves have additional protections at the state level (fig. 1.6). Although it has been nearly three decades since their return in some areas, conflict surrounding wolves continues, often in connection with other social and environmental issues in the West (Martin 2020, Nie 2003). Furthermore, relatively little research has considered variation across the region or the particularities of federal grazing lands as a site of encounter and conflict—an important gap when considering the viability of various tools and techniques on specific landscapes.

Figure 1.5—National Forest System lands in the foreground and private rangelands in the distance, northeastern Washington. Photo by Robert Anderson.

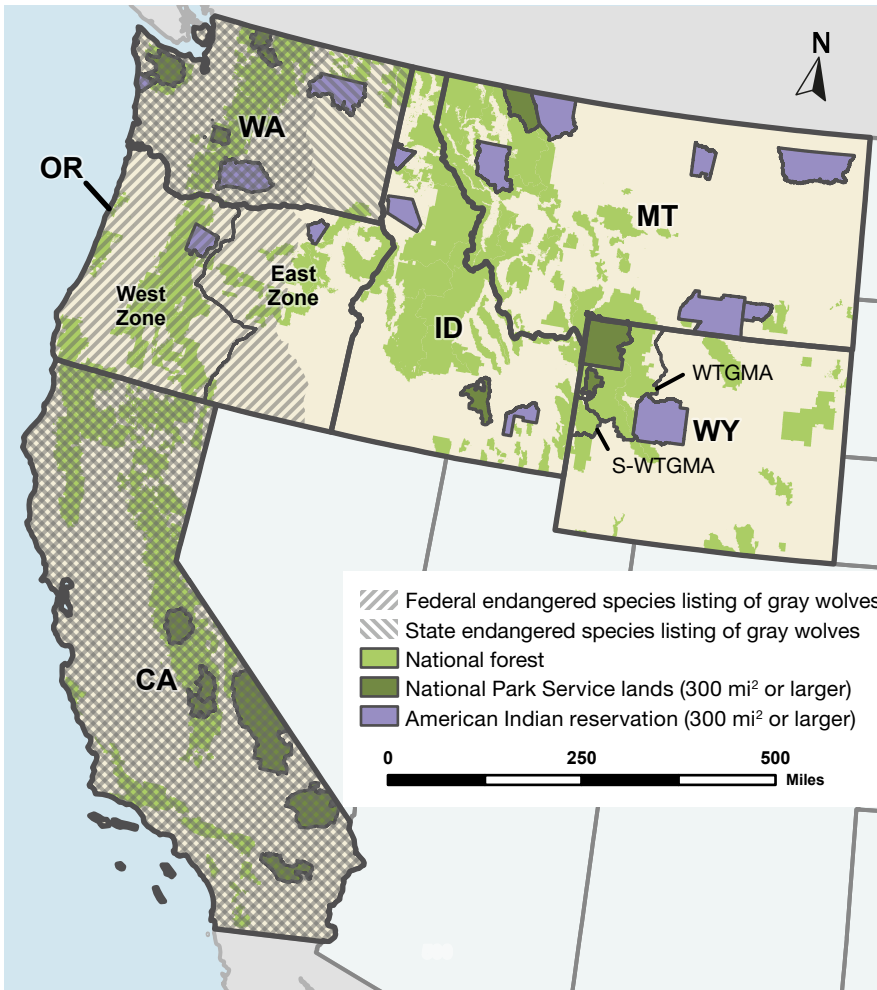


Figure 1.6—Wolf protection status across our six-state research area. WTGMA = wolf trophy game management area, S-WTGMA = seasonal wolf trophy game management area. Map by Abigail Kaminski.

Report Focus and Organization

This report summarizes and synthesizes results from an assessment of wolf-livestock conflict and mitigation efforts on national forests across the American West that were conducted between 2020 and 2022. This project emerged from conversations with resource managers in the Forest Service's Pacific Northwest Region (Region 6) contending with heightened social conflict surrounding wolf-livestock interactions on the Colville National Forest in Washington. This included a lawsuit filed in 2020 that sought to require range managers to regulate livestock management practices to reduce encounters between livestock and wolves that lead to lethal removal of wolves by the Washington Department of Fish and Wildlife.

Given the recognized complexity and durability of conflict surrounding wolf-livestock conflict and management, resource managers for the Forest Service Pacific Northwest Region requested a regional social science engagement, emphasizing the sharing of insights from national forests across the western states. This approach was selected because of the growing recognition of the need for attention to the human dimensions of wildlife conflict and coexistence as well as the relative dearth of cross-regional and comparative studies from which to learn (Baruch-Mordo et al. 2009, Dickman 2010; cf. Ghosal et al. 2015, Skogen et al. 2008). The literature on carnivore conservation widely recognizes the need for increased social acceptance among populations who share space with these species (Anderson 2021, Chapron et al. 2014). Wolf conservation, in particular, poses a unique challenge given the uneven geography of wolf distribution and its impacts and the cultural and political polarization surrounding their return. Despite widely recognized and significant social dimensions, research into wolf conflict too often emphasizes the technical elements of conflict mitigation and the biophysical aspects of wolf-livestock interactions. Our research, therefore, centers social science methods as an essential, and still underrepresented, approach to wildlife conservation and management. Our team of scientists—an environmental anthropologist and three human geographers by training—conducted a mixed-methods overview and a series of case studies across six western states with established wolf populations: California, Idaho, Montana, Oregon, Washington, and Wyoming (fig. 1.7). Research was codeveloped and conducted in consultation with a Forest Service advisory board (see chapter 2).

Chapters are ordered following a rough spatial-temporal logic: Idaho, Montana, and Wyoming represent the Northern Rocky Mountain wolf population and site of the 1995 and 1996 reintroductions in central Idaho and Yellowstone National Park. Wolves spread from there to Oregon and Washington, and then on to California.

Our aims were to characterize wolf-livestock conflict across states and a sample of national forests to better understand the role of Forest Service managers in mitigating the conflict and to identify and share best practices, barriers, and opportunities with managers across the American West. Guiding questions included the following:

- How do the experiences of wolf-livestock conflict and management on National Forest System lands vary across the West?
- What roles do social and environmental factors (e.g., physical geography and ecology, regional political economy, state-level policy, culture) play in these conflicts?
- What is the perceived effectiveness of various management strategies for mitigating wolf-livestock conflict (including both lethal and nonlethal interventions), and what are the identified enabling conditions and barriers to successful implementation?
- What is the perceived range of choices and activities available to Forest Service personnel managing conflict on these shared landscapes?
- What are key transferable insights and lessons learned from other Forest Service managers facing wolf-livestock conflict on National Forest System lands?

In the remainder of this report, we lay out findings from this research. Chapter 2 presents further details on our methodology and analytical approach. Chapters 3 through 8 cover our individual case study summaries and findings. Though each chapter focuses on a specific national forest, they also provide an overview of the broader management history and landscape of wolves and wolf management in the state in which that forest is located, which provides important context for understanding wolf-livestock dynamics on the national forest. In each case study chapter, we provide an overview of the ecological and social context, a brief history of wolf return to the area, a summary of policy and management at the state level, an overview of wolf-livestock conflict within the state, a more detailed discussion of wolf-livestock conflict dynamics on the



Figure 1.7—Site locations for case studies referenced in this 2020 through 2022 study of wolf-livestock dynamics on six national forests in the Western United States. Chapter numbers listed in the legend indicate where details on each case study can be found in this report. Map by Abigail Kaminski.

specific national forest, and a summary of approaches used to mitigate conflict and insights from managers working there. Chapter 9 provides a comparison across the six case studies and presents a discussion of some of the crosscutting themes that emerged from our research. Finally, chapter 10 is a synthesis of some of the broader lessons learned, providing insights for Forest Service managers seeking to mitigate conflict and address concerns around wolf-livestock interactions on national forests.

Chapter 2: Methods

Data Collection

In the fall of 2020, our team began developing a research plan in collaboration with an advisory board consisting of U.S. Department of Agriculture, Forest Service, Pacific Northwest Region (see fig. 1.3) regional and forest-level range program managers. We necessarily adapted our methods (Flick 2007a) to fit the circumstances of research during the COVID-19 pandemic (i.e., interviews were all conducted virtually, and field visits were kept to a minimum). Research methods included the following:

- A survey of range program specialists on national forests and grasslands where both wolves and livestock were present across six Forest Service regions—Northern (Region 1), Rocky Mountain (Region 2), Southwestern (Region 3), Intermountain (Region 4), Pacific Southwest (Region 5), and Pacific Northwest (Region 6) (see fig. 1.3).
- Case study profiles of six national forests chosen in consultation with our advisory board and regional range program managers, including semi-structured qualitative interviews with Forest Service staff and other stakeholders (see chapters 3–8).
- A review of policy and gray literature surrounding wolf-livestock conflict and coexistence efforts in the regions.

Survey

During late 2020 and early 2021, we participated in a series of virtual meetings with range management program staff in six Forest Service regions—Northern (Region 1), Rocky Mountain (Region 2), Southwestern (Region 3), Intermountain (Region 4), Pacific Southwest (Region 5), and Pacific Northwest (Region 6)—during their routine monthly regional range program calls (conducted via Microsoft Teams). In these meetings, we introduced our project, asked which national forests and grasslands in the region had wolves (either transient or established) as well as livestock grazing, and requested contact information for range managers and other relevant contacts on units with wolves. We then designed and implemented a survey to inventory the presence and status of wolf populations on those national forests and grasslands with livestock programs, identified perceived levels of wolf-livestock conflict and the number

of allotments and permittees affected, and documented management approaches that had been used to mitigate conflict along with their perceived effectiveness (see survey instrument in app. 1). We distributed our survey via an e-mail message—containing a link to an online Google form—to the key contact on each National Forest System unit with wolves ($n = 42$) between December 2020 and February 2021. We received a complete survey for 40 of 42 units in our sample, a 95 percent response rate.

Case Studies

We selected six case study national forests (fig. 1.7) on which to conduct more intensive investigations; selections were based on the expert advice of Forest Service regional range program managers and in consultation with forest-level range program managers on select units. Our criteria emphasized the selection of sites where wolf-livestock conflict was a salient issue and that represented diverse ecological contexts, social dynamics, and management approaches (Flick 2007a, Seawright and Gerring 2008). Research on each case study national forest consisted of semi-structured qualitative interviews with regional and forest-level rangeland management program specialists and specialists from other Forest Service programs (e.g., Wildlife Program), as well as state agency representatives, livestock producers, and environmental organizations.

We selected interviewees based on their familiarity and experience with wolf-livestock conflict issues, federal lands grazing, or both, at the recommendation of project advisors or via snowball sampling (identification of potential participants through referral by those already participating) (Patton 2014). Because our focus was on the role of Forest Service managers in wolf-livestock conflict, we only interviewed a small number of affected permittees and other stakeholders at the recommendation of managers interviewed. Sample sizes for each case study (detailed in the following chapters) were determined by the number of relevant actors given this focus. Researchers followed established protocols for research with human subjects as laid out in the Collaborative Institutional Training Initiative (CITI) Program, through which all held valid certificates at the time of research. Interviewees participated in the study

on a voluntary basis and did so following verbal informed consent after being briefed on the research process, potential risks of participation, and steps taken to ensure anonymity and privacy.

During 2021, we conducted a total of 69 interviews (9 to 15 interviews for each case) using a protocol we developed for this project (app. 3). We held conversations via Zoom or telephone that lasted between 45 and 110 minutes each. Interview recordings were then transcribed by Landmark Associates (thelai.com). Each researcher (except SC) was responsible for conducting two case studies—JM: Boise (Idaho, chapter 3) and Lassen (California, chapter 8) National Forests; KE: Beaverhead-Deerlodge (Montana, chapter 4) and Shoshone (Wyoming, chapter 5) National Forests; RA: Wallowa-Whitman (Oregon, chapter 6) and Colville (Washington, chapter 7) National Forests. The approach for data collection and analysis was consistent across all case studies unless noted otherwise.

Policy and Literature Review

Alongside primary research, the team conducted parallel reviews of policy documents, agency websites, and reports associated with wolf management, history, conflict, and litigation, focused on National Forest System lands in our respective states. This included keeping up with the latest in wolf management policies and monitoring data across the states in our study area. This was further supplemented with the authors' prior research experience, including state-level research previously conducted around wolf issues in Washington (Anderson 2022) and Idaho (Martin 2020), and around land users and resource management in the Greater Yellowstone Ecosystem (Epstein 2020) and broader American West (Charnley et al. 2014).

Analysis

Our analysis proceeds from a data triangulation approach (Flick 2007b)—bringing together survey, interview, and policy review data—and emphasizes a relational comparison (Hart 2006). It is informed by work from political ecology and critical scholarship on the American West (Martin et al. 2019, Schroeder et al. 2006, Swette et al. 2023) as well as the latest studies in human-wildlife conflict and coexistence (Frank et al. 2019, König et al. 2020, Margulies and Karanth 2018). Our research team compared results across cases during monthly virtual meetings throughout

2022, in a 2-day in-person workshop in early 2023, and by reviewing each other's case study writeups.

Transcriptions were analyzed in ATLAS.ti (ATLAS.ti 2022) using a set of codes we developed, corresponding to key topics of interest and emphasizing a thematic analysis (Guest et al. 2012). Before coding for each case study, researchers coded the same interview and compared results to ensure intercoder reliability. Each researcher then coded interviews from their respective case studies and drafted the associated case study chapter in this report. From our findings we developed a typology of the conflict interventions in use in the West (table 1.1), produced a comparative overview of spatial variation in policy and management across the six states studied (chapters 3 through 8), and identified emergent crosscutting themes (chapter 9)—all of which help supplement geographically siloed analyses of wolf-livestock conflict and coexistence efforts in the study area.

As necessitated by our methodology, our data focuses on the *perceptions* of survey respondents and interviewees around the effectiveness of interventions to address wolf-livestock conflict, rather than experimental testing or direct field observation of the various tools and techniques discussed (see table 1.1). This mirrors a broader issue surrounding research on predator management and coexistence interventions noted in the literature, namely an often-voiced concern about the lack of “gold standard” or better experimental testing (Treves et al. 2019, van Eeden et al. 2018). However, our aim with this project was not to conduct rigorous experimental testing of any given technique but rather to better understand how and where these tools are being implemented and their perceived effects (more recent research has begun to investigate the ecological mechanisms and effectiveness of various management interventions, e.g., Wilkinson et al. 2020, Young et al. 2019). Furthermore, we recognize that gold-standard studies are often difficult to implement in the complex context of real-world wildlife conflict. However, practitioners and managers working in the field are highly attuned to the ecological complexities of their region and can offer meaningful insights about tool efficacy—and other aspects of conflict mitigation—even in the absence of rigorous scientific testing. Our emphasis on human perceptions, while limiting the scope of the scientific conclusions that can be

drawn about the tools and techniques themselves, represents an important addition to a literature on human-wildlife conflict reduction that is often focused on ecological metrics without simultaneously attending to the important role of human perceptions in shaping conservation outcomes (see also McInturff et al. 2021b, Volski et al. 2021)

Relatedly, our interviewees are situated social actors (Haraway 1988, Martin 2021a), with both individual insights grounded in their particular contexts and experiences, as well as a necessarily limited perspective; in other words, individuals may not be fully aware of all happenings on the ground. This can lead to occasional discrepancies between our survey data (which reflect a single Forest Service manager's perspective on any given forest), our interview findings, and other formal statistics, highlighting the value of triangulation for qualitative research (Flick 2007b). We recognize, then, that the perspectives of our interviewees are based on their personal experience, necessarily subject to individual biases, and vary in the degree to which they are informed by the latest ecological science. Their situated, personal, and observational accounts are highly informative given our interest in the sociopolitical conflict surrounding wolves. The unique and nuanced insights around social dynamics and human perceptions of ecological systems and processes made possible by qualitative investigation (Drury et al. 2011, Macon and Whitesell 2021, Sayre 2004) make our findings highly relevant for addressing the complex socioenvironmental challenge of human-wildlife coexistence and lend this project the potential to inform future experimental and quantitative studies.

As with any qualitative, case-study-based research, we are limited by the data collected. Despite our efforts to represent diverse voices, a limited number of interviews cannot comprehensively represent all stakeholder perspectives. A particular gap in this research is the absence of indigenous perspectives among our interviewees. Our focus on the national forest context and a sampling approach emphasizing the network of stakeholders directly invested in national forest management led to little emphasis on American Indian tribal management or perspectives in this report. We have tried to recognize the roles that tribes play outside our case studies but realize the need for future research. We also recognize that even where tribes do not play a role in contemporary management, all our research

sites represent colonized, and often unceded, tribal homelands. We also do not seek to generalize from this set of case studies to other national forests; given local variations in social and ecological conditions, there is no doubt that unstudied national forests may have experiences that diverge from those documented here. With this report, we thus aim not for comprehensiveness but rather to describe notable contrasts and divergent histories and identify key dynamics from across our range of case studies such that our findings might aid Forest Service staff in better mitigating wolf-livestock conflict on the multiple-use lands under their management.

Chapter 3: Boise National Forest, Idaho

Introduction

Created in 1908 from portions of the Payette and Sawtooth Forest Reserves, the Boise National Forest (BNF) today covers more than 2.6 million acres across west-central Idaho. Lands associated with the BNF are part of the traditional territories of the Shoshone, Paiute, and Nez Perce Tribes, who exercise off-reservation treaty rights on the BNF (USDA FS, n.d.b). The forest ranges from an elevation of 2,800 feet to nearly 10,000 feet above sea level, and includes portions of the Boise, Salmon River, and West mountain ranges. The landscape is diverse, including sagebrush steppe and spruce-fir forest, nearly 10,000 miles of streams and rivers, and more than 15,000 acres of lakes and reservoirs. The BNF contains five ranger districts—Cascade, Emmett, Idaho City, Lowman, and Mountain Home—and is bounded by the Payette,

Salmon-Challis, and Sawtooth National Forests to the north and east (fig. 3.1).

The six western Idaho counties that surround the BNF¹ contain some of the state's most densely populated areas, including Boise (Ada County), the state capital and most populous city in Idaho, with 236,634 people (U.S. Census Bureau, n.d.). Boise is part of a rapidly growing metropolitan region: in 2018, it was the nation's fastest growing city (Sharf 2018), and the region's population is expected to grow from 807,700 in 2022 to 1,363,100 in 2060 (Stebbins 2022). These counties have seen a 286 percent increase in population since 1970, including a 220,000 person increase between 2000 and 2021 (Headwaters Economics 2023). Alongside this growth, the area has experienced rising per

¹ Ada, Boise, Elmore, Gem, Valley, and Washington Counties.

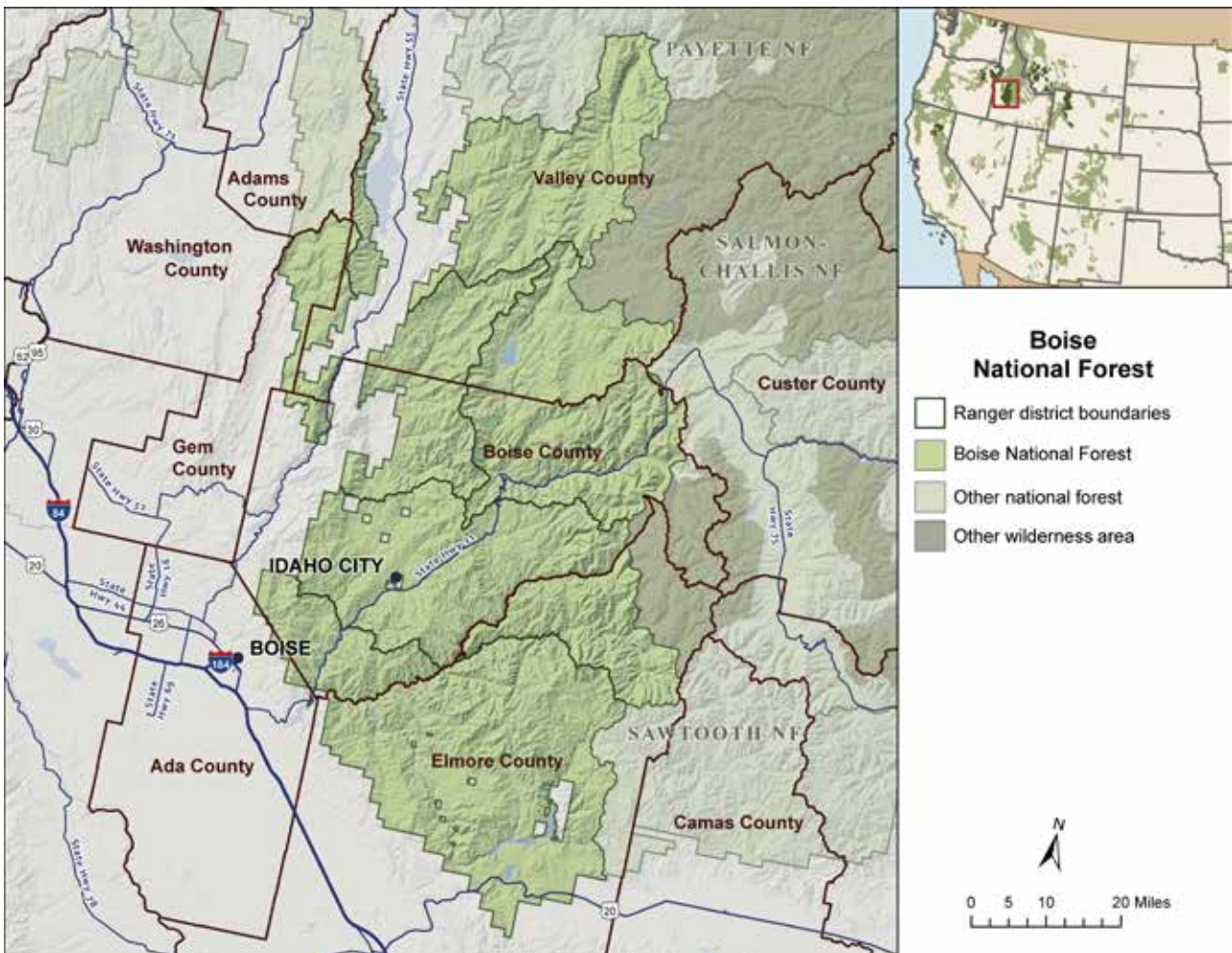


Figure 3.1—Boise National Forest, Idaho. Map by Abigail Kaminski.

capita income. Government represents the largest employer in many of these counties, but there is also a prominent agricultural sector—although agriculture is smaller than construction, manufacturing, and services.

As one BNF biologist put it, “we’re skyrocketing with people moving here,” and this influx of migrants continues to transform local economies and values along “New West” lines (see Hines 2012, Riebsame and Robb 1997, Robbins et al. 2009). Federal lands make up 67.2 percent of the total combined land area across the six counties—with Forest Service lands representing 51.2 percent of the total—and the area has seen a growing travel and tourism sector associated with recreation on these landscapes (Headwaters Economics 2023). With more than 70 campgrounds and 1,300 miles of trails, the BNF serves as “the recreational backyard” for the city of Boise and surrounding communities (USDA FS, n.d.a).

The BNF is managed for multiple use, including livestock grazing, sport hunting, mining, timber management, and recreation. In 2019, the sum of these activities supported about 1,400 local jobs, representing \$52,430,000 in local labor income and \$77,346,000 in gross domestic product,

with 1,490,000 recreational visits and significant timber production (16,808 hundred cubic feet [CCF] of sawtimber and 14,966 CCF of fuelwood in 2019) (USDA FS 2022). Notable among our cases, Idaho continues to graze more sheep on its national forests than many other states in the West, and significantly more sheep graze on the BNF than on other national forests in our study. In 2022, the BNF had 35 permittees grazing a total of 32,863 cattle (113,887 head months) and 137,980 sheep (283,883 head months) across its 46 active allotments (table 3.1). Permittees typically winter animals on private ranches or U.S. Department of the Interior, Bureau of Land Management lands in the southern part of the state and move them onto Forest Service lands for the summer (sheep operators, in particular, follow this transhumant grazing pattern). In 2019, the BNF grazing program supported an estimated 100 local jobs, representing \$1.8 million in labor income (USDA FS 2022).

Gray wolves (*Canis lupus*) were effectively extirpated from Idaho by the 1930s. Although studies showed no permanent populations after this point, occasional sightings were noted and there was documentation of occasional wolves prior to reintroduction. These were likely dispersing

Table 3.1—Summary of wolf and livestock statuses for the Boise National Forest (BNF), Idaho

Fast fact	BNF data
Estimated year first resident wolf pack reestablished in Idaho	1995/1996
Estimated year first resident wolf pack reestablished on the BNF	1995/1996 ^a
Estimated wolf population in Idaho	About 1,270 ^b
Estimated wolf population on the BNF	8 to 12 packs ^{a,c}
Number of permittees with active grazing permits on the BNF, FY 2022	35 ^d
Number of grazing allotments on the BNF, FY 2022	46 active, 12 vacant ^d
Number of permitted cattle (and HM), FY 2022	Cows with nursing calves: 32,423 (112,307 HM) ^d Yearlings (9 to 18 months): 440 (1,580 HM) ^d
Number of permitted sheep (and HM), FY 2022	Ewes with lambs: 110,195 (238,297 HM) ^d Mature sheep: 27,785 (45,586 HM) ^d
Number of permitted horses or mules (and HM), FY 2022	514 (1,747 HM) ^d
Estimated number of allotments on the BNF where wolves were present, 2020	50 ^c
Estimated impacts of wolves on the BNF, 2020	Three sheep producers and one cattle producer affected ^c

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a Data source: 2021 case study interviews.

^b Data source: IDFG (2023).

^c Data source: survey respondents corroborated where possible through interviews. Numbers have not been independently verified and may vary over time.

^d Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

wolves from Canada “trying to get established,” as one BNF biologist noted, although conflict with grazing may have “inhibited” reestablishment. In 1980, the U.S. Fish and Wildlife Service (USFWS) Northern Rocky Mountain Wolf Recovery Plan recommended reintroduction of wolves to central Idaho and Yellowstone National Park based on an assessment of appropriate and available habitat (IDFG, n.d.b; see also Bangs and Fritts 1996, Fischer 1995, Fritts et al. 1997). In 1995, the USFWS released the first 15 wolves on the edge of Idaho’s Frank Church-River of No Return Wilderness, followed by 20 more in 1996.² From these 35 initial individuals, the wolf population grew steadily in numbers and range, quickly establishing on the BNF and then across the state until suitable wolf habitat was fully occupied. Idaho would then provide the base population for expansion throughout the Pacific Northwest.

This case study is based on research methods discussed in chapter 2, including surveys, interviews, and literature and document reviews. We interviewed nine individuals associated with wolf-livestock conflict on the BNF, including one former and two current employees of the national forest (one range specialist, two biologists), representatives of Idaho Department of Fish and Game (IDFG) (one current and one former employee), one representative of U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) (in Idaho), one Idaho environmental nonprofit director working on wolf issues, and two regional livestock producers. Interviews were supplemented with data from other sources, including previous Idaho-based research (Martin 2020, 2021b) as well as agency websites, reports, and gray and scientific literature.

Wolves and Wolf Management in Idaho

Idaho’s reintroduced wolves were categorized as a “non-essential experimental population” under section 10(j) of the U.S. Endangered Species Act (ESA 1973). This classification allowed for more flexible management and lethal control of so-called problem wolves. Federal listing gave the USFWS management authority over Idaho’s wolf

populations. Prior to 2002, IDFG was kept out of the wolf management process by the state legislature, which rejected the legitimacy of the reintroduction action.³ USFWS funds were funneled instead to the Nez Perce Tribe, who played a central role in on-the-ground management and monitoring as the recovery effort lead (Nez Perce Wildlife Division, n.d.; Wilson 1999).

Despite sociopolitical conflict surrounding the wolves’ return, the state population grew steadily, hitting recovery targets in 2000 and triggering the process of Endangered Species Act delisting. In anticipation of federal delisting, the Idaho legislature moved to allow IDFG to coordinate with USFWS and implement a state wolf management plan developed in 2002.⁴ The Idaho Wolf Conservation and Management Plan, prepared by the Idaho Legislative Wolf Oversight Committee (ILWOC 2002), includes declarations against wolf presence in the state, “calling for and demanding that wolf recovery efforts in Idaho be discontinued immediately and wolves be removed by whatever means necessary.”⁵ The plan treats minimum federal recovery goals as its population targets, above which, as one IDFG regional supervisor put it, “We will manage the population with... harvest [like] we do with other species” (ILWOC 2002: 7).⁶ The 2002 management plan (ILWOC 2002) was the governing document for wolf management in Idaho until 2023 (IDFG 2023). In the late 2010s, efforts toward revising the plan to bring it in line with other IDFG species management plans were begun but then suspended, according to one IDFG supervisor.

Recovery targets in Idaho were confirmed by 2001, initiating a 3-year countdown to federal Endangered Species Act delisting (IDFG, n.d.b; ILWOC 2002). In part because other

² January 14, 1995: 4 wolves were released at Corn Creek on the edge of the Frank Church-River of No Return Wilderness; January 20, 1995: 11 wolves were released at Indian Creek and Thomas Creek along the Middle Fork Salmon River in central Idaho; January 1996: 20 wolves were released near Dagger Falls at the edge of the Frank Church-River of No Return Wilderness in central Idaho (Martin 2020).

³ State of Idaho. Statute 36-715. Wolves—transition—authorities and duties of the Office of Species Conservation—Fish and Game Commission—Department of Fish and Game. <https://legislature.idaho.gov/statutesrules/idstat/title36/t36ch7/sect36-715/>.

⁴ State of Idaho. 2003. House Bill No. 294. Wolves. <https://legislature.idaho.gov/sessioninfo/2003/legislation/H0294/>.

⁵ State of Idaho. 2001. House Joint Memorial No. 5. Wolf recovery efforts. <https://legislature.idaho.gov/sessioninfo/2001/legislation/hjm005/>.

⁶ Federal recovery goals of 10 breeding pairs and 100 individual animals became superseded over time, with frequent reference to “15–150” (15 packs and 150 individuals) as a means of staying above the federal threshold (see Barker 2017, Martin 2020). Advocates view these numbers as too low, while, as one IDFG regional supervisor noted, “We’re hearing from legislators and some commissioners that any number higher than 150 won’t be acceptable.”

aspects of recovery were not yet reached—including genetic connectivity with other population units in the region—legal back-and-forth continued until delisting was passed via a federal budget bill rider in 2011.⁷ Federal Endangered Species Act delisting then initiated a 5-year federal oversight period (ended in 2016), during which, as one BNF district biologist recalled, “A lot of money came in through federal sources in order to support the continuation of ... monitoring data.” Extensive wolf tagging and collaring efforts—intended to document sustained wolf population numbers (Martin 2021a)—were carried out over this period.

With the end of federal funding and oversight, however, IDFG moved toward alternative methods and reduced population monitoring (Ausband et al. 2014, Horne et al. 2019). One former BNF biologist recalled that “with few exceptions, they were not maintaining collars” and “monitoring fell off significantly.” We estimate from our interviews that there has been a relatively stable population of 1,000–2,000 wolves statewide in Idaho since 2015. According to IDFG, the state’s wolf population fluctuated around 1,270 animals between 2019 and 2021 (fig. 3.2) (IDFG 2023).

However, such numbers remain uncertain given changes in population monitoring practices (see below) and the

introduction of “ramped up harvest,” as described by one former IDFG researcher (see below, also Ausband et al. 2023). Prior to the release of the Idaho gray wolf management plan 2023–2028 (IDFG 2023), IDFG’s most recent wolf management report and wolf presence map were from 2015 (IDFG 2016, n.d.b; fig. 3.3)—before the end of federal oversight.

Before the 2011 delisting, wolf management activities were coordinated between USFWS and the Idaho Governor’s Office of Species Conservation (OSC), which was created in 2000 to coordinate all state activities involving federally listed threatened and endangered species.⁸ In 2005, IDFG became an agent of the USFWS (taking over from the Nez Perce Tribe), assuming primary responsibility for monitoring and management of wolves in the state. After delisting (2011), IDFG continued to manage wolf populations across Idaho—reporting to a governor-appointed Fish and Game commission—while OSC funneled federal money into compensation for confirmed wolf predations. Since 2014, the Wolf Depredation Control Board within the Office of the Governor has directed and managed funds for wolf control (State of Idaho, Wolf Depredation Control Board, n.d.).

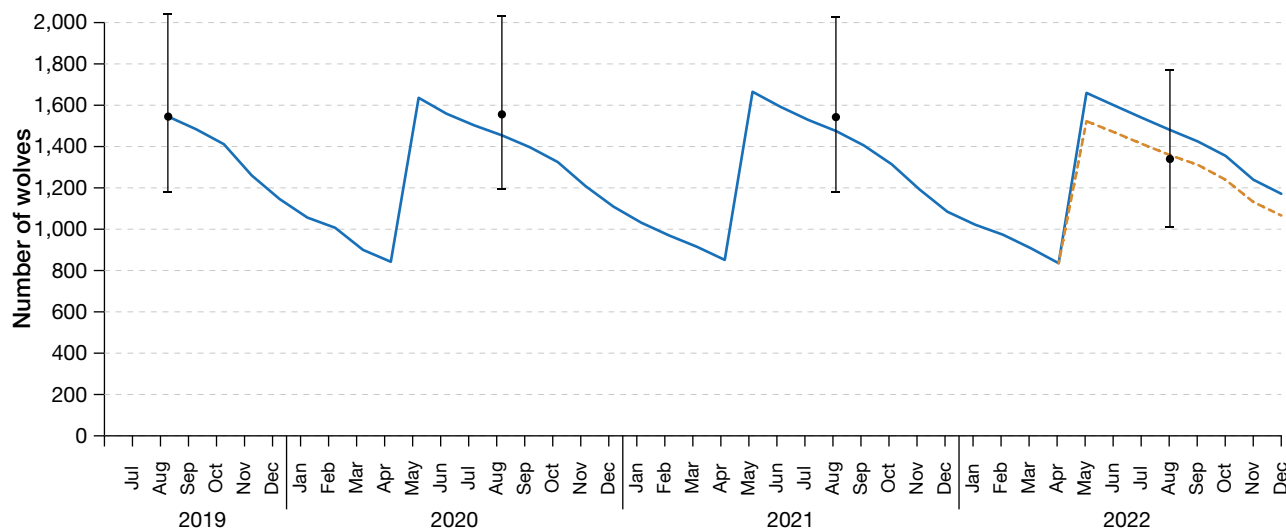


Figure 3.2—Camera-based statewide wolf abundance estimates for Idaho (points with 95 percent confidence intervals). The blue solid line projection from August 2019 to December 2022 uses documented human-caused mortality along with constant rates of natural mortality and wolf demographics based on prior research. The orange dashed line from April 2022 shows the projected effect of decreasing average reproduction by one pup per pack (IDFG 2023: 35).

⁷ Public Law 112-10. 112th Cong. (April 15, 2011). <https://www.govinfo.gov/content/pkg/PLAW-112publ10/html/PLAW-112publ10.htm>.

⁸ State of Idaho. Statute 67-818. Coordination of policy and programs related to threatened species and endangered species in Idaho. <https://legislature.idaho.gov/statutesrules/idstat/title67/t67ch8/sect67-818/>.

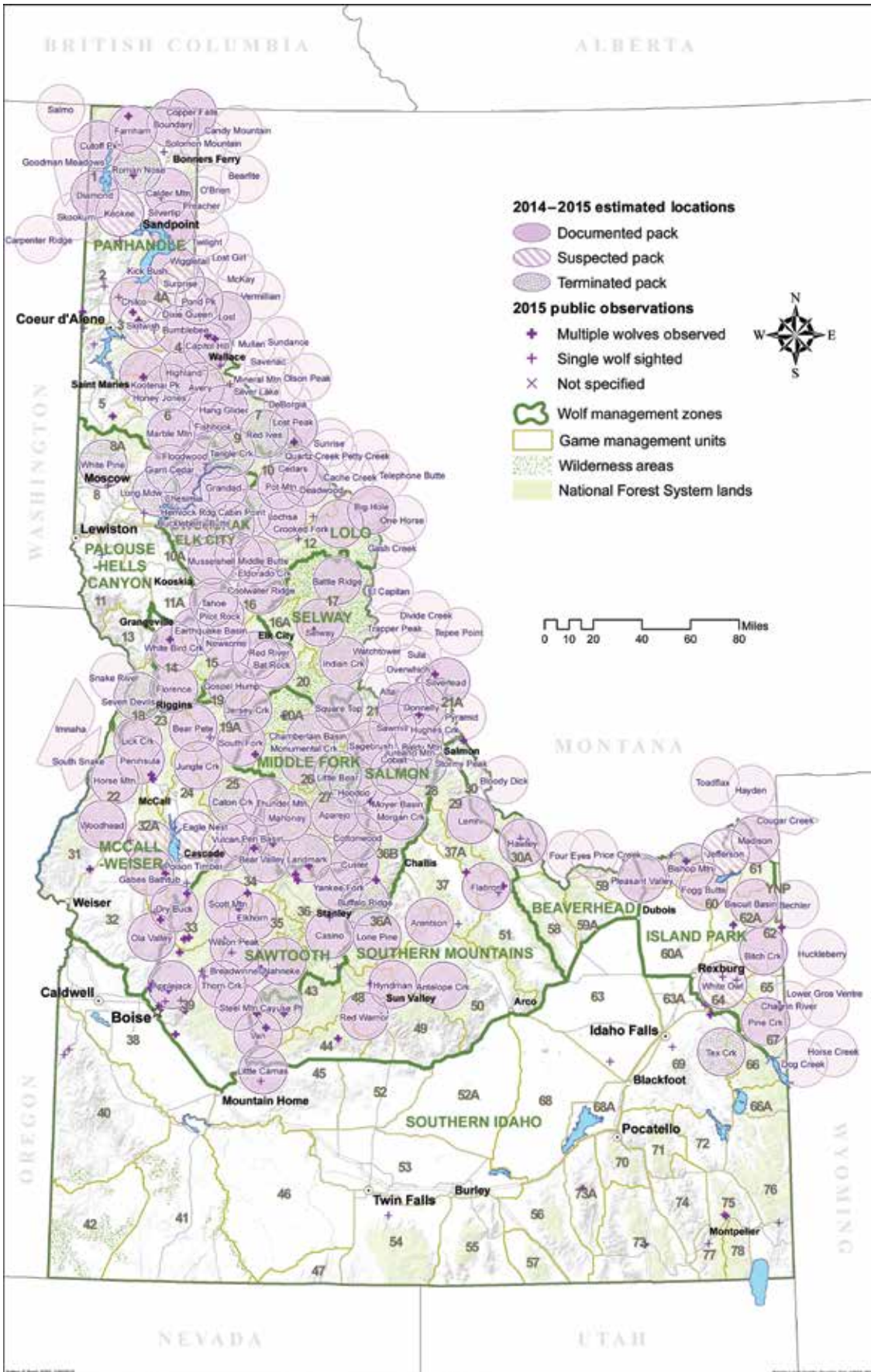


Figure 3.3—Idaho wolf and wolf pack locations, 2015 (IDFG 2016). Pack locations were determined using radio collar location data and visual observations through January 2016.

Lethal control in response to livestock predation has been standard practice in Idaho since the early years of reintroduction, when the USFWS managed conflicts under the authority of section 10(j)—experimental nonessential population designation—of the U.S. Endangered Species Act. Following confirmed predation by wolves, IDFG authorizes the control action, which WS carries out in coordination with producers on private lands and with state and federal agencies. Idaho is seen as “pretty aggressive” in authorizing wolf control in response to livestock predations, which “has been additionally liberalized” over time, according to one IDFG regional supervisor. From July 1 through September 30, 2021, WS-Idaho investigated 84 wolf complaints for 46 livestock producers in 13 counties; of those, 49 (about 58 percent) involved confirmed depredations, resulting in the removal of 21 wolves (USDA 2021).

WS uses multiple strategies and techniques in managing wolf predation, including nonlethal tools. As the state’s WS supervisory wildlife biologist put it, “We try to weigh out our options to get the result that we’re wanting ... to reduce the conflicts.” However, some packs are “pretty notorious for getting into trouble,” and “[i]n some situations,” according to the agency, “lethal methods are the appropriate and the right tool.” These lethal methods include shooting from a helicopter or airplane, shooting from the ground, and trapping, as well as radio collaring “to help focus efforts to make control actions more efficient,” as one IDFG manager explained. This collaring “help[s] Wildlife Services find the pack responsible for depredating wolves by using a radio-collared wolf or to be able to locate those and lethally control them, when they’re in a place that they can get to them from the air.”

Idaho has relied on public hunting, or “harvest,” of wolves as a key management strategy since its introduction in 2009. As the state gained control and authority over wolves, IDFG liberalized regulations surrounding wolf hunting, including extended bag limits (unlimited since July 1, 2020) and increased season length for hunting and trapping throughout the state; as an IDFG supervisor explained, it is “[a]ll designed to increase wolf harvest and reduce the population.” One BNF biologist recalled that when hunting began, the state had an opportunity to make wolves more of a “desirable” trophy species but instead “chose to manage them in a more generic kind of low-level way” as a big game species with low-cost tags (\$13.50 for residents, \$31.75 for nonresidents as of 2023)

(IDFG, n.d.a).⁹ IDFG sold more than 53,600 wolf tags in 2022, yet estimated success in 2021 was 0.3 percent; trapping had a higher success rate of 25 percent (IDFG 2023: 19). Hundreds of wolves are killed each year in Idaho; at the time of our 2021 interviews, 2019–2020 had seen the highest documented wolf mortality to date at 584 wolves (fig. 3.4).

Expanded wolf hunting and trapping, intended to reduce livestock and elk predation, has resulted in concerns over a potential wolf population crash and federal relisting (Moore 2020, Regan 2021, Williams 2022). Since 2015, however, the wolf population has appeared to be relatively stable despite high levels of mortality (from hunting and control actions, as well as poaching, highway mortalities, and unknown causes). The population was estimated by interviewees to be between 1,000 animals in winter and at least 1,500 in summer. As one IDFG supervisor explained, “We’re not running out of wolves” (see also IDFG 2021b, 2023; fig. 3.2).

Yet with greater take, the reliability of previously developed monitoring efforts is undercut, increasing uncertainty over wolf population numbers (see Martin 2021a). One former IDFG researcher noted that in recent years the shift away from monitoring shifted back once again as “the department needed to have more information, not less” to support new management directions. Notably, this return to monitoring was characterized as “not really a management question. It’s more of a politics thing, honestly.” In 2021, the Idaho State Legislature passed Senate Bill 1211¹⁰ establishing year-round trapping of wolves on private property and unlimited purchase of wolf hunting tags—although again without much subsequent effect on the overall population (Francovich 2022a). At the same time, the nonprofit organization Foundation for Wildlife Management offered reimbursement for expenses associated with wolf hunting and trapping in Idaho, which has been described in our interviews as a “bounty” of \$1,000 or more (see Foundation for Wildlife Management, n.d.). As of 2023, IDFG has also approved a plan to reduce the number of wolves in the state to 500 animals, an about 62-percent reduction (fig. 3.5), in part by directly reimbursing hunters and trappers for expenses (IDFG 2023: 39; see also Blanchard 2023b, Booher 2023).

⁹ Contrast Wyoming at \$21.00 for residents, \$187.00 for nonresidents (WGFD, n.d.a).

¹⁰ State of Idaho. 2021. Senate Bill 1211. Wolves. <https://legislature.idaho.gov/sessioninfo/2021/legislation/s1211/>.

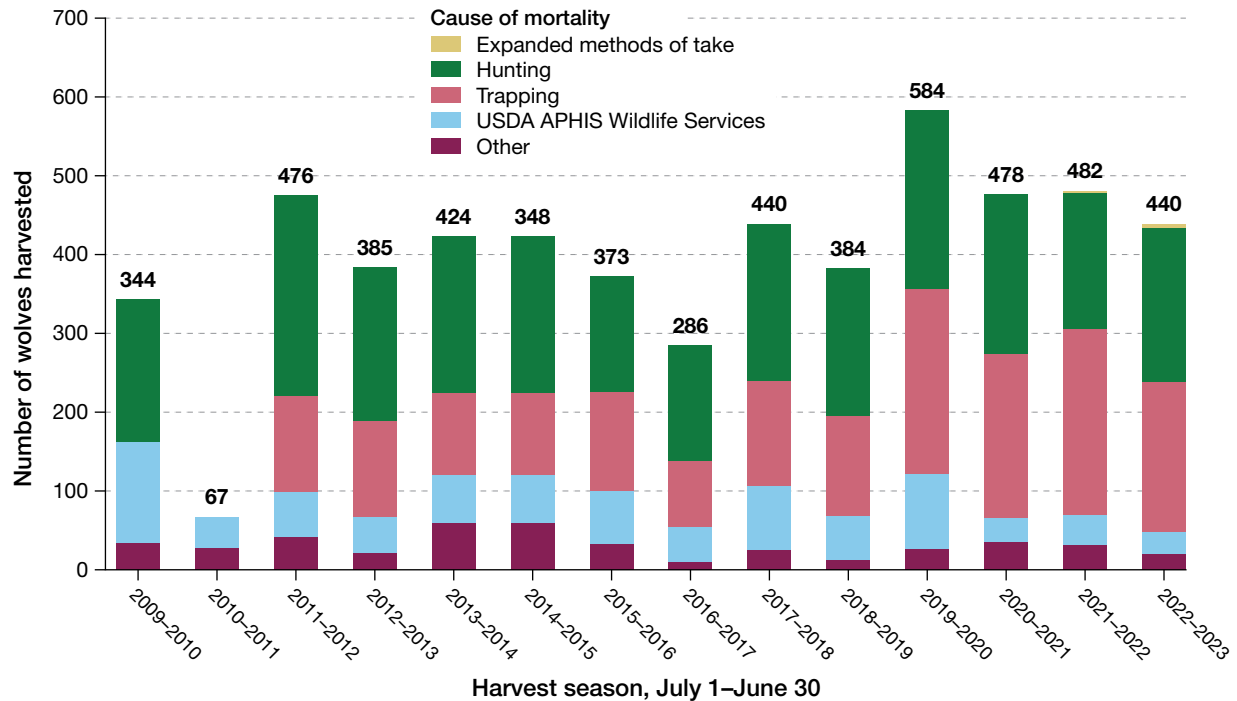


Figure 3.4—Human-caused wolf mortality in Idaho, 2009 through 2023. USDA (U.S. Department of Agriculture) APHIS (Animal and Plant Health Inspection Service) Wildlife Services refers to wolves culled by program agents. Other includes minimal mortality categories such as predation control, illegal take, depredation kill, and road kill. Note the use of expanded methods of take from 2021 through 2023. Source: updated from IDFG (2023: 13); for expanded methods of take see IDFG (2021a).

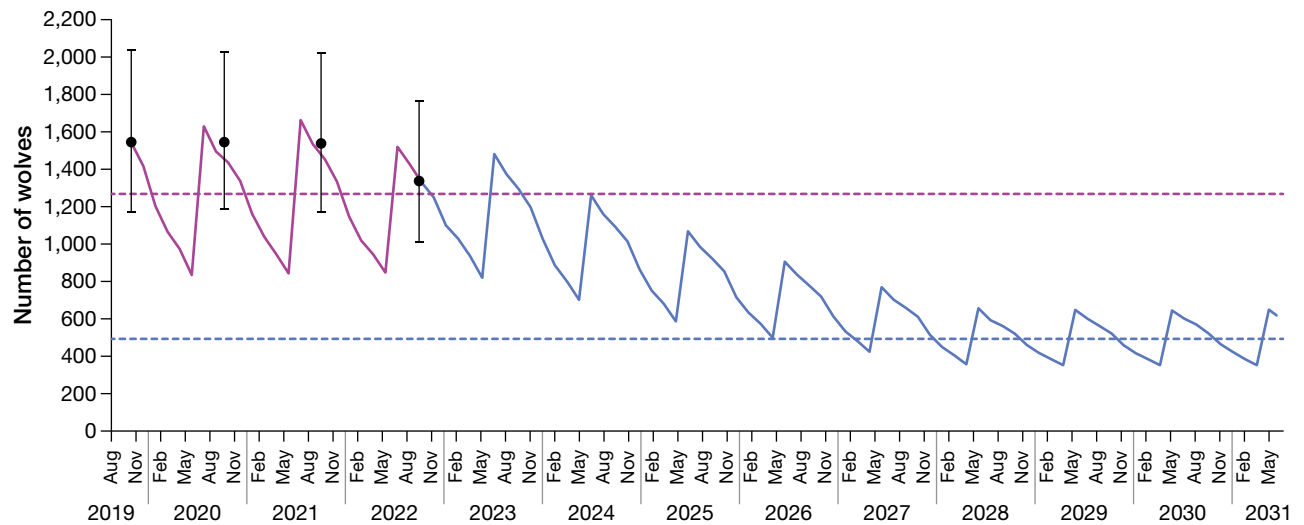


Figure 3.5—Idaho wolf reductions (IDFG 2023: 41). Camera-based statewide abundance estimates from August 2019 to August 2022 (points with 95 percent confidence intervals) (see fig. 3.2). The solid blue line shows projected annual fluctuation under an increased harvest scenario with a goal of 500 wolves average (dashed blue line) in the state by 2028. The solid purple line uses documented human-caused mortality combined with rates of natural mortality and average wolf demographics documented in prior research in Idaho and other western states. The dashed purple line represents the projected average abundance of 1,270 wolves, 2019–2021. Source: IDFG (2023: 41).

Wolf-Livestock Conflict in Idaho

Wolf reintroduction to Idaho has been controversial from the beginning, causing significant fear and uncertainty over possible impacts among livestock producers as well as excitement and curiosity from others. Conflict and polarization have fluctuated over time, with peaks of controversy around periods of high impacts, such as the start of hunting, and the delisting-relisting legal back-and-forth of 2008–2009 and 2010–2011. Following delisting in 2011, “conversation was easier and more open,” according to one former BNF biologist, having moved away from previously prevalent attitudes of “shoot, shovel, and shut up.” However, antiwolf rhetoric remains, often articulated in terms of federal imposition and nonbelonging. As another BNF biologist explained, “We see the more traditional view of wolves... ‘They were never here before, and the wolves we have now are Canadian wolves. The government has forced this on us, and we just need to get rid of them.’”

As in much of the region, wolf-livestock conflict is most often framed around economic impacts for livestock producers, including lethal predation as well as livestock stress, behavior changes, and weight loss. As one BNF rangeland specialist put it, “For me [as a Forest Service manager], it could be a paperwork headache, right? For an operator... It hits them in their pocketbook, whether it’s weight coming off their animals or actual depredations.” Predation is “a financial burden and perhaps even an emotional one” for individual producers, as one environmental program director put it, but wolves are “not an industry-wide menace.” A former IDFG researcher explained, “To the industry as a whole..., it’s about as consequential as lightning strikes, right?... Larkspur [*Delphinium* spp.] is way more dangerous [than wolves] to the livestock industry.” For some operators, as a former BNF biologist noted, the costs of predation are “just a part of doing business... and working on public land grazing.”

However, according to our interviews, operators are unevenly positioned to bear these added costs, with larger scale producers more able to sustain the loss than operators who might run one or only a few bands of sheep. Furthermore, wolf impacts are experienced unevenly over time and space (fig. 3.6). Although the focus of our research was on National Forest System lands, wolves also effect private lands and winter ranges where they may target confined and concentrated cattle or sheep operations.

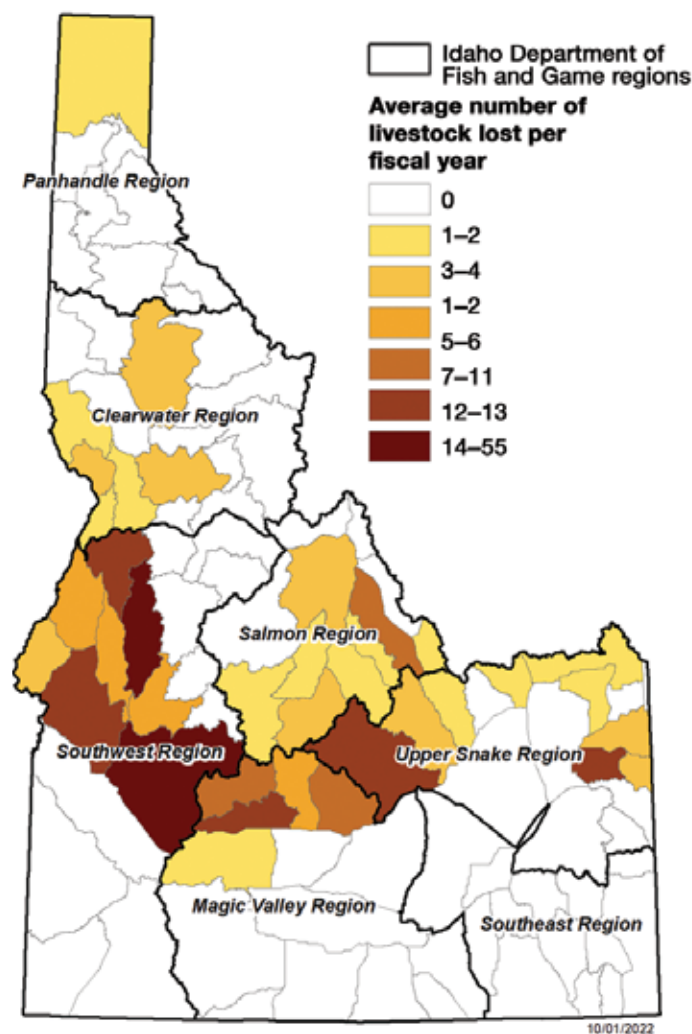


Figure 3.6—Average annual documented wolf-caused livestock losses (injured or killed) by game management unit. Data are based on confirmed and probable determinations by U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services investigations between July 2017 and June 2022 (IDFG 2023: 26).

Such impacts provide an important broader context for producer attitudes; ranchers may be affected by wolves year-round, though they only graze federal lands a few months of the year.

However, recent animosity toward wolves in Idaho, the “real fire” of opposition, according to one former IDFG researcher—now comes “from sportsmen and women, people who want to hunt deer and elk.” Guides, outfitters, and multigenerational hunting families are concerned with whether “elk hunting [is] going to be just as good in the future... 10 years from now, 20 years from now, as it is for me,” as one WS biologist put it. A BNF biologist also noted this concern that “if we don’t shoot these wolves, they’re

gonna get out of control, and then we'll lose everything." Others pointed out how fears of ungulate devastation are overblown. As one Idaho environmentalist noted, "The data don't bear [that] out, ...it was said [wolves] would wipe out all the big game animals... None of that's happened."

Indeed, elk harvests in Idaho are now "higher than... when wolves were introduced," as one IDFG supervisor explained, but this "misses a big piece of the story." While IDFG claims to have "made great progress in elk management," such progress is geographically uneven: "Things are not great everywhere.... There are places where... elk populations are doing very, very well, but we're still struggling and well below our objectives in those backcountry [hunting areas]." Some of the traditionally most popular hunting sites remain below targets, while frontcountry areas—"the very area that there was this very concerted effort to reduce the wolf population," as one BNF biologist noted—have seen elk numbers (and crop depredation issues) increase. This nexus of wolves, elk, and agriculture highlights the tensions of managing multiple aims and constituencies. A former IDFG researcher elaborated: "That's the sticky part, where they [IDFG] want to produce more elk for hunters because they're getting yelled at, but then they have farmers [and] ranchers who are well-connected—some of them are in the legislature—saying, 'All your damn elk come down to eat my alfalfa and hay in the wintertime. I'm tired of it.' ... When you confront the sportsman crowd with this... [that's] irony, right?"

Polarized discourse surrounding wolves is, of course, nothing new. As one Forest Service manager noted, "I've been here for 8 years on the Boise [National Forest]. Honestly, I don't see a lot of change. People either love them or they really don't." Compared with elsewhere in the Pacific Northwest, management in Idaho is even seen as "a little easier," joked a former IDFG researcher, because "everybody hates wolves." At public meetings on harvest proposals, "the agency [IDFG] responds to what they hear," which is "basically one voice." The same researcher noted, too, how recent years have seen a new period of increasing antiwolf sentiment and state-level "draconian measures," including in Idaho and Montana: "The last probably 4 years... it's higher than it was in 2009. It's more ridiculous now than it was before we delisted," possibly linked to "this national mood of outrage."

Wolf-Livestock Conflict on the Boise National Forest

Wolves in Idaho tend to inhabit forest lands instead of desert. This tendency, combined with the scale of National Forest System lands in the state, has led the Forest Service to play a prominent role in wolf management discussions. About 62 percent of Idaho is public land, and national forests cover more than 20 million acres, or about 40 percent, of the state's land area (Conservation Voters for Idaho 2022, USDA FS 2017). According to BNF managers, early on there were "little bursts" of "attention and public response," and "we were infamous for a while. It literally went around [the] world. There [were] people from Australia [who] were attacking us: 'Stop killing the wolves!'" Because wolves are now state managed, federal agencies such as the Forest Service are not seen as playing a major role in management. However, the wolves are "still on our forest" and "classified as a sensitive species," according to one BNF biologist, so some obligations toward conservation and recovery remain.

Wolves became established on the BNF shortly after the reintroductions of 1995 and 1996, although recorded sightings of wolves in the area date back to the 1970s. According to our survey data, wolves were "released on the Boise [National Forest] in 1995" but "likely never gone from the forest." As noted above, reintroduced wolves were in fact released at the edge of the Frank Church-River of No Return Wilderness, but likely moved onto the BNF shortly thereafter. Because of changes in monitoring and management practices since delisting (discussed above), current population levels are unclear (fig. 3.7). Our survey noted 18 packs across all districts of the BNF and 50 allotments with wolves: however, another BNF biologist thought "18 was kind of high... there's been a lot of hunting... so there's been disruption in the population." According to our survey data (see app. 1), the BNF has six active sheep/goat allotments with **high** levels of wolf impacts, while cattle impacts were characterized as **moderate** (affecting three sheep operators and one cattle producer in 2020 based on impacts confirmed by a WS trapper; unconfirmed wolf predation and other impacts may have also occurred).

Urban proximity adds its own complications to wolf conflict. As managers noted, many Boise residents "think it's neat" having wolves around (in contrast with more traditional rural communities), but some newcomers to the area are "naive to recreating in the forest... and ...[un]familiar with the predators" creating potentially "unfortunate

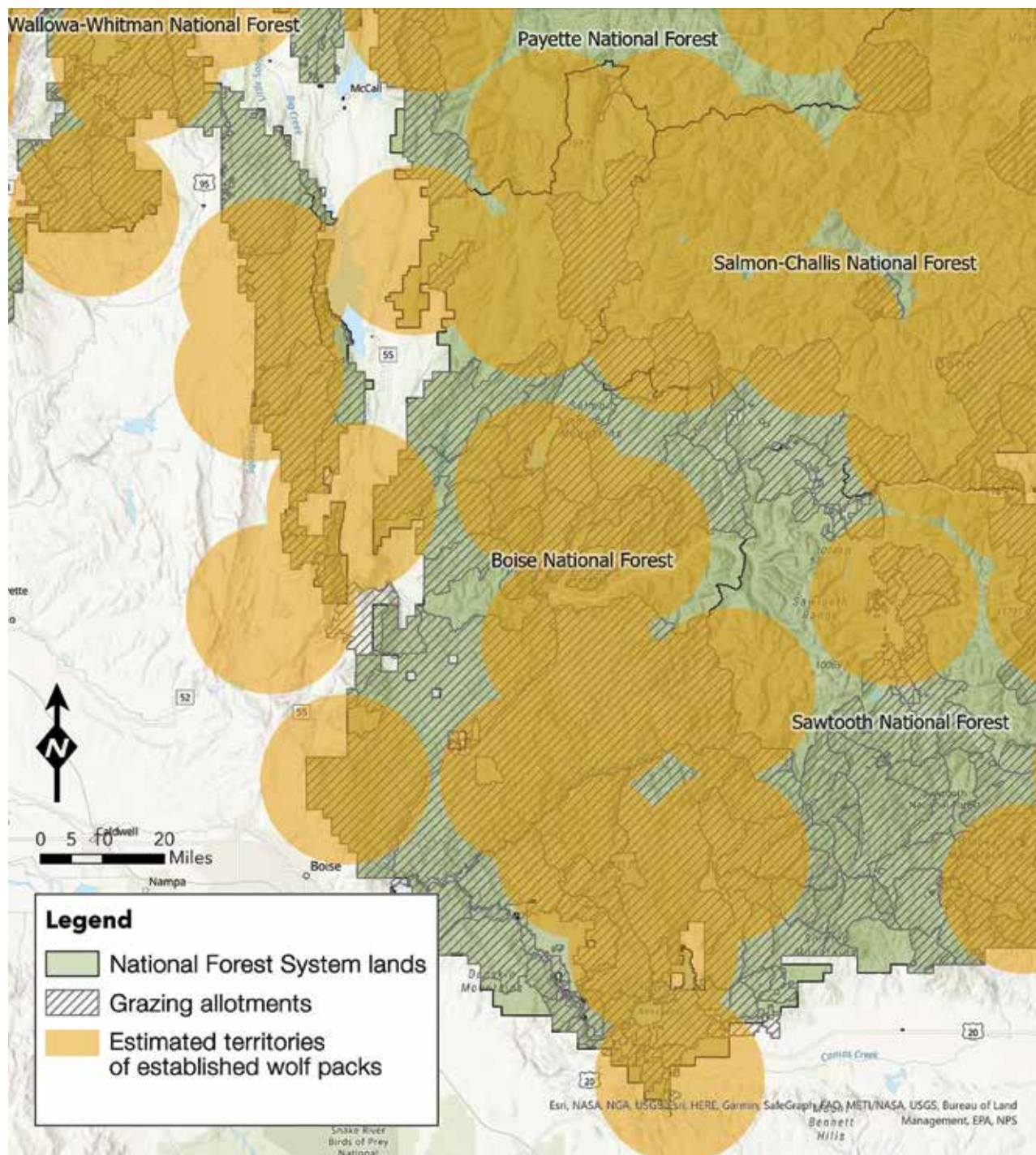


Figure 3.7—Estimated wolf pack territories on the Boise National Forest and neighboring areas overlaid on U.S. Department of Agriculture, Forest Service grazing allotments. Pack territories represent the known groups of wolves at the time of the most recent pack-scale monitoring effort conducted in 2015 (see fig. 3.3). These are likely to vary from year to year and thus should be interpreted as a general indication of approximate wolf pack density and not current conditions. Source: (IDFG 2016). Map by Robert Anderson.

situations” between recreationists’ dogs and wolves. Pet dogs and humans can also create problems with the livestock guardian dogs used by herders (see below).

Permittees on the BNF often rank wolf issues as a “number one” concern, according to the forest’s managers:

“Once they became established, it’s all about wolves.” This is despite the presence and impacts of other predators. One sheep producer (see box 3.1) clarified that “coyotes... still are our number-one predator. We do have problems with cougar and we have problems with bear also, but... coyotes

Box 3.1**Sheep Grazing**

Historically, much of the American West—and federal range—was grazed by sheep, only later to be superseded by cattle (see Rowley 1985, Wentworth 1948). This decline may, in part, have been based in “unconscious and unwitting discrimination against sheep and goats” by the early U.S. Department of Agriculture, Forest Service (quote attributed to H.G. Merrill, supervisor of the Santa Barbara National Forest in California, ca. 1911) (Rowley 1985: 83; see also Perkins 1992, Sayre 2017: 46–47).

Sheep fall prey to wolves in much greater relative numbers vis-à-vis cattle, including via pileups and surplus killing (Levy 2013, Muhly and Musiani 2009). According to one former Boise National Forest (BNF) biologist, producers know that “in putting livestock out on a landscape, there are a lotta sources of death for... sheep.” A range specialist explained: “Sheep are just inherently easier to pick off. They’re smaller. They [wolves] can get in and get a few more. They can work up, get in a bit of a frenzy, if you will. Sheep aren’t the smartest. You take one bite out of a sheep, it’s going to lay down and die. Same thing with cattle, but cattle are bigger. Even a calf is more to take down than a lamb.”

Interviewees frequently described sheep and cattle grazing on Forest Service lands as “completely different,” with sheep requiring the presence of a herder to keep them bunched and moving through the allotment. In

contrast, much of rangeland cattle production has moved to a low-labor model and a preference for scattering over the landscape. Cattle can be “turned down on a landscape and not monitored on a daily basis,” as a former BNF biologist noted, but permittees “often don’t know until they take them off the range at the end of the season, whether they’ve had depredation.”

Sheep production’s labor intensiveness thus has a “silver lining,” the biologist added; however, as herders “are with the animals, functionally 24/7... [providing] a degree of deterrence and flexibility in addressing those livestock-wolf interactions along those lines that you definitely don’t have for cattle” (fig. 3.8). Because wolves generally attack livestock at night, herders and guard dogs can be bedded down near the sheep, a strategy one one supervisor with the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services said “proved to be very, very effective [at] keeping the predators away during the night.” As a permittee noted, however, bedding down with the sheep is “not always possible... as sheep tend to like to bed on hilltops and high knolls.” Anecdotal, at least, the greater the distance to the camp the more vulnerable the sheep and the slower the response. One BNF manager explained, “They [the herders] should sleep with their sheep, and maybe they’d see [wolves] more... [but] I can’t tell a man where he’s going to sleep or not.”



Figure 3.8—Sheep grazing in and around the Wood River Valley, Idaho. Photos by Jeff Vance Martin.

[are] number one, probably wolves would be number two.” Wolves appear to present a greater risk to livestock than bears and lions, although such assessments are complicated by questions of overall population, density, and hunting strategies (Collinge 2008). Yet wolves are also a newer and more unpredictable challenge for producers; as that same permittee noted, “They’re tough to figure out... a bear that’s been into sheep, they’re pretty easy to catch, but the wolves not so much.”

Some of the concern around wolves is thus thought to be “sociological,” as one BNF wildlife biologist put it, and reinforced by agency practices. That same biologist noted the contrast between wolf and bear impacts and public and agency reactions:

The bears don’t garner the same response... I don’t see [IDFG] authorizing when a black bear can be killed for depredation, but [they] do it for wolves... I [also] don’t get calls... from people... concerned about the bears. They’re calling about their concern about the wolves.

Continuing, they noted:

Just a handful of years ago, we had a bear situation. There was initial concern that it was wolves because the sheep herder had seen tracks all around all these dead carcasses. Didn’t seem normal that so many animals would have been killed by wolves, but sure enough, Wildlife Services went out, and they determined the wolves had come in after the fact...; prior to confirming it was bear, there was an action initiated to go out and control those wolves. When they found out it was bear, they did not do the action.

Approaches to Managing Wolf-Livestock Conflict on the Boise National Forest

Permittees across Idaho have employed multiple strategies to mitigate wolf-livestock conflict (table 3.2). These include various nonlethal deterrents, “noisemakers and all that stuff,” and as one former IDFG researcher put it: “We tried tricking wolves... putting out scat and urine years ago to try and make the wolves think there was a pack there.” Elsewhere in the state, there are long-standing

Table 3.2—Approaches for managing wolf-livestock conflict on the Boise National Forest (BNF)

Approach	Implementor(s)	Perceived effectiveness among interviewees
Human presence (herders, range riders)	Permittees, WS	Highly effective (particularly for sheep), but uneven use among cattle producers given extensive ranges.
Livestock guardian dogs (LGDs)	Permittees (sheep producers)	“Very effective” for sheep production, but added costs.
Radio collaring	IDFG, WS	Highly effective among BNF managers for avoiding conflicts but reduction in availability following delisting and loss of federal support.
Deterrents (e.g., turbo fladry, Foxlights, noisemakers)	Nonprofit organizations, permittees, WS (limited use on the BNF)	Limited use among permittees (promoted elsewhere in the state).
Compensation for confirmed losses to wolf predation	Nonprofit organizations, Idaho Governor’s Office of Species Conservation	Mixed outcomes; appreciated but does not cover full losses, “better than nothing.”
Lethal removal	WS (authorized by IDFG)	Viewed as “an effective tool” by WS; permittees view the program positively. BNF managers saw variable successes, “Sometimes it worked well. Sometimes it didn’t.”
Public hunting	Members of the public (managed by IDFG)	Debated; potential stabilizing effect on overall numbers, along with destabilization of pack dynamics in particular locations; some speculation of increasing elusiveness of wolves and fear of human presence.
Information sharing and communication	BNF, IDFG, permittees	Communication protocols and data sharing very effective among BNF managers (see below).

IDFG = Idaho Department of Fish and Game; WS = U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services.

collaborative efforts devoted to developing and promoting nonlethal tools and techniques—and providing material support for their use (see Martin 2021b, Stone et al. 2017). However, on the BNF, a more limited set of tools is in use, primarily “traditional measures,” as one BNF manager put it, including herders and guard dogs.

While IDFG authorization is always given for nonlethal, according to WS, such measures have never been a requirement in the state and appear unlikely to become so. As one IDFG supervisor explained, “I just don’t see that the state will be in a position to require that action...; the livestock lobby, the agricultural lobby, from a... political standpoint, is awfully powerful...; this wasn’t something that they want to have to manage on top of what they’d always been required to do.” These tendencies are seen as rooted in connections with the legislature: many state politicians are themselves livestock producers or come from ranching families, making them “willing to put more money in the pot” for wolf management, as one BNF manager put it, and less likely to push policies opposed by producers. As a former IDFG researcher noted, producers are “well-organized and they’re well-connected and a bunch of them are legislators. They have the ear in Boise. They have the political power.”

From the perspective of one Forest Service manager, “It’s not so much that the agency wouldn’t want to try it [nonlethal tools and techniques], but the permittees have dug their heels in a little” based on assessments of the relative costs and benefits of such interventions for operation management. There are no requirements for nonlethal usage in the state of Idaho or on the BNF. However, our survey showed that there is conflict prevention language included in annual operating instructions to avoid spatial overlap during the grazing season. This includes language around communication and requirements for targeted preventative measures within a 1-mile buffer of active den and rendezvous sites (coordinated between the Forest Service district wildlife biologist and IDFG, working with the range management specialist and permittees). However, tools and techniques are not paid for by any range program funds, and it is “up to the permittee to figure out how” to address requirements and which tools to use.

Reconnaissance—There has been significant change over time in Idaho regarding monitoring of wolf numbers and locations and the availability of those data. During the early 2000s, according to one former BNF biologist, the USFWS

“was throwing out collars on a regular basis for monitoring individual packs. They had a ton of data.” IDFG also put significant investment into monitoring, with an emphasis on radio collaring, until 2016. For the Forest Service, these data “help[ed] us determine where we had conflicts and where we could try and avoid conflict,” the biologist said. “It was really valuable for us.” Along with “well-established pack dynamic[s],” these data made management “more predictable.” As that biologist explained, “You could manage some of your livestock interactions around those [known] geographic areas” making it “fairly easy” to avoid those challenges: “With all those things in place, [it] minimize[d] the impact on my time.”

However, with the end of federal support, radio collaring and those data diminished. As another BNF biologist explained, “It became too expensive for [Idaho Department of] Fish and Game to sustain that type of monitoring operation.” Another former BNF manager recalled, “We would just watch those animals ‘wink out.’ When the battery expired on the collar, we no longer had a data point.” The collaring that IDFG continued was “not part of the monitoring program;” rather, it was “primarily to help focus efforts to make [WS] control actions more efficient,” including those concerning elk. From 2016 to 2018, IDFG developed alternative modeling methods for estimating wolf presence and abundance, relying on “very, very intensive” camera deployment, but with concerns around estimation validity (see Ausband et al. 2023, Blanchard 2023a, and Martin 2021a).

Deterrents—A suite of technological tools has been developed and deployed in Idaho, including electrified turbo fladry, Foxlights, and various noisemakers (e.g., starter pistols) that “stretch” human presence. While arguably effective, particularly when subsidized (see Martin [2021b] on Blaine County’s Wood River Wolf Project), usage on the BNF has been limited by challenges of topography, access, and labor requirements. As a former Forest Service manager noted, while “some of the other nonlethal actions... championed out of the Wood River Wolf Project” were tried on the BNF, “[t]he logistics of it just simply did not lend itself to a lot of success,” and “[a] lot of that interest died off within a year.” Some of this can be attributed to differing social values (Manfredo et al. 2003, 2009)—in contrast with the Wood River Valley, ranchers that graze cattle on the BNF have been described as “more traditional”—as well as the economic and staff support provided elsewhere. WS remains open to nonlethal tools and techniques “[if]

it makes good sense for our program and our livestock producers.” They have supported fladry projects every year and were testing a new strobing ear tag program for sheep according to our interviews. Notably, the support of nonlethal alternatives by WS represents a new direction in Idaho—previously, BNF managers said that while WS would “share their alternatives... they would often be presented as ‘Yeah, you can do this, but here’s why it won’t work.’” In contrast, the new WS state supervisor noted, “Our goal is to reduce conflicts, and so if there’s something out there that’s going to work, I’m all over it.” OSC has also made funds available “to provide livestock producers with proactive measures to help **prevent** wolf-livestock conflicts,” more than \$150,000 in 2021 (IGOSC 2021, emphasis in the original).

Husbandry—Human presence remains the “time-tested, proven method” for reducing predation on livestock, according to many interviewees, “whether it’s a herder for the sheep or a cowboy for the cows.” For cattle producers, one IDFG supervisor noted that only range riders have been effective for deterring losses on public range, yet usage by operators is uneven. As one BNF biologist noted, “How often those people are present on the allotments with the animals varies.” WS also employs riders seasonally “out on big, big forest allotments,” the biologist added; but “we can’t afford to have a range rider everywhere throughout the entire state of Idaho.” Sheep operators rely on herders—as a former IDFG researcher put it, “They have [helped] for thousands of years”—as well as livestock guardian dogs, which serve as an alert and deterrent system. Different breeds of livestock guardian dogs are used, including Great Pyrenees and akbash (big white dogs) historically used for coyote defense, as well as Anatolian shepherd (Kangal), Transmontano mastiff, and Komondors. One BNF manager described livestock guardian dogs as “a must! They are very effective,” and noted that “it’d be frankly... silly not to use a guard dog.” However, dogs can be costly; a permittee explained that “it’s added a layer of expense and added management... I go through a pallet of dog food every month now.” There are also limitations in their deployment and effectiveness against wolves, resulting in exploration of new breeds and the use of flashing or spiked collars.

Compensation—Defenders of Wildlife, through their Wolf Compensation Trust, originally led compensation for livestock losses from wolf predation in the Northern Rocky Mountain region. The trust paid out more than \$1.4 million to regional livestock producers until a joint

federal and state program took over in 2010 (Defenders of Wildlife 2010a, 2010b). Compensation continues today through federal funds managed by the OSC (IGOSC, n.d.).¹¹ The program has been a “limited success” for producers, as one permittee explained, “I think most ranchers would say they don’t feel like when they do get a check from [the] Office of Species Conservation that they really were 100 percent compensated for their losses.” Confirmed losses are a fraction of those suspected, and compensation does not account for nonlethal effects (e.g., weight loss and behavior change) nor future potential earnings. As one IDFG supervisor put it, “No one has the delusion that they’re being fully compensated for all losses... the funding doesn’t cover all losses that are documented, let alone all of the losses that weren’t actually found.” Still, the program is appreciated by permittees as “better than nothing... [we’re] glad to have the program.”

Lethal Control and Hunting—As noted above, lethal control and public hunting are central pillars of Idaho’s wolf management policy. According to our survey, WS lethally controlled about 90 wolves in response to livestock predation on the BNF since 2003, or “On average 7 per year.” Overall, BNF biologists characterized WS removals as “fairly consistent, and fairly low” over time, with some variation over the years, and “pretty measured, all things considered.” Permittees generally viewed WS as responsive to their needs: “they’ll come in and either put snares out you know, try and trap the wolves. I mean they’ll actually spend the night out there trying to catch them and get a shot at them.” While WS sees targeted trapping as “an effective tool,” it can also put people at risk “with their [pet] dogs,” according to one biologist—a challenge on multiple-use landscapes such as the BNF. While the intent of lethal removal is “to reduce that risk of further depredation actions,” according to one former BNF biologist, it has had variable success: “Sometimes it worked well. Sometimes it didn’t.” Although public hunting does appear to have a stabilizing effect on the overall population, some locations (e.g., the Idaho City ranger district) noted initial increases in wolf numbers following hunting, and perceived “increased livestock interactions and depredations.” Others, however, speculated that hunting made wolves more “elusive... [and]

¹¹ In 2021, \$191,728 was available to compensate Idaho livestock producers for that year’s verified wolf predation losses. The funds were awarded to the Idaho Governor’s Office of Species Conservation from the USFWS Livestock Loss Demonstration Project Grant Program. The WS must confirm losses, and compensation is based on “the average market rate for livestock sent to market in the fall” (IGOSC 2021).

concerned about human presence,” and that “just having more humans out there [hunting] seems to push the wolves back away from the sheep” (see Anderson et al. 2023).

As noted above, the use of nonlethal tools and techniques has never been a requirement in Idaho, whereas lethal control and hunting tap into regional norms. As one BNF manager put it,

It’s just a traditional thing. There really is this... need to control, and they [producers] felt that wolves weren’t here, or they got rid of them for a reason... until they brought them back, and now we’ve got the problem again.

There is a sense that management options have “gotten better over the years” for permittees, who felt “really hamstrung” when wolves were first reintroduced, but now the “rules and regs on taking them out aren’t near[ly] as stringent as they once were.” Given the number of wolves in the state and livestock on the landscape, one BNF employee noted, “very few [predation] events... given the risk of being out... in the wilds, and there [are] all these natural predators on this landscape, it seems to me that we’re pretty fortunate that there’s not more going on.”

Summary and Key Findings

Wolf reintroduction in Idaho represents “one of the biggest and greatest success stories in reintroduction of any animal,” as a WS representative put it. “They did make it, and they did make it very, very well,” the representative said. Patterns and policies in Idaho have changed dramatically over time, from reintroduction to recovery, delisting, and expanded hunting. Predation remains a concern for individual producers and with particular packs, and while it comes and goes, there is an expectation that conflict will be more or less constant. With removal and reimbursement policies in place, wolves are increasingly seen as “part of the business” now. With this, however, comes a sense of inevitability and resignation: “As a rancher, yeah, I’m going to be stuck the rest of my life dealing with wolves... it certainly doesn’t make our life or our work any easier, but yeah, there’s not much I can do about it.” Controversy and polarization thus remain strong more than 25 years since reintroduction; the state’s WS supervisor noted, “It is just as dynamic and just as controversial today as it has ever been.”

Looking back, one former BNF manager noted that amid the peaks and valleys of conflict, there was “a renaissance

period” or “sweet spot”—perhaps 2014 to 2016—in which managers had “tools available,” grazing was occurring “even in the presence of wolves,” and hunters “got a chance to be a part of the equation.” They explained that “there was just this tenuous place where things felt like [they had] found an equilibrium, and then it’s starting to slide again.” The same manager noted how frustrations from livestock producers resulted in “a lot of pressure to change how management actually occurs,” leading to the above-noted expansions in hunting and trapping by IDFG—“more aggressive..., more liberal, or unrestrictive seasons” (see also Blanchard 2020). These expansions, however, have thus far come without massive changes to the overall wolf population—nor, it seems, to levels of conflict. Despite efforts proposed in 2023 to further reduce the population, permittees and managers noted that wolves are “smart animals,” and it remains “hard to hunt a wolf [in Idaho] You[’ve] got to earn it.” As one long-time IDFG employee noted,

You’ve got a small number of people that take four or five [wolves]. You[’ve] got two guys that take more than 15. You look at it and there’s all of these major steps that result in very little additional wolf mortality.

While targeted removal can be effective locally, a former BNF biologist explained that “nature abhors a vacuum.” Despite IDFG’s “open control authorizations,” in chronic problem areas—landscapes with good forage for both livestock and wild ungulates—removal is a temporary measure at best: “2 or 3 years... there’ll be a new pack back.” In the meantime, removal and hunting can disrupt pack dynamics in ways that increase risk to permittees and put managers at a disadvantage. As another BNF manager put it, “We’re just always reactionary. We can’t figure out what their patterns are.” The effective subsidy of lethal control by the state government undercuts moves toward nonlethal alternatives (Martin 2021b), and, according to some proponents, the legislature “exaggerate[s] the effect of wolves...on the industry and on people.” As a former IDFG researcher put it, “The legislature’s spending their time proposing how to kill wolves... It’s bizarre. I don’t know, the fervor’s weird.”

Notably, Idaho’s continued promotion of removal and population reduction may affect broader regional recovery and population connectivity, as dispersing wolves “get in trouble” when they pass through much of southern Idaho.

Such charges potentially open the state to legal challenges when environmental nongovernment organizations no longer see a way “to gain traction in the state.” Wolf proponents have argued for the need to avoid building policy “on hyperbole” and “misinformation.” Nontargeted removal and “super liberal regulations,” as they have been characterized by some, are contrasted with “a more surgical approach” to conflict and population management that keeps wolf packs intact. As mentioned above, Forest Service managers noted the value of a “well-established, predictable pack structure” for navigating shared space between wolves and livestock. In contrast, “removal of that pack or severe reductions in it... probably created more problems than it solved,” because managers “had to basically start from scratch with no data to work off of.”

The decline in wolf collaring and telemetry data since 2016 has likewise “created more challenges” for Forest Service managers, leaving them without an effective tool for “giving that livestock producer a heads-up.” Some expressed interest in “restart[ing] this discussion about... radio collars” and getting “better data through collars on [both] livestock and wolves” to help plan grazing routes and work with permittees to avoid predation. Managers also stressed the value of interagency communication for relationship-building and proactively responding to prevent livestock predation. Communication protocols—including information packets and a phone tree—helped contain sensitive information while sharing what was important

in a timely manner. One BNF biologist recalled how the potential risks from those who might “take advantage” of data sharing to “try and cause harm”—a noted challenge earlier in the recovery process, with both pro- and antiwolf actors—were resolved through multistage sharing:

[WS trappers] will send us the information, and it's in a 10-mile area, right? We'll say, 'In this drainage,' and then we know it's somewhere... our biologists will [then] call the trapper and get the more detailed information. That protected that from being written down,

and thus the risk of lawsuit. Similarly, “get[ting] together” to share information across agencies and with permittees at annual operating instruction meetings also helped minimize risk, although some questioned how often information sharing resulted in real changes to grazing plans given other restrictions.

Although polarization and antiwolf sentiment in the region are once again on the rise, there is extensive wolf habitat on Forest Service lands in Idaho, and despite controversy, many concede that “wolves are here to stay.” While uncertainty remains, the Forest Service is “one of the biggest pieces of this puzzle” and will likely play a key role in conflict management and mitigation in the years to come.

Chapter 4: Beaverhead-Deerlodge National Forest, Montana

Introduction

The Beaverhead-Deerlodge National Forest (BDNF), the largest national forest in Montana, covers 3.38 million acres, with 219,000 acres of designated wilderness and 1.8 million acres of inventoried roadless areas (fig. 4.1) (USDA FS 2009). The southeast part of the BDNF forms part of the Greater Yellowstone Ecosystem. The geography of the forest's five ranger districts includes numerous mountain ranges where some peaks exceed 11,000 feet. Lodgepole pine (*Pinus contorta* Douglas ex Loudon) dominates forest lands in the BDNF, whereas more open country in lower elevation valleys contains sagebrush and grassland species (DeBlander 2001, USDA FS 2009). The BDNF provides favorable habitats for both gray wolves (*Canis lupus*) and livestock that graze on national forest allotments.

Extensive rural areas with low populations, several major population centers such as Bozeman and Butte, and areas with longstanding and growing exurban development pressure surround the BDNF (Gude et al. 2006). The region's varied economic profile features a heavy emphasis on natural resource industries (mining, timber, and agriculture) as well as tourism and service-related employment (including government). Researchers at the U.S. Department of Agriculture, Forest Service estimated that the BDNF directly supported a range of local employment opportunities (e.g., related to forest management, agency operations, and recreation) for a total of 1,130 jobs in counties containing or near BDNF lands in 2019. Of these, 290 were associated with livestock grazing on the BDNF, including 160 direct jobs that generated nearly \$3 million in labor

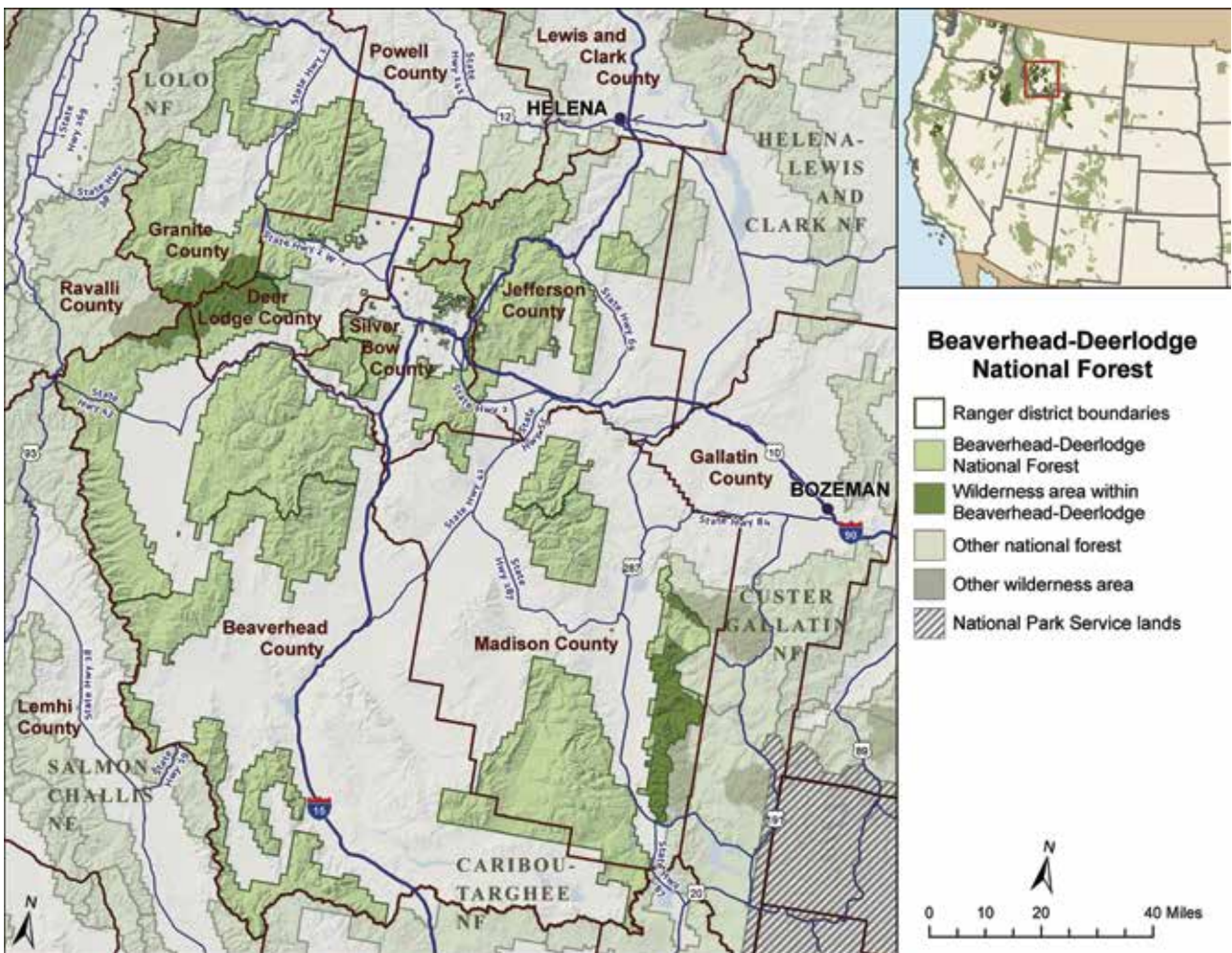


Figure 4.1—Beaverhead-Deerlodge National Forest, Montana. Map by Abigail Kaminski.

income (USDA FS 2022). Over the past several decades, the region has been undergoing demographic transitions related to growing recreation demand and an influx of amenity-oriented and absentee landowners. However, agricultural production—including cattle and sheep ranching—remains a core component of the region’s cultural landscape as well as an anchor industry for the region’s smaller and more rural communities (Gosnell and Travis 2005). Consequently, the BDNF has the highest number of grazing permittees, and one of the highest numbers of permitted livestock, of any national forest in the Forest Service’s Northern Region.¹

Following their extirpation in the early 20th century, gray wolves began recolonizing Montana from Canada around Glacier National Park in the late 1970s. The first wolf den found in Montana following recolonization occurred in 1986 near the park (MNHP and MTFWP, n.d.). Since

then, wolves have dispersed into other parts of Montana, mostly in the western part of the state (Inman et al. 2020). However, according to our interviews, wolves did not become a confirmed presence near the BDNF until 1996, shortly after the wolf reintroduction efforts into Yellowstone National Park. According to interviewees and survey data at the time of our study, roughly 10 wolf packs occupied some portion of the BDNF (app. 2). In 2022, the BDNF had 215 grazing permittees authorized to graze on its 224 grazing allotments (table 4.1). Conflicts between wolves and livestock on the BDNF have occurred since the wolf’s return to the region and remain an issue for the forest’s federal land grazing permittees today.

This case study is based on research methods discussed in chapter 2, including surveys, interviews, and literature and document reviews. We interviewed 12 individuals (one

Table 4.1—Summary of wolf and livestock statuses for the Beverhead-Deerlodge National Forest (BDNF), Montana

Fast fact	BDNF data
Estimated year first resident wolf pack reestablished in Montana	1979 (MNHP and MTFWP, n.d.)
Estimated year first resident wolf pack reestablished on the BDNF	1996 ^a
Estimated wolf population in Montana, 2021	1,144 wolves in 192 packs (Parks et al. 2022: 16)
Estimated wolf population on the BDNF, 2021	About 10 packs ^c
Number of permittees with active grazing permits on the BDNF, FY 2022	215 ^b
Number of grazing allotments on the BDNF, FY 2022	224 active, 18 vacant ^b
Number of permitted cattle (and HM), FY 2022	Cows with nursing calves: 132,595 (347,538 HM) ^b Mature cows with no calf: 1,803 (3,112 HM) ^b Yearlings (9–18 months): 14,755 (39,058 HM) ^b Bulls: 394 (1,238 HM) ^b
Number of permitted sheep (and HM), FY 2022	Ewes with lambs: 11,700 (19,825 HM) ^b
Number of permitted horses or mules (and HM), FY 2022	845 (1,176 HM) ^b
Estimated number of allotments on BDNF where wolves were present, 2020	About 100 ^c
Estimated impacts of wolves on the BDNF, 2020	10 permittees affected ^c

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a Data source: 2021 case study interviews.

^b Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

^c Data source: survey respondents corroborated where possible through interviews. Numbers have not been independently verified and may vary over time.

¹ Data from U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

conversation was a group interview), including 6 BDNF employees (5 from its range program, and 1 biologist), 2 U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) employees, and 1 Montana Department of Fish, Wildlife and Parks (MTFWP) employee. Other interview participants included one expert from a nongovernmental organization (NGO), one grazing permittee, and one range rider who worked on the BDNF. We supplemented interviews with data from other sources, including agency websites, reports, a review of the published and gray literature, and prior research experience of the authors related to land and wildlife management in the Greater Yellowstone Ecosystem (see Epstein et al. 2018, 2022; Haggerty et al. 2018).

Wolves and Wolf Management in Montana

Wolves in Montana are part of the Northern Rocky Mountain subpopulation, which includes populations across Montana, Idaho, and Wyoming, as well as parts of eastern Washington and Oregon, and north-central Utah. Northern Rocky Mountain gray wolves were listed as an endangered

species under the federal Endangered Species Act (ESA 1973) in 1974 (MTFWP 2008). A wolf recovery plan for the Northern Rocky Mountains, established in 1980 and revised in 1987, set the benchmark for recovery at 30 breeding pairs for 3 consecutive years (USFWS 1987). Wolf populations in the 1980s and 1990s grew steadily as wolves continued to disperse from Canada. As noted earlier, the reintroduction of wolves to Yellowstone National Park and the wilderness areas of central Idaho in 1995 and 1996 provided another source of regional population growth (fig. 4.2).

Montana met the federal recovery goal in 2002 with 663 wolves and 43 breeding pairs, leading to a declaration of biological recovery by the U.S. Fish and Wildlife Service (USFWS) (Inman et al. 2020). However, some federal oversight of wolf management in Montana continued during the better part of the following decade, in part because of legal action over Wyoming's plan for managing their portion of the Northern Rocky Mountain population's range. The USFWS approved Montana's Gray Wolf Conservation and Management Plan in 2004, and MTFWP's tenure as the lead administrative agency for the state's wolf population began in 2005 (Guercio and Duane 2009). In 2008,

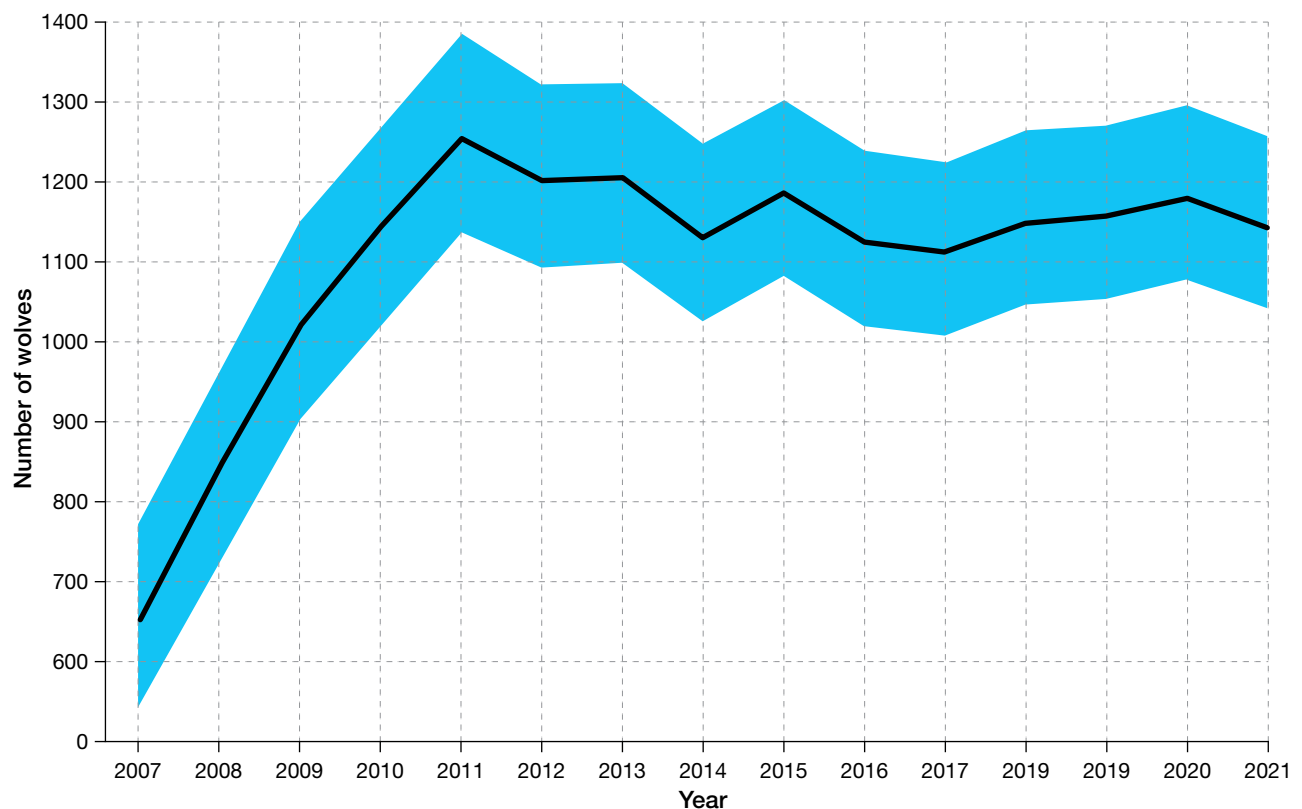


Figure 4.2—Estimated number of wolves in Montana, 2007–2021. Blue ribbon upper and lower borders indicate 95 percent credible intervals. Source: Parks et al. (2022: 11).

the USFWS moved to delist Northern Rocky Mountain wolves. Shortly after, in 2009, MTFWP initiated the state's first wolf hunting season, during which 72 wolves were harvested (MTFWP 2009). A series of litigation efforts resulted in a brief relisting of wolves in Montana in 2010, but in April 2011, a Congressional budget bill initiated the final Endangered Species Act delisting rule for wolves in the Northern Rocky Mountains (Inman et al. 2020, Mulder 2014) (fig. 4.2).

MTFWP reports that wolf populations in Montana have stabilized since their delisting from the federal Endangered Species Act in 2011 at about 1,150 wolves (fig. 4.2) (Inman et al. 2020: vi). After reaching recovery goals, MTFWP shifted from monitoring wolf populations and their distribution using radio collars and telemetry methods to using an Integrated Patch Occupancy Model, owing to cost concerns (see Inman et al. 2020: 3). According to model outputs, the growth rate has fluctuated (from slightly positive to negative) since 2016, averaging 191 packs and 1,141 individuals per year between 2016 and 2020. The 2021 estimates for populations statewide were 192 packs and 1,144 individuals (Parks et al. 2022: 16), with most located in the western half of the state (fig. 4.3). Statewide estimates are also informed by capture and collar data collected by the Blackfoot Nation and Confederated Salish and Kootenai Tribes of the Flathead Nation (Inman et al. 2020: 25).

Following delisting in 2011, wolves in Montana were classified as a “species in need of management.” The MTFWP is the state's lead management agency responsible for managing wolves according to guidelines laid out in the 2004 Montana Gray Wolf Conservation and Management Plan. The Confederated Salish and Kootenai Tribes of the Flathead Nation and Blackfoot Nation each have management plans that guide wolf management on the Flathead and Blackfoot Reservations, respectively (Blackfoot Nation Fish and Wildlife 2008).

MTFWP's 2004 plan acknowledges hunting and trapping as tools to “help MTFWP manage wolf numbers” (MTFWP 2002: iii); both are permitted throughout most of the state, with notable exceptions, special regulations, or both, for national parks, national wildlife refuges, and tribal reservations. The goal of the public harvest program is to maintain the recovered wolf population while minimizing wolf-livestock conflicts, reducing wolf impacts on ungulate populations and associated hunting opportunities, and acknowledging the diversity of values among interest groups (Inman et al. 2020).

In addition to the 2004 Montana Gray Wolf Conservation and Management Plan, the state's Fish and Wildlife Commission reviews wolf seasons regularly, and Montana state law can guide aspects of wolf management, including regulated public hunting and trapping. In 2021, the Montana legislative session approved several changes to the wolf

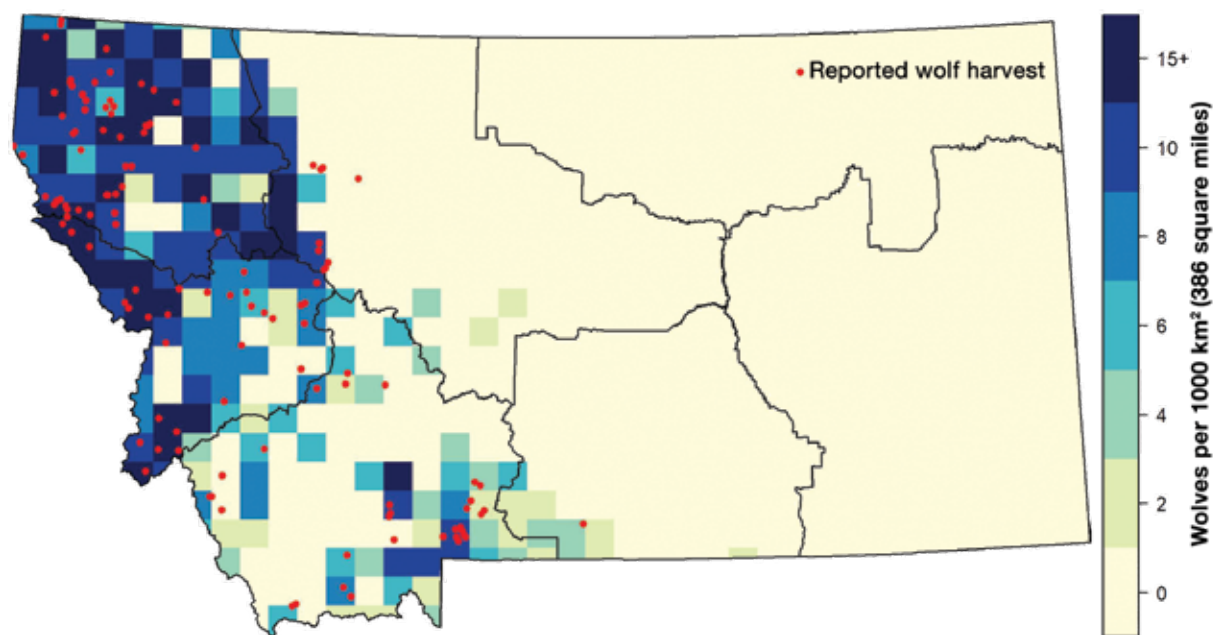


Figure 4.3—Wolf density in Montana in 2021 with reported harvests. Source: Parks et al. (2022: 13).

harvest season. These included opportunities to expand the hunting season,² allowances for the use of snares by those in possession of a trapper's license,³ and reimbursements for costs associated with hunting and trapping.⁴ Additionally, Montana Code Annotated 87-1-901 establishes intentions to reduce the number of wolves statewide to a "sustainable" level that supports at least 15 breeding pairs. To reach these new levels, the commission has the authority to apply a range of management techniques where they have jurisdiction, including the use of bait while hunting and trapping, hunting during nighttime hours with artificial light, and unlimited take of wolves on a single license (Parks et al. 2022). A total of 273 wolves were taken via hunting (148) and trapping (125) during the 2021–2022 wolf season, which concluded on March 15, 2022. Montana sold 17,937 resident wolf hunting licenses in 2021, generating \$341,043 (Parks et al. 2022: 23).

Beyond public hunting and trapping, the Montana Gray Wolf Conservation and Management Plan and associated legislation also allow for lethal control of local wolves deemed a threat to private property or human life. Additionally, Montana Code Annotated 87-2-901 allows for landowners statewide to take up to 100 wolves on their properties without a license if wolves are "a potential threat to human safety, livestock, or dogs."⁵ WS may also remove problem wolves and is responsible for investigating property damage claims related to livestock from wolves.

To compensate for the financial burdens posed by wolf-livestock interactions, the Montana Livestock Loss Board was established in 2007 as part of the Montana Department of Livestock to reimburse individuals for property loss (i.e., animals) related to wolves. The reimbursement system covers death losses confirmed or deemed probable by WS personnel at 100 percent of fair market value. Veterinary bills for injuries confirmed to be caused by wolves may also be covered at 100 percent "when funding becomes available." However, indirect losses and costs are "not directly covered" (Inman et al. 2020: 18).

In 2021, \$103,815.95 was paid to 37 livestock owners for damages from wolves related to 81 head of livestock and 2 dogs.⁶ Comparatively, damages paid for mountain lion depredations totaled \$42,647.70, while grizzly bear-related incidents totaled \$193,971.17 (Parks et al. 2022: 19).

As part of statewide efforts to reduce wolf-livestock conflicts, Montana Code Annotated 87-1-623 compels MTFWP to allocate funding from wolf license sales to wolf collaring initiatives that support conflict mitigation in livestock areas.⁷ These collars also help WS be "more efficient and effective at controlling packs that depredate on livestock" (Parks et al. 2022: 20). According to the 2021 annual report, WS captured and collared 5 wolves, while MTFWP captured and collared 15 wolves, for a total of 20 statewide by both agencies (Parks et al. 2022: 20).

MTFWP and WS regularly partner with Montana landowners, NGOs, and federal agencies in nonlethal conflict-reduction efforts. On the BDNF, the Greater Yellowstone Coalition and WS are collaborators on the Gravelly Mountains range rider program. WS has also employed a full-time conflict reduction specialist since 2018, while the MTFWP has five wolf specialists across the state (Parks et al. 2022).

Wolf–Livestock Conflict in Montana

Wolves in Montana regularly encounter livestock on both public and private lands, creating opportunities for multiple types of conflicts. In 2021, wolves were confirmed responsible for the deaths of 67 cattle, 29 sheep, and 3 livestock guardian dogs. An additional 12 cattle and 6 sheep were reported as probable wolf kills (Parks et al. 2022). Interviewees, as well as several research studies, emphasized that wolves kill Montana livestock more frequently on private lands than on public lands (DeCesare et al. 2018, Inman et al. 2020: 15). However, the challenges of identifying and confirming losses from wolves (as opposed to other predators), especially in remote public grazing allotments, also make the exact level of loss on public allotments "unknown" (Inman et al. 2020: 15). That livestock losses from wolves and other predators can be difficult to

² Montana Code Annotated 87-1-304. 2023. Fixing of seasons and bag and possession limits.

³ Montana Code Annotated 87-1-901. 2023. Gray wolf management—rulemaking—reporting.

⁴ Montana Code Annotated 87-6-214. 2023. Unlawful contest or prize.

⁵ Montana Code Annotated 87-2-901. 2022. Appointment of license agents.

⁶ Discrepancies between the number of reported depredation and reimbursement totals are due to payments made for probable kills and differences in tally systems (calendar versus federal fiscal year) (Inman et al. 2020: 18).

⁷ Montana Code Annotated 87-1-623. 2023. Wolf management account.

detect (e.g., getting to the carcass in time) and prove (establishing how the animal died) can restrict reimbursement opportunities for livestock producers. This was a noted source of frustration among permittees and local producers, according to several of our interviewees.

According to interviewees and research on predation events across the state, cattle losses occur most frequently in the spring when calves are smaller and more vulnerable (Sime et al. 2007). Interviewees further emphasized that detections are more likely near the home ranch, where accessing kill sites quickly is often easier than on remote public allotments. Overall, the number of wolf-related predation events in Montana can also rise in the autumn as, according to Sime et al. (2007), “food demands of the pack increased and pups began traveling with the pack and learning to hunt.” This observed seasonal pattern of conflict holds less well for the state’s sheep operators, who suffer year-round losses more regularly, given the smaller size of sheep compared with other livestock classes (Sime et al. 2007: 26).

Conflicts between wolves and livestock also vary geographically in Montana. DeCesare et al. (2018: 716)

describe a “notable concentration of events in relatively few (hunting) districts,” mostly concentrated in the western half of the state. The number of reported depredation events in Montana hit a high in 2009 at 233. Since then, MTFWP reported that the number of conflicts across the state has trended downward, with the average dropping to roughly 100 for the years between 2014 and 2020. However, WS has only been able to verify roughly 50 percent of these reports since 1997 (fig. 4.4).

Montana’s general decline in predation since 2009 is often attributed to targeted lethal removal practices. WS employees most frequently carry out lethal control activities, though private citizens also kill wolves (DeCesare et al. 2018: 721, Inman et al. 2020). In 2021, 39 wolves were killed via lethal control (38 by WS and 1 by private citizens). This was fewer than in years past, continuing the downward trend. Since meeting recovery goals in 2002, an average of 70 wolves per year have been removed (killed); since delisting in 2011 and the arrival of public hunting, an average of 67 wolves have been removed per year (Parks et al. 2022).

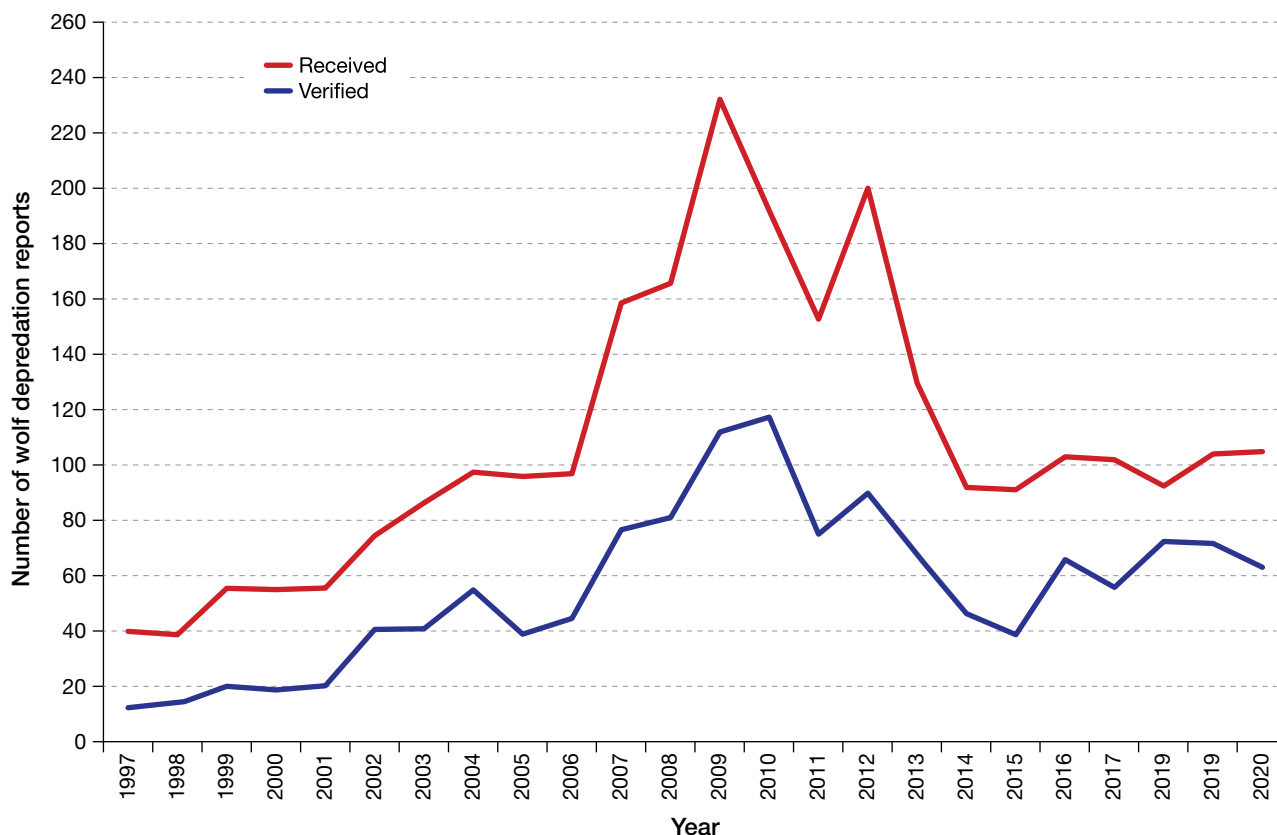


Figure 4.4—Reports and verified reports of wolf depredation-related damages to livestock made to the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, federal fiscal years 1997–2021. Source: Parks et al. (2022: 18).

From a social perspective, wolves and wolf management have been, and still are, a source of tension and conflict across the state. The restoration of wolves to the Greater Yellowstone Ecosystem and subsequent dispersal into southwestern Montana in the mid-1990s was a celebrated event for wolf conservation advocates. However, rapidly growing wolf populations also prompted members of the state's agricultural and hunting communities to voice concerns over how wolves would affect the region's livestock industry and ungulate populations (e.g., elk and deer) (Kaufman 2011, Mulder 2014, Richardson 2022). In this way, the demographics of social conflict over wolves in Montana parallel those from other places characterized by tension over wolf-livestock dynamics (e.g., other western states such as Idaho and Wyoming, the U.S. Midwest, and Scandinavia)—rural, private landowners and livestock producers report relatively low tolerance for wolves and more urban populations, conservation organizations, and indigenous groups are generally more supportive of wolf conservation measures (Lewis et al. 2018, Richardson 2022).

While Lewis et al. (2018) note that tolerance for wolves amongst rural private landowners has remained relatively low across the state, rural communities in Montana have also been at the forefront of the state's conflict-reduction initiatives. For example, the Blackfoot Challenge, a collaborative, landowner-led NGO based in Montana's Blackfoot Valley, initiated a series of proactive, community-based management practices in partnership with federal agencies (Forest Service; U.S. Department of the Interior, Bureau of Land Management; USFWS) and MTFWP to reduce negative wolf-livestock interactions following the recolonization of wolves in the region in the mid-2000s. Montana has also been host to nonprofit innovations related to predator-livestock conflict more broadly. For example, Defenders of Wildlife started a depredation payment program for the state in the late 1980s, providing reimbursement to affected ranchers until 2010 (totaling more than \$400,000), when the program transitioned to federal funding (Defenders of Wildlife 2010a, 2010b). Sustained efforts to reduce conflicts between predators and rural communities across Montana have made the state a leader in collaborative conservation approaches (Western Landowners Alliance 2019, Wilson et al. 2017). However, despite the region's collaborative initiatives, the wolf has remained a polarizing figure in public political debates, with social tensions related to wolves hitting a particularly high note in the early 2020s.

Following the delisting of wolves across the United States (populations outside of the Northern Rocky Mountains) in 2020, Montana Governor Gregory Gianforte supported a series of new and controversial wolf management regulations (see above). According to regional news coverage, the new legislation, and the expanded opportunities for hunting and trapping it provides, reflect the successful lobbying efforts of hunting groups and livestock producers who continue to see wolf populations as a threat to ranching and big game species (Brown 2021). Proponents of Montana's new measures have also argued that, rather than introducing new tools, the policy changes merely expand the toolkit available to managers, public hunters, and trappers for controlling wolf populations (Mott 2021). However, the policy changes in Montana and the adoption of similar measures in Idaho, Wyoming, and Wisconsin have drawn sharp criticism from multiple advocates in the wolf conservation community. Several environmental NGOs, including the Center for Biological Diversity, Humane Society, and Sierra Club, filed a legal petition to relist wolves in the spring of 2021, questioning the ecological integrity of the new policies that could, they argue, bring populations to dangerously low levels. A formal letter asking U.S. President Joseph Biden's administration to enact emergency protection measures for wolves nationwide also came from a coalition of indigenous tribes and organizations (Richmond 2021). Such recent events highlight the divergence characterizing wolf-livestock conflict at the state level.

Wolf–Livestock Conflict on the Beaverhead-Deerlodge National Forest

Population estimates for wolves on the BDNF are difficult to obtain because, as noted above, neither MTFWP nor the Forest Service monitor wolf populations on the ground using collar data. However, interview and survey data suggest that roughly 10 wolf packs currently occupy the BDNF. Furthermore, survey results indicate that established wolf packs occupy some, but not all, of the available wolf habitat there (fig. 4.5). Ranger districts where wolf presence was noted include the Madison, Butte, Dillon, Wisdom, and Pintler (fig. 4.1). Additionally, respondents from our survey estimate that 100 of the BDNF's 234 grazing allotments reportedly experienced wolf presence in some form in 2020, according to our survey data (see app. 2).

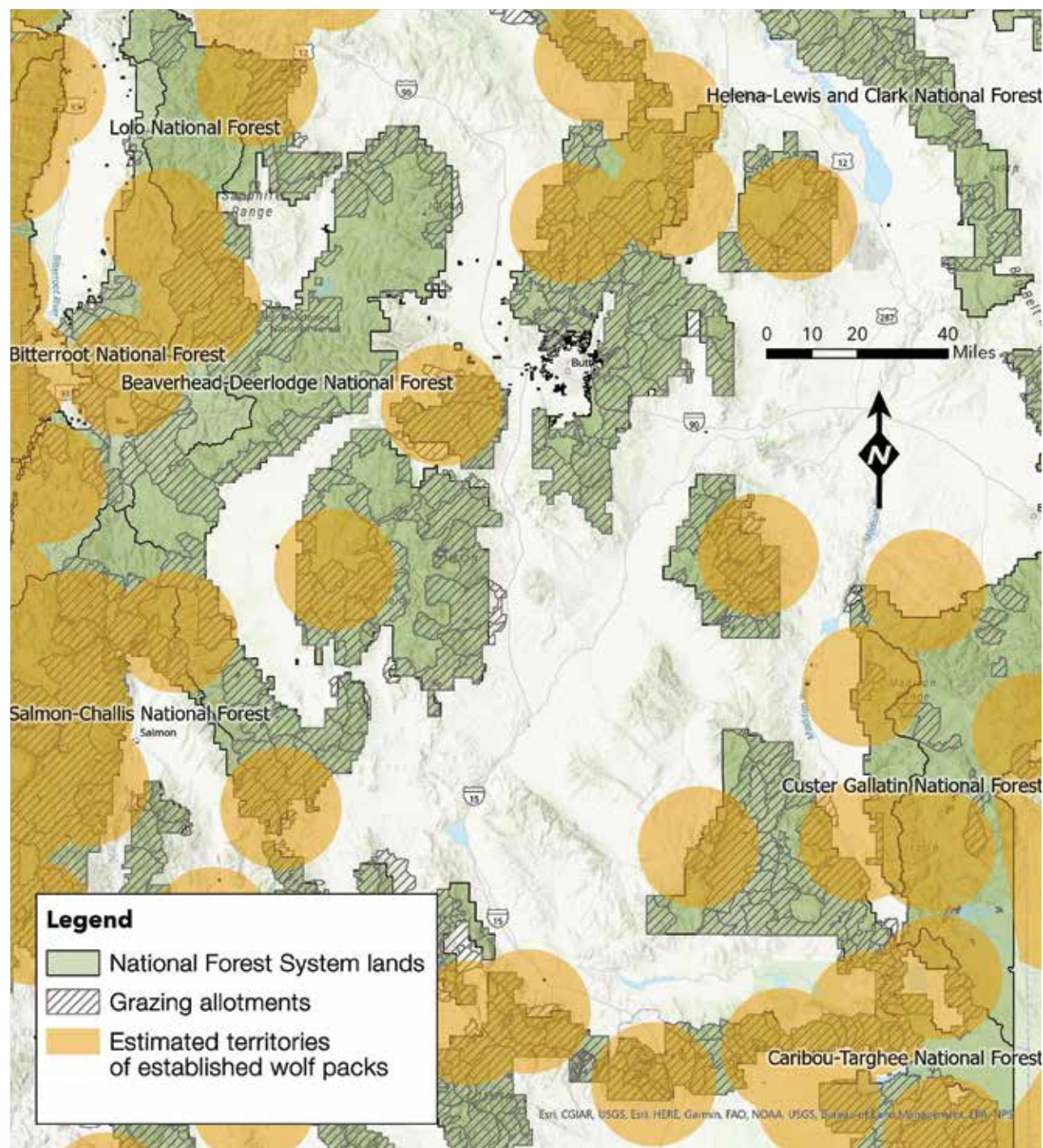


Figure 4.5—Estimated wolf pack territories on the Beaverhead-Deerlodge National Forest and neighboring areas with pack centroids from Parks et al. (2022) expanded to typical wolf pack territorial area and overlaid on U.S. Department of Agriculture, Forest Service grazing allotments. These represent likely approximate territories for known groups of wolves at the time of the monitoring effort, which likely vary from year to year. Map by Robert Anderson.

Wolf population dynamics on the BDNF appear to mirror those across the state. According to interviews with Forest Service employees, while packs “expanded out” in the early 2000s, current populations are in a “steady state,” at least from the perspective of replacement from hunting and natural disturbances within the population.

At the same time, wolf populations on the BDNF reflect its connection to a broader landscape of wolf habitat. “Wolves show up” from other places, including Idaho, which “is very much a source.” One interviewee from the Forest Service said, “We have documentation of wolves coming from 360 degrees.”

Much like wolf-livestock dynamics statewide, conflict, and specifically livestock loss, has been a consistent feature of range management on the BDNF since the wolf's establishment in the region in the late 1990s. Employees at the BDNF estimated that 10 of the 222 permittees were affected by wolves in 2020, according to our survey data (see app. 2), with more impacts on cattle than sheep or goats. These numbers did not reflect a particularly "high predation year" in the eyes of some interviewees. Indeed, a majority reported that overall predation had decreased over the previous decade, in line with patterns at the state level. However, negative wolf-livestock interactions continue to affect the region's livestock industry. For example, one interviewee noted that a local permittee called 2020 their "worst year ever" for predation, having lost roughly "30 calves and 8 to 9 cows" to confirmed wolf and grizzly kills.

Employees from the Forest Service ranked the current level of conflict on the BDNF as moderate, a status some attribute to the geography and landownership patterns of the region. However, interviewees stressed that conflict was a consistent feature on the landscape. Characterized by "island ranges," the BDNF features a chain of public land areas composed of high alpine areas surrounded by low-lying valley bottoms held largely in private hands. One interviewee from the Forest Service explained that, unlike other national forests where wolf packs can live almost entirely within the confines of federal lands, wolves on the BDNF move seasonally across a patchwork landscape of public and private lands where the chance of encountering livestock is nearly guaranteed. "There is nowhere in Beaverhead that I can think of where wolves will not encounter livestock at some points, both allotments as well as private," explained a Forest Service employee.

Several interviewees from the Forest Service and MTFWP emphasized that the life course of livestock and their movement from seasonal private and public pastures influences where and when wolf-livestock conflict occurs in and around the forest. Most allotments on the BDNF are in relatively high-elevation mountains, meaning permittees cannot turn out livestock until mid-June or early July, after calving season. A significant portion of the conflict, therefore, occurs in early spring on private lands when calves are particularly vulnerable. However, according to one interviewee from MTFWP, the "worst months" for conflict are August and September, when cows are on public allotments.

While there was a relative consensus among our case study participants about the timing of conflicts, there was more variation amongst interviewees concerning other factors that create high-conflict areas. Some insisted that where predation events occurred was largely "random," while others described some allotments as "riskier" than others. Nevertheless, rugged terrain, thick timber, and downed trees were some of the landscape features that interviewees identified as more conflict-prone, partly because such places make it more difficult to survey and protect herds. "The harder conflicts are those smaller herds and more heavily timbered country. You can't see the cows, and you can't see the wolves." Furthermore, several interviewees said that parts of the forest consistently emerge as "hotspots" of conflict where producers "consistently [deal] with wolves." Such places often feature ranches and public grazing allotments that overlap with the home range of a local pack, including den and rendezvous sites. The size of a producer's operation was another noted factor. One interviewee from the Forest Service said that over the tenure of wolf restoration, some operators with larger allotments, which can contain as many as 3,000 cattle, have undertaken "extensive" mitigation to reduce predation from wolves and, as a result, "have more or less figured out how to coexist." Conversely, smaller operators or those with less oversight tend to have more "issues."

Interviewees emphasized that for producers affected by wolves, the impacts extended beyond livestock predation. Loss of nonlivestock property (i.e., livestock guardian dogs) and changes in livestock quality and health—including weight loss related to the presence of predators—were challenges noted by participants from state and federal agencies and members of the livestock community. Multiple interviewees also expressed concern over the administrative and management issues wolves bring to livestock operations. For example, wolves might push cattle into the "wrong pasture" or "weird places," making it difficult for producers to locate or access herds. Importantly, wolves also compound with other uncertainties faced by permittees on federal lands. As one interviewee from MTFWP put it, "The biggest stress is the unknown. Don't know what happened, something happened, don't know how to fix it."

Controversy over wolves in and around the BDNF has historically hinged on these associated challenges

that wolves bring to the region's livestock operations. Interviewees noted that the social dynamics after wolves returned in the 1990s were "tough," with conservation groups "pitt[ed]" against industry groups. "Population expanded far quicker than anybody expected it to. We had a lot of problems with it, a lot of interactions, a lot of lethal removals, a lot of livestock loss, a lot of very upset people." However, most interview respondents reported that local perceptions and attitudes have "evolved" in several ways. One major "turning point" in local attitudes arrived after federal delisting; according to interviewees, many livestock producers felt "empowered" by opportunities for more liberal lethal control and public hunting.⁸

Another factor mentioned by interviewees relevant to shifting social dynamics in and around the BDNF is that local institutional support for conflict reduction measures has increased, with local collaboratives, such as the Big Hole Watershed Committee, and conservation NGOs, such as People and Carnivores, supporting a range of nonlethal practices through cost-sharing and technical assistance programs (see next section). Interviewees also suggested that after "20 plus years" of managing livestock near wolves, some animosity has also "waned," at least amongst producers, as some have "gotten used to" wolves in the area. "We understand 'em a little better," noted one permittee.

Ultimately, employees of the BDNF described contemporary social conflict over wolves as moving more into the background of range management, as "bigger issues" have eclipsed the wolf as a range management concern. Managing beetle-killed lodgepole pine and impacts from mechanized recreation were both noted as pressing public land challenges. Furthermore, from the perspective of local livestock producers, one interviewee, echoing the view of several others, conveyed a stronger sense of urgency over the region's grizzly bear population as the predator of top concern for rural economies dependent on public grazing lands: "That's actually more of the focus on those really big allotments. It's more bears."

Approaches to Managing Wolf-Livestock Conflict on the Beaverhead-Deerlodge National Forest

Interview participants commented on a range of tools, and shared insights on their perceived effectiveness from the perspective of mitigating predation and social tensions (table 4.2). At the top of the list for most interviewees were opportunities for lethal removal, a strategy cited as the region's most effective for managing conflict. WS, with support from MTFWP, carries out lethal control in Montana. In and around the BDNF, WS employs several government trappers responsible for removing predators on the forest's public allotments and surrounding private lands. Unlike public hunting and trapping, which reduces conflict by reducing the overall number of predators, interviewees pointed out that targeted lethal removal was effective because it involves killing wolves strategically, by targeting the "naughty," "bad," or "instigator," individuals believed to be associated with predation. To illustrate their point, one interviewee described how in the early 2000s, a ranch operation near the forest suffered chronic predation losses for multiple years. While lethal removal was used consistently over that period, it wasn't until WS removed the "right wolves" that the ranch saw a reduction in predation.

While range staff at the BDNF do not play a direct role in lethal control on public allotments (this is handled by WS), interviewees from the Forest Service were emphatic about the role of lethal control in managing wolf-livestock interactions on public grazing lands. Having a "government trapper on call," noted one interviewee from the Forest Service, is the "biggest point for us" in reducing conflict. "If we have issues, he'll come in and help."

Relatedly, several interviewees noted that the state's adoption of public hunting and trapping in 2011 initially produced a "radical shift" in the number of local predations: "It was really, to me, very stark when the hunting season was opened up. A year later, we had almost no depredation." Others were more tentative about the effectiveness of hunting long-term; as one noted, wolves are "learning to avoid the hunters." However, there was widespread agreement about the general approval of public hunting and trapping by many of the rural communities surrounding the BDNF.

Concerning nonlethal strategies, range riding was the most referenced strategy used on the BDNF that was believed to contribute positively to conflict mitigation. Range riders in the area include those employed by

⁸ Notably, while recent social science research from elsewhere in Montana has also suggested links between opportunities to hunt and trap wolves and social tolerance (Richardson 2022), other studies have found little evidence to support this claim in other states, e.g., Wisconsin (Hogberg et al. 2016).

Table 4.2—Approaches for managing wolf-livestock conflict on the Beaverhead-Deerlodge National Forest (BDNF)

Approach	Implementor(s)	Perceived effectiveness among interviewees
Lethal removal	WS with support from MTFWP	High when targeting “problem” wolves believed to be causing depredation.
Public hunting and trapping	Members of the public (managed by MTFWP)	Reduces overall wolf populations, not as effective as targeted lethal removal; initially effective, may be less effective over time; perceived social benefits associated with local control.
Range riding	Permittees and those employed by them, nongovernmental organizations	An effective nonlethal strategy; increases human presence, helps identify wolf kills to secure depredation payments, serves to monitor and obtain information about wolf presence.
Reconnaissance, e.g., howl surveys, observation	BDNF employees	“Very effective” for identifying wolf versus bear kills and tracking wolf presence on allotments.
Fladry, nonlethal munitions, spotlights	Permittees	Effective on a “small scale.”
Livestock guardian dogs for sheep	Sheep producers	“Super effective.”
Management flexibility on allotments	BDNF, permittees	Can help permittees avoid wolves and reduce conflict; promotes adaptive management responses to wolf presence.
Information sharing and serving as liaison to mitigation resources	BDNF	Helps connect permittees to resources for conflict mitigation and to raise awareness about wolf dynamics on the national forest; reduces social conflict.
Compensation programs	Permittees affected by predation	Mixed outcomes; challenging to consistently identify kills.

WS = U.S. Department of Agriculture, Animal and Plant Health Inspection Services, Wildlife Services; MTFWP = Montana Department of Fish, Wildlife and Parks.

individual permittees as well as positions funded by local organizations such as the Centennial Valley Association. For some participants, the value of range riding related to increased “human presence” on the landscape and, thus, deterrence of wolves near livestock. Others noted how range riders served an important role in identifying wolf kills, thereby securing depredation payments for livestock owners. General monitoring—providing more information about the wolves’ location to producers—and range care were both also noted as benefits of range riding programs.

According to one interviewee from the Forest Service, reconnaissance tools such as the howl surveys can be “very effective” for distinguishing between bear and wolf kills on federal lands. Similarly, other Forest Service employees noted the value of tracking wolf presence generally, describing how they make “mental notes” when out on allotments. Tools aimed at deterrence were also noted. According to interviewees, the forest’s sheep producers have been using livestock guardian dogs for “quite some time,” which have been “super effective.”

A recurring theme in discussions about tool efficacy, however, is that tools that provide some level of benefit on private lands are less effective on the BDNF’s allotments. For example, some local ranchers used electric fencing and fladry to deter wolves on their private pastures. However, interviewees noted that scaling up this tool on remote and expansive public allotments is “not practical” given the cost and labor requirements. Furthermore, interviewees felt that tools like fladry provide only a “temporary” solution, deterring wolves only until they “tested” the flagging. In sum, “there are very few things that work well on public land,” noted one permittee: “I run 300 cow-calf pair on 13,000 acres of forest. There’s really no way to protect ‘em at that point.”

Beyond the perceived efficiency of particular tools, interviewees described a constrained position for government employees when making decisions about adopting tools on the BDNF’s individual allotments. “I can’t come in and tell you as a rancher..., ‘you need to do this.’ [That’s] not my place, not my role, not how I even operate,” explained

one interviewee. Similarly, employees from both MTFWP and the Forest Service described the role of BDNF staff as being largely in the “background” of most conflict efforts. Despite this position, interviewees described two overarching strategies for range management staff to support conflict reduction efforts.

First, interviewees emphasized opportunities for working with producers on a “case-by-case basis” to address wolf-livestock dynamics on individual allotments. “Whether a producer wants not to put out a cow-calf pair, [or], they want to put out just dry cows,” BDNF staff noted that they felt they “had enough flexibility in [range management] policies” to make changes that respond to wolf-livestock conflicts. One interviewee described how a permittee opted to leave an allotment early because of pressure from a nearby wolf pack and was able to have their grazing fees refunded. Another interviewee offered that shifting locations for cow camps (presumably away from known wolf habitat) on allotments, or adjusting on and off dates for grazing seasons, presented other chances for adaptive conflict management. “We always put the caveat in there like we’ll see how it goes and at what point we need to make a change and how we can make that change.”

Interviewees noted that another proactive role for Forest Service staff in conflict-mitigation efforts was in linking grazing permittees with technical support and information resources. As described above, multiple landowner-led collaboratives and NGOs on and around the BDNF host active range rider and carcass removal programs, and provide funding for cost-share programs. One Forest Service interviewee explained how they connected permittees affected by wolves and bears to the local NGO, People and Carnivores, by sharing contact information. Similarly, being a source of information for the public about current wolf dynamics on the BDNF was described as another avenue for Forest Service employees to contribute to conflict reduction. It’s critical that “people feel like they can get help,” noted another interviewee. Ultimately, in the eyes of Forest Service staff on the BDNF, these strategies improve local social relations related to wolf conflict, and “helps [with] tolerance a bunch.”

Summary and Key Findings

Much like in the neighboring states of Wyoming and Idaho, wolves in Montana have been a feature of the social and ecological landscape for several decades, giving the state and its resource managers a long-term view of the challenges and opportunities wolf restoration and management bring. At the level of the state, Montana’s approach to wolves involves a relatively liberal lethal control framework where MTFWP manages public hunting opportunities and WS takes a leading role in wolf removal. As one interviewee noted succinctly, “... everybody wants a degree of lethal removal.” Nevertheless, sincere efforts for conflict reduction are also a key feature of Montana’s wolf-livestock landscape. Montana continues to host sustained, on-the-ground, community-based efforts to minimize negative wolf-livestock interactions—Defenders of Wildlife noted that Montana had “a record number of conflict prevention projects” in 2020 (Talmo 2021). Yet wolves remain persistently engulfed in the broader political arenas where they take center stage in regional and national environmental debates. This latter fact is well demonstrated by the ongoing efforts of the state legislature (at the time of writing) to expand opportunities for reducing wolf populations. With multiple decades of experience behind them, the Forest Service managers on the BDNF have seen how wolf-livestock conflicts have both dynamic and enduring qualities. Interviewees were emphatic that social attitudes and nonlethal practices have improved (at least slightly), but wolves continue to stir local controversy, particularly as part of broader debates over predator (e.g., grizzly bear) control.

Accompanying a general level of satisfaction with respect to wolf-livestock conflict in the region is a set of notable areas for improvement. For example, while several interviewees were supportive of the state’s compensation program overall, some questioned the incentive structure of depredation payments, arguing that they “compensate for the negative,” as opposed to paying for positive conservation change. Another noted challenge for depredation payments concerns the critical mechanisms for allocating compensation to affected producers: positive verification of wolf-killed livestock. The remote nature of allotments makes it difficult to confirm the cause of death for livestock before they are affected by other predators, scavengers,

or environmental elements. Furthermore, riding out to investigate kills has become more perilous, noted several interviewees, as the increased presence of grizzly bears in and around the BDNF creates opportunities for dangerous interactions at kill sites.

Interviewees also expressed concern about the long-term viability of conflict reduction strategies from an economic perspective. Tools such as fladry can be “super labor intensive and super expensive,” noted one interviewee. Several others expressed concerns about tools and practices such as range riding that sometimes depend on volunteer, student, or intern labor. Several interviewees questioned if such employees could earn a “living wage” and if some local producers could take on the extra costs that conflict-prevention measures impose. Though several local organizations add capacity through programming and resources, their financial support largely depends on private donations or grant opportunities, leaving the region’s long-term funding horizon for conflict prevention unresolved. Furthermore, the complex ownership landscape of rangelands in the region, and more specifically the public grazing lands of the BDNF and surrounding private ranchlands, means that conflict resolution requires an inherently crossboundary approach. Lastly, for some interviewees, MTFWP’s shift toward theoretical population modeling to estimate wolf populations and distribution, as opposed to collar data and tracking used previously, has made tracking wolf populations around the state, including in and around the BDNF, more difficult. While interviewees acknowledged that tracking wolf populations using collar data was not a sure-fire strategy for reducing predation, they noted that more data could assist with the verification of wolf kills while also providing permittees an additional level of “comfort” concerning the predator dynamics affecting their allotments.

At the close of our interviews, we asked participants what advice and recommendations they felt their experiences could offer other national forest managers working where wolves and livestock overlap. Interviewees shared several key points. Creating “strong relationships” with permittees “can go a long way” toward “helping to avoid mistakes,” noted one Forest Service employee. Similarly, another interviewee noted the need for Forest Service staff to relate to the multiple positions of those invested in

reducing wolf-livestock conflict. “Respecting other people for what they do, even though it’s not maybe in your values” can help develop “credibility.”

We couldn’t do what we do if we didn’t have respect for our permittees, and we couldn’t do what we do if we didn’t have respect for wildlife advocates and wolf advocates and other wildlife managers.

While building effective relationships takes time, interviewees noted that working deliberately to establish trust and rapport, especially between range staff and permittees, is how to get past “barriers” and “lay the groundwork” necessary for managing issues on individual allotments.

Several interviewees emphasized how wolf-livestock interactions should be seen as an enduring feature of range management. “It’ll be constant. It’ll be something that you’ll be managing for the rest of your career,” noted one Forest Service employee. Conflict, in this sense, “is a necessary part of having wolves on the landscape,” said another Forest Service employee. Knowing this, interviewees emphasized the value of being “proactive” by being “willing to call up the neighbor” and learn about other contexts. As one interviewee reflected,

A lot of states, a lot of agencies, a lot of partners have been dealing with it for a long time, and there’s some comfort in knowing that you’re not the first ones to have to manage this challenging dynamic.

Finally, interviewees also contributed finer scale recommendations for reducing conflict in and around the BDNF specifically. For example, several interviewees emphasized the need for stable and predictable funding sources to support nonlethal conflict reduction measures such as range riding. Having enough agency staff to respond to conflicts effectively was another noted recommendation, as was having an “independent” agency such as WS charged with identifying wolf kills. As one interviewee explained, tolerance for wolves improves when “people feel like they can get help” if they need it.

Chapter 5: Shoshone National Forest, Wyoming

Introduction

The Shoshone National Forest (SNF) is located in the north-west corner of Wyoming and consists of 2.4 million acres across five U.S. Department of Agriculture, Forest Service ranger districts: Clarks Fork, Greybull, Wapiti, Washakie, and Wind River (fig. 5.1). This is the nation's first national forest, originally set aside in 1891 as part of the Yellowstone Timberland Reserve (USDA FS 2015). The topography and geography of the SNF vary from sagebrush flats to high peaks, with elevation ranging from 4,600 feet at the mouth of the Clarks Fork River canyon to 13,804 feet at Gannett Peak, the highest point in Wyoming. More than 25 percent of the SNF is above the treeline. It includes portions of several major mountain ranges—the Absaroka, Wind River, and Beartooth Mountains—and borders Yellowstone National Park, a boundary especially meaningful to the

history of wolf management in the region given its role in reintroduction. The SNF has 1.4 million acres managed as wilderness, a designation that limits mechanical and motorized management practices (i.e., aerial practices requiring helicopters) (USDA FS 2015).

The SNF has administrative offices in Cody (Park County) and Lander and Dubois (Fremont County), Wyoming. All five counties within the national forest are nonmetropolitan, meaning they have fewer than 50,000 people each. Population growth and demographic change associated with exurban development and tourism have influenced the region's social and cultural character over the past several decades. However, according to our interviews, there remains a strong symbolic and cultural attachment to agriculture as a land use and component of the local economy. Farm employment accounted for 5.2 and

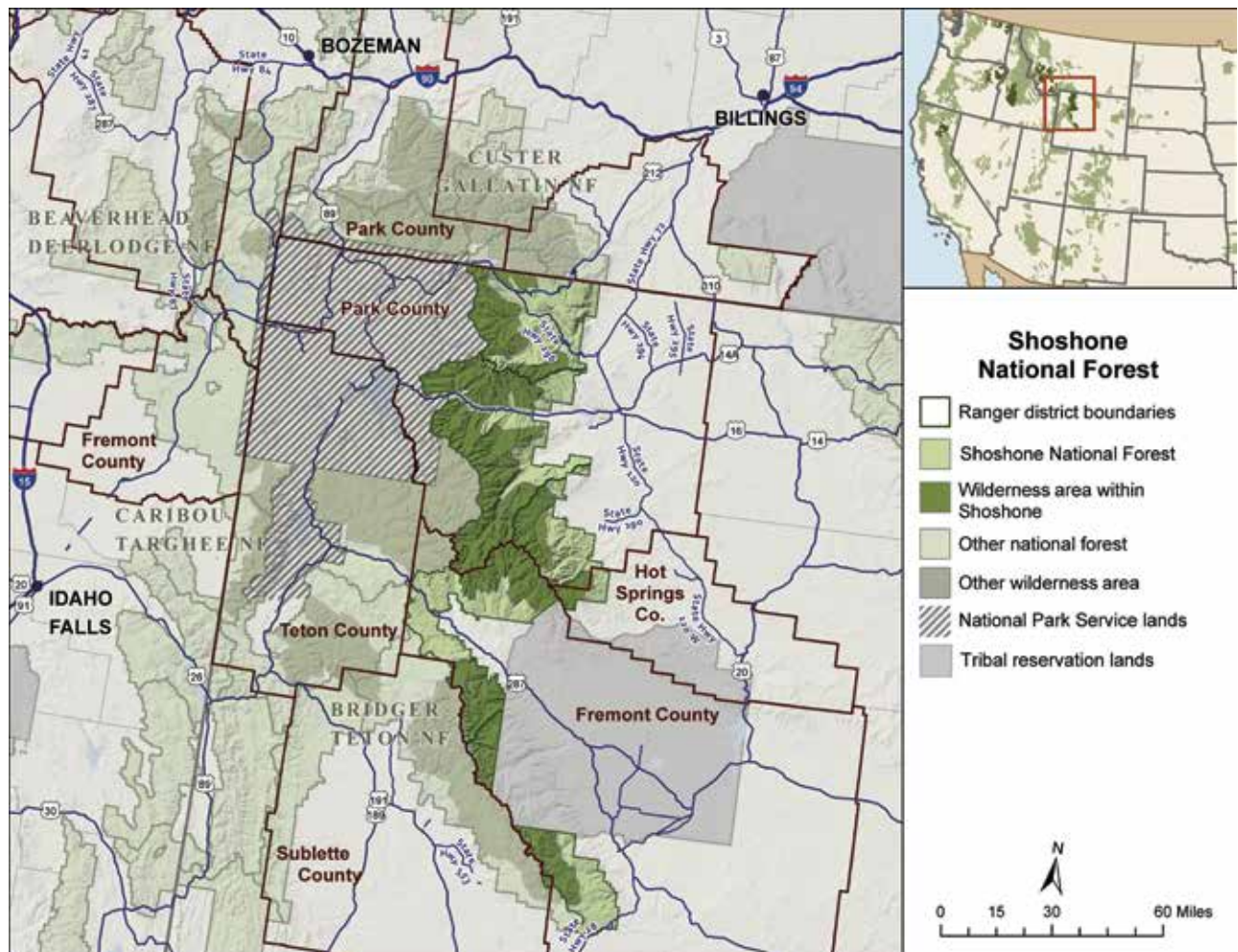


Figure 5.1—Shoshone National Forest, Wyoming. Map by Abigail Kaminski.

6.5 percent of total employment in Park and Fremont Counties, respectively, in 2019 (Headwaters Economics 2023). Farmland accounts for about 20 percent of the land base in both counties, and more than 80 percent of this farmland is in permanent pasture or rangeland. Beef cattle are the dominant type of livestock production (Headwaters Economics 2023). Accordingly, in and around the SNF, expanding amenity-oriented economies (e.g., recreation, tourism) occur alongside longer standing natural resource-based economies such as ranching and energy extraction (e.g., oil, gas).

The SNF grazing program is more than a century old. Though commercial sheep grazing was a focus through the early 1900s, it has since slowly declined (USDA FS 2015). Initially, stocking rates were reduced to address overgrazing issues; however, in recent decades, reduced demand for wool and meat and increases in imported sheep products have further affected the region's sheep industry. In 2003, the last sheep grazing permittee on the Clarks Fork Ranger District (the northern portion of the forest where wolves are more active) was moved to a vacated allotment on the nearby Bighorn National Forest. Currently, the SNF has only two sheep allotments located in the far southern end of the forest near South Pass where conflicts with large carnivores and bighorn sheep have been minimal. In contrast, permitted cattle grazing and demand for cattle allotments have remained steady for decades (USDA FS 2015). In 2019, the grazing program supported an estimated 60 local jobs in total, 30 of which were direct jobs generating an estimated \$809,000 in direct labor income that year (USDA FS 2022).

Following their extirpation in the early 20th century, gray wolves (*Canis lupus*) were reestablished in Wyoming as part of the 1995/1996 reintroduction efforts in Yellowstone National Park. Throughout the late 1990s, wolf populations grew and expanded into SNF lands and elsewhere in the state. At the time of this study, Wyoming had at least 314 wolves, and according to interviews, SNF employees estimate that 16 to 17 packs occupy some portion of the forest. In 2022, the SNF had 61 permittees authorized to graze livestock on the forest's 92 active grazing allotments (table 5.1). Inevitably, wolves and livestock encounter one another periodically, and wolf-livestock-human conflict sometimes results.

This case study is based on research methods discussed in chapter 2, including survey, interviews, and literature

and document review. We interviewed 11 individuals (one conversation was a group interview), including 3 SNF employees (1 from the range program, 2 biologists), and 5 Wyoming Game and Fish Department (WGFD) employees (2 worked specifically with wolves, and 3 worked on conflict with carnivores generally). Other interview participants included one former Forest Service employee; one local, independent wolf advocate/stakeholder; and one researcher with extensive experience studying wolf-livestock issues on private lands. We supplemented interviews with data from other sources, including agency websites, reports, and both gray and scientific literature.

Wolves and Wolf Management in Wyoming

The U.S. Fish and Wildlife Service (USFWS) reintroduced 31 wolves to the Wyoming portion of Yellowstone National Park in 1995 and 1996 following their extirpation from Wyoming early in the 20th century. At that time, wolves were federally listed as endangered under the federal Endangered Species Act (ESA 1973) and were managed under the jurisdiction of the USFWS. In the years that followed, wolf populations grew and expanded throughout northwest Wyoming. The state met federal recovery goals of at least 150 individuals and 15 breeding pairs (a pair of wolves that produces at least two pups) in 2002. In 2003, the USFWS reclassified gray wolves in most states as threatened rather than endangered. On two different occasions between 2008 and 2017, wolves in Wyoming were delisted from the federal Endangered Species Act (2008, 2012) and then relisted again (2008, 2014), causing management authority to shift back and forth between the USFWS and the state. Since 2002, populations have remained above the minimum delisting criteria but have fluctuated, concurrent with the shifts in management policy related to Endangered Species Act delisting and relisting (WGFD 2022).

In 2017, the U.S. District Court of Appeals ruled in favor of state-level delisting, and Wyoming again assumed management of wolf populations (WGFD 2022). Per the USFWS recovery criteria, Wyoming, Montana, and Idaho must meet a combined minimum of 450 wolves across the Northern Rocky Mountains wolf populations. This goal is spread equally across the three states, each required to maintain a population of at least 150 wolves and 15 breeding pairs yearly. The requirements for maintaining Wyoming's minimum wolf population are further split geographically,

Table 5.1—Summary of wolf and livestock statuses for the Shoshone National Forest (SNF), Wyoming

Fast fact	SNF data
Estimated year first resident wolf pack reestablished in Wyoming	About 1996, immediately after reintroduction in Yellowstone National Park
Estimated year first resident wolf pack reestablished on the SNF	About 1996, immediately after reintroduction of in Yellowstone National Park
Estimated wolf population in Wyoming, 2021	At least 314 wolves and 40 packs (WGFD 2022)
Estimated wolf population on the SNF, 2021	12–14 packs, 72–112 wolves ^{a, b}
Number of permittees with active grazing permits on the SNF, FY 2022	61 ^c
Number of grazing allotments on the SNF, FY 2022	92 active, 2 vacant ^c
Number of permitted cattle (and HM), FY 2022	Cows with nursing calves: 35,119 (89,726 HM) ^c Mature cows with no calf: 77 (225 HM) ^c Yearlings (9–18 months): 9,512 (28,097 HM) ^c Bulls: 116 (251 HM) ^c
Number of permitted sheep (and HM), FY 2022	Ewes with lambs: 2,300 (2,004 HM) ^c
Number of permitted horses or mules (and HM), FY 2022	572 (2,012 HM) ^c
Estimated number of allotments on the SNF where wolves were present, 2020	Most allotments in northern portions of the SNF, very few in Washakie Ranger District ^a
Estimated impacts of wolves on the SNF, 2020	40–50 permittees graze on allotments where wolves are present; approximately 25 have experienced predation or actively manage for wolves (estimation by SNF employees) ^{a, d}

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a Data source: 2021 case study interviews.

^b Wyoming Game and Fish Department monitoring data from 2022 suggests 16 to 17 packs overlapping with SNF.

^c Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

^d Data source: survey respondents corroborated where possible through interviews. Numbers have not been independently verified and may vary over time.

with at least 50 wolves residing within Yellowstone National Park and the Wind River Range and at least 100 residing outside in a region managed by the WGFD called the Wolf Trophy Game Management Area (WTGMA). These limits reflect the USFWS recovery goals and, in the words of the Wyoming Game and Fish Commission, ensure that “genetic diversity and connectivity issues do not threaten the population.”¹

The management areas described above reflect the range of management authorities and agencies associated with wolf management in Wyoming, including the WGFD, the Shoshone and Arapaho Tribal Fish and Game Department of the Wind River Indian Reservation, the USFWS, and the National Park Service (fig. 5.2). Because different managing authorities have different management jurisdictions and priorities, wolves have different management designations based on where they reside in the state. One

set of management areas includes those overseen by the WGFD. Informed by policies and recommendations set by the Wyoming Game and Fish Commission, the WGFD is charged with managing and monitoring wolves according to state statute in areas outlined in the Wyoming Gray Wolf Management Plan, which the USFWS approved in 2012. These areas include the WTGMA and the Seasonal Wolf Trophy Game Management Area (SWTGMA) (WGFD 2022).

Wolves in the WTGMA are managed as trophy game animals with a designated season for public hunting in 13 different hunt areas. This designation means that legal take of wolves by members of the public in the WTGMA can only be done by licensed hunters during the hunting season, through a “legal take permit,” or in situations involving self-defense or damage to private property. The SWTGMA functions as an additional hunt area but one in which wolves have different management designations based on the time of year. Between October 15 and the end of February,

¹ 040-21 Wyo. Code R. § 21-5. Monitoring gray wolves.

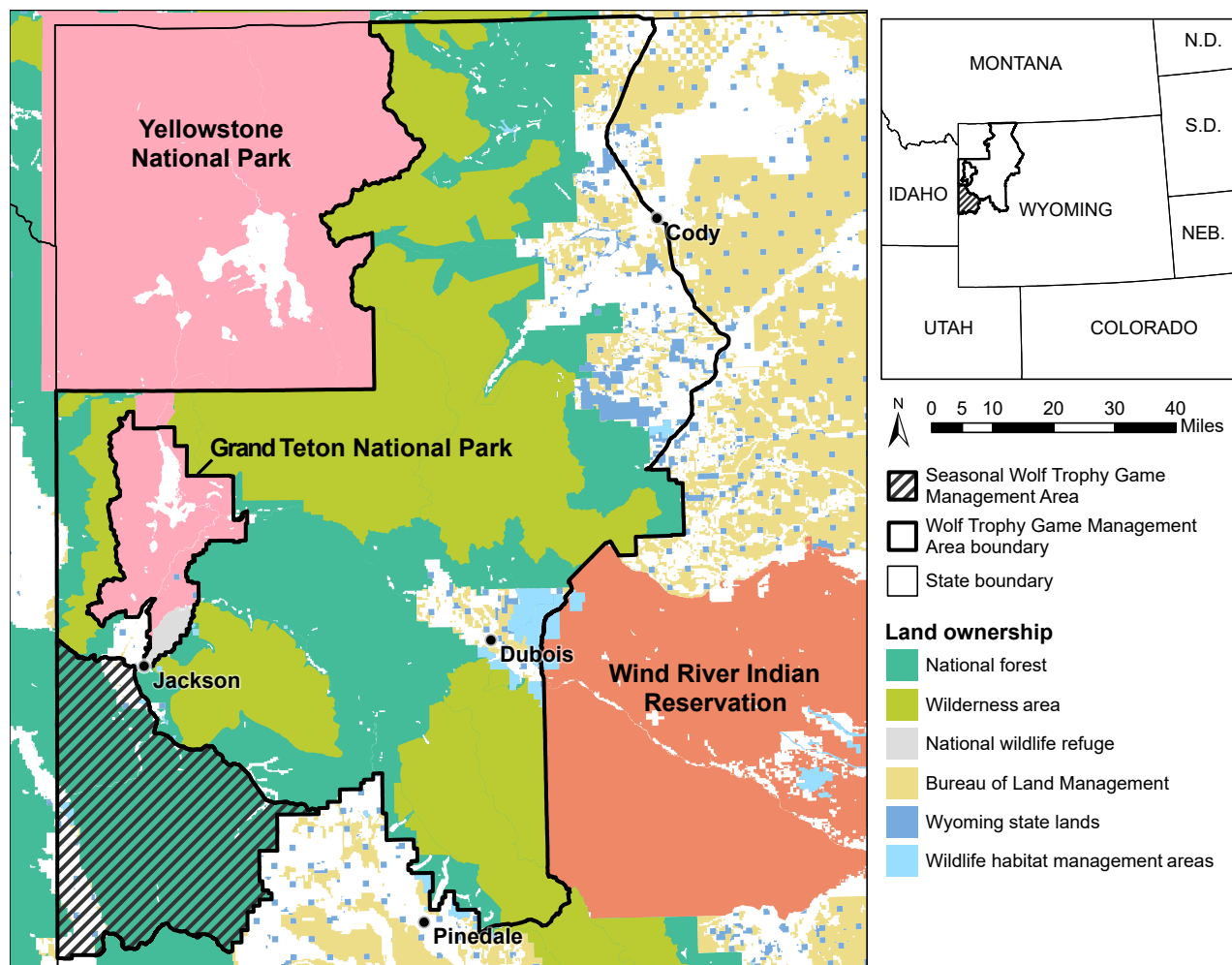


Figure 5.2—Wyoming wolf management areas. Source: Wyoming Game and Fish Commission (2011).

wolves are managed as trophy game species with similar stipulations as those in the WTGMA; from March 1 to October 14, wolves in the SWTGMA are managed as a predatory species and can be killed in any legal manner. The WGFD set a mortality limit of 47 wolves for the 2021 season, during which, a total of 30 wolves were killed in the 14 hunt areas managed by WGFD. This total includes 28 wolves killed legally and 2 killed illegally (WGFD 2022).

The National Park Service manages wolves when they reside within Wyoming's two national parks, Yellowstone and Grand Teton. Hunting is not permitted within these areas. The USFWS manages wolf populations active in the National Elk Refuge, a wildlife refuge near Grand Teton National Park.

The Shoshone and Arapaho Fish and Game Department in cooperation with the USFWS manage wolves on the Wind River Reservation as a trophy species. The Wolf Management Plan for the Wind River Indian Reservation

(Eastern Shoshone and Northern Arapaho Tribes and Shoshone and Arapaho Tribal Fish and Game Department 2007) allows for the management of a hunting season wherein hunters and trappers require a tribe-sanctioned permit. Wolves are designated as a predatory species year-round in the Predatory Animal Area, which refers to areas outside of the WTGMA, SWTGMA, Wind River Indian Reservation, National Elk Refuge, and National Park Service lands. Predatory status means that wolves can be harvested at any time; individuals who kill a wolf must report it to the WGFD within 10 days.

In addition to managing wolves through hunting, Wyoming has legal allowances for lethal control of gray wolf populations under certain conditions in the WTGMA. Although wolves in the WTGMA and the SWTGMA between October 15th and the last day of February can only be taken with a hunting license, there are two exceptions. First, if landowners witness gray wolves damaging

private property, the wolves can be immediately killed.² Owners must leave the carcass of the gray wolf at the kill site and notify personnel at the regional WGFD office within 72 hours. Second, if owners find that gray wolves have “harassed, injured, maimed or killed livestock or domesticated animals, or are occupying a chronic wolf predation area,” they may notify WGFD and secure either a “lethal take permit” to hunt the wolves or instigate the removal of the “offending” wolf or wolves by WGFD or U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) personnel following agency protocols.³ Lethal take permits allow for the legal killing of up to two gray wolves with firearms within the permit’s specified geography. Beyond conflicts with livestock, wolves may be lethally removed if the WGFD determines that they are unacceptably affecting wild ungulate populations. In 2021, WGFD reported that 17 wolves were killed for conflict control measures (WGFD 2022).

Wyoming also has a robust conflict compensation program. Landowners and individuals with property damage (e.g., to a dog or livestock) can receive compensation for wolf-related incidents through several different avenues. Landowners who experience confirmed livestock-wolf conflicts in the WTGMA and SWTGMA are eligible for damage payments through the WGFD. Compensation formulas differ depending on the type and age of livestock or property affected and the nature of the damages. Producers with confirmed wolf-related predation on sheep or calves can receive up to seven times the value of each affected individual in compensation, depending on how many other calves or sheep they are missing. They can also be compensated at full market value for verified kills of individual yearlings or adult livestock. Veterinary costs for individual livestock injured but not killed by wolves are also eligible for damage compensation, as are more general damage claims related to property (e.g., fences) (see WGFD 2022). Producers seeking compensation for damages accrued in the Predatory Animal Area are not eligible for compensation through the WGFD program unless their property borders the WTGMA. However, some nongovernmental

organizations, such as Defenders of Wildlife, previously compensated producers in this area in exchange for adopting nonlethal mitigation strategies.

Population monitoring of wolves in Wyoming is the responsibility of the WGFD, except on the Wind River Indian Reservation and in Yellowstone National Park. WGFD uses a dual approach and tracks both the number of individual wolves and breeding pairs within the WTGMA. Outside of this area, wolves are either considered predatory species and are not actively monitored or are within the jurisdictional authority of the Wind River Indian Reservation or the National Parks Service. Data collected through tracking devices (including radio collars), counting wolves during capture operations, telemetry, observations made by qualified personnel, and camera traps inform population reporting from the WTGMA. In 2021, the WGFD captured and collared 56 wolves as part of monitoring efforts. The state also mandates reporting of all wolves killed by the public. Figure 5.3 shows wolf mortality in the WTGMA since 2008, indicating that public hunting has reduced the occurrence of lethal removals (WGFD 2022).

In 2021, Wyoming had at least 314 wolves and 40 packs statewide (including at least 23 breeding pairs), concentrated largely in the northwestern corner of the state. Wolves are spread across the state’s multiple management regions, with at least 161 wolves (at least 24 packs and 14 breeding pairs) in the WTGMA, at least 97 wolves (at least 3 packs and 6 breeding pairs) in Yellowstone National Park, at least 17 wolves (at least 3 packs and 2 breeding pairs) in the Wind River Indian Reservation, and at least 39 wolves (at least 5 packs and 1 breeding pair) in the region of the state where wolves are designated as predatory animals (WGFD 2022).

Wolf-Livestock Conflict in Wyoming

Wolf-livestock conflict, or more specifically, predation or injury of livestock by wolves, has been a persistent management feature of both public and privately held rangelands in Wyoming since the wolf’s return to the region in the 1990s. Since 2008, the number of conflicts has varied year to year, with a peak of 188 individual domestic animals killed or injured by wolves in 2016 (WGFD 2022: 21). While no single pattern can perfectly explain wolf-livestock conflict dynamics across the state, the numbers highlighted in figure 5.4 correspond with several observations made by our interviewees. For example, “picture a yo-yo,” noted one interviewee referring to the oscillations in wolf-livestock

² The State of Wyoming Statute §23-3-115(c). Taking black bear, mountain lion, gray wolf, bobcat, weasel, badger, squirrels or muskrat for damaging property. <https://wyoleg.gov/statutes/compress/title23.pdf>.

³ 040-21 Wyo. Code R. § 21-6. Lethal control of gray wolves designated as trophy game animals.

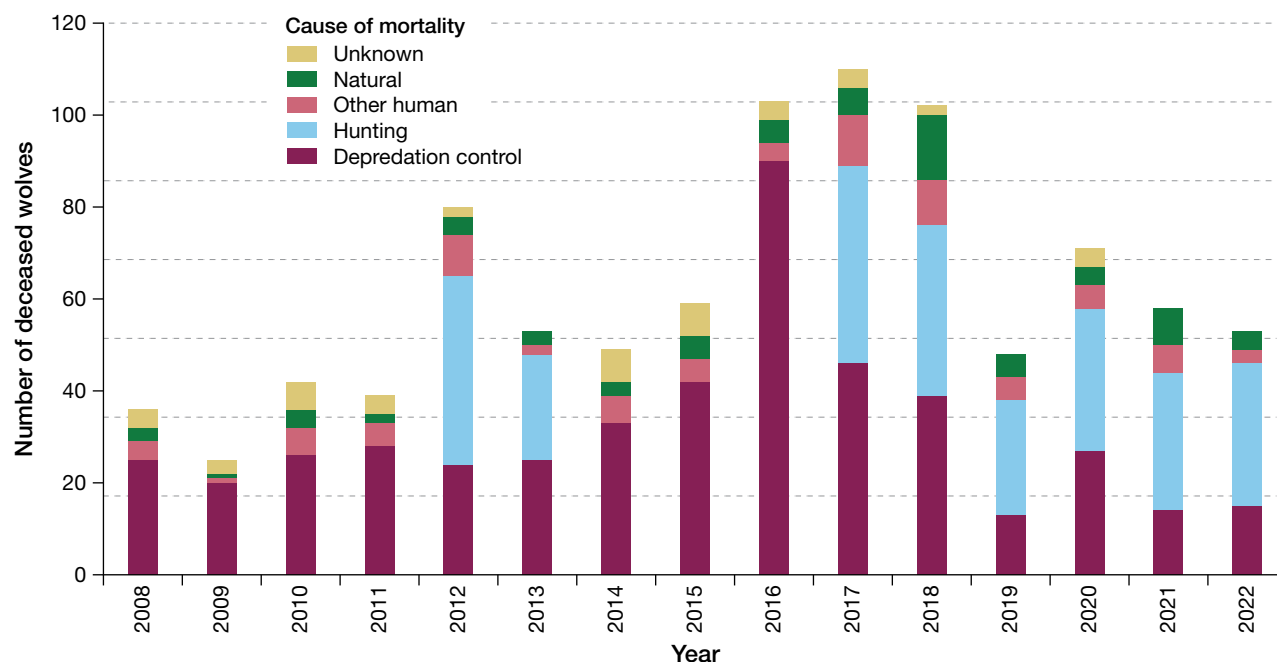


Figure 5.3—Causes of wolf mortality in the state of Wyoming's Wolf Trophy Game Management Area, 2008 to 2022. Courtesy of Ken Mills.

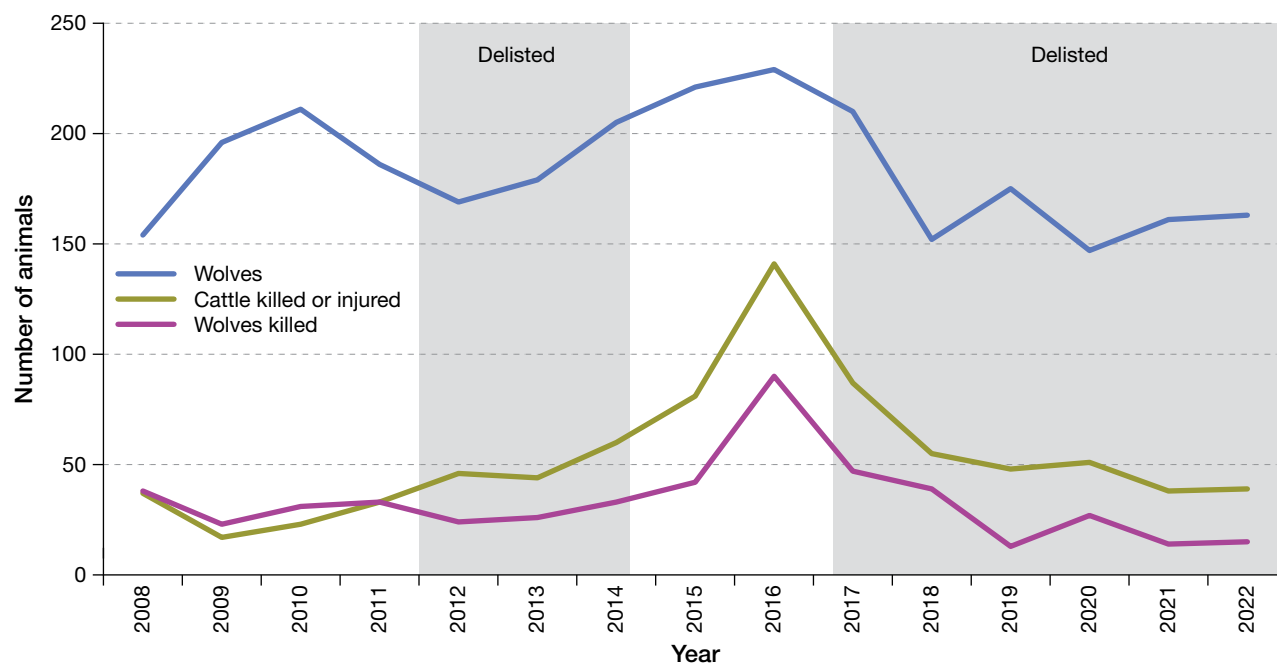


Figure 5.4—Wolf population numbers in Wyoming's Wolf Trophy Game Management Area, 2008–2021, in relation to wolf-cattle conflicts (confirmed instances of wolf-caused death or injury of cattle) and wolves killed. Periods in which wolves were delisted from the federal Endangered Species Act are shaded in gray. Source: Mills (2022), see also WGFD (2022: 21).

conflict and wolf populations and their correspondence to management policies and, more specifically, to periods of delisting and relisting. In years following federal protection and relisting, wolf populations have increased, roughly in line with an increase in conflict (specifically with sheep in 2008 and with cattle and sheep in 2014). Periods associated

with state-led management have corresponded with downward shifts in population, though always above relisting levels, with a notable downslope in conflict since 2017. In 2021, wolves across Wyoming were confirmed as the cause of death or injury for 109 head of livestock, including 50 cattle, 50 sheep, 5 livestock guardian dogs, and 1 horse.

Of the 40 packs documented in Wyoming in 2021, 19 were involved in at least one livestock conflict.

From a social perspective, interviewees noted that wolves and wolf management have been a lightning rod issue for residents in Wyoming since their reintroduction to Yellowstone in the mid-1990s. For wolf conservation advocates, the state played and continues to play a key role in the wolf's return to the region. However, another important dynamic raised by one Forest Service employee relates to the economic identity of the state. Wyoming is an "agriculture and outdoor state" that "tends to be oriented strongly (on)... livestock production." Negative attitudes toward wolves were particularly apparent in some of the rural communities with strong ties to the livestock industry. As one interviewee recalled, "There was a lot of pushback...when wolves were originally introduced...a lot of unknowns, a lot of fear."

At the same time, interviewees noted key differences in social perceptions across the broader Greater Yellowstone region. For example, one interviewee emphasized an important difference between the eastern side of the Greater Yellowstone (and the SNF) and the western or "Jackson side" of the region, an area long associated with both conservation advocacy and extreme wealth (Farrell 2020, Righter 2008), as well as more outspoken prowolf sentiment.

Wyoming has gone farther than others in developing novel strategies for management, which includes designating areas with no lethal control, areas with public hunting and management, and a large portion of the state where wolves are considered predators. In the eyes of some interviewees, this has given the state a more grassroots approach to managing conflict—state-led management and the public hunting opportunities associated with it are seen as a source of "increased tolerance." As one interviewee described, public hunting gave some communities in Wyoming a sense of local control:

A lot of it was the local control issue. I think hunting certainly had a part of that because that feeds into the local control. What can I do? This is what I can do type thing... It's like, 'Yay, we can hunt. Now, I can tolerate wolves.'

Similarly, several interviewees explained that the state's wolf management specialist, a position hosted in the WGFD, was an important contribution to improved social relations across the state, and especially between the WGFD and local producers.

Important criticisms have been raised, however, about the inclusivity of Wyoming's approach to wolf management. For example, according to Watters et al. (2014), members from the Eastern Shoshone and Northern Arapaho Tribes from the Wind River Indian Reservation have felt they have not had an adequate opportunity to participate in federal and state decision-making. Furthermore, the regular killing of charismatic and well-known Yellowstone National Park wolves has repeatedly raised concerns among wolf advocates, including members of the scientific and environmental communities, about the effects of public hunting outside the park on wolf pack dynamics within park borders (Williams 2012).

Ultimately, while interviewees shared a perspective that the hyperpolarization of the wolf's initial return had subsided, at least somewhat, several respondents emphasized that a more diverse set of voices characterize contemporary influences on management. As one Forest Service employee observed, wolf management in Wyoming may not be possible "without conflict." However, it is also "not just the producers anymore," they noted. Recreational use has grown substantially throughout the state, "especially...with [the] COVID [19 pandemic], the forest use was just incredible." This has raised, at least for federal forest managers, new questions that transcend anti- and prowolf sentiment: "It's not protecting producers or protecting wolves, but it's finding out how do we manage this landscape use at much larger levels."

Wolves and Wolf-Livestock Conflict on the Shoshone National Forest

Following their initial reintroduction into Yellowstone in 1995 and 1996, wolves expanded rapidly into surrounding National Forest System lands, including the SNF, through "natural dispersal," according to our interviewees. Forest Service interview participants estimated that 16–17 packs are currently active on the SNF, with pack sizes generally ranging from 6 to 8 animals for a total between 72 and 112 wolves in and around the forest at any one time (fig. 5.5). The WGFD is responsible for wolf population monitoring on the SNF. Interviewees noted that, with the exception of the forest's most southern portions (in the southern Wind River Range), all of the "suitable habitat has been filled" by wolves.

As described above, wolves on the SNF are under the management authority of WGFD. Most of the SNF lies within the WTGMA, meaning wolf populations are managed there

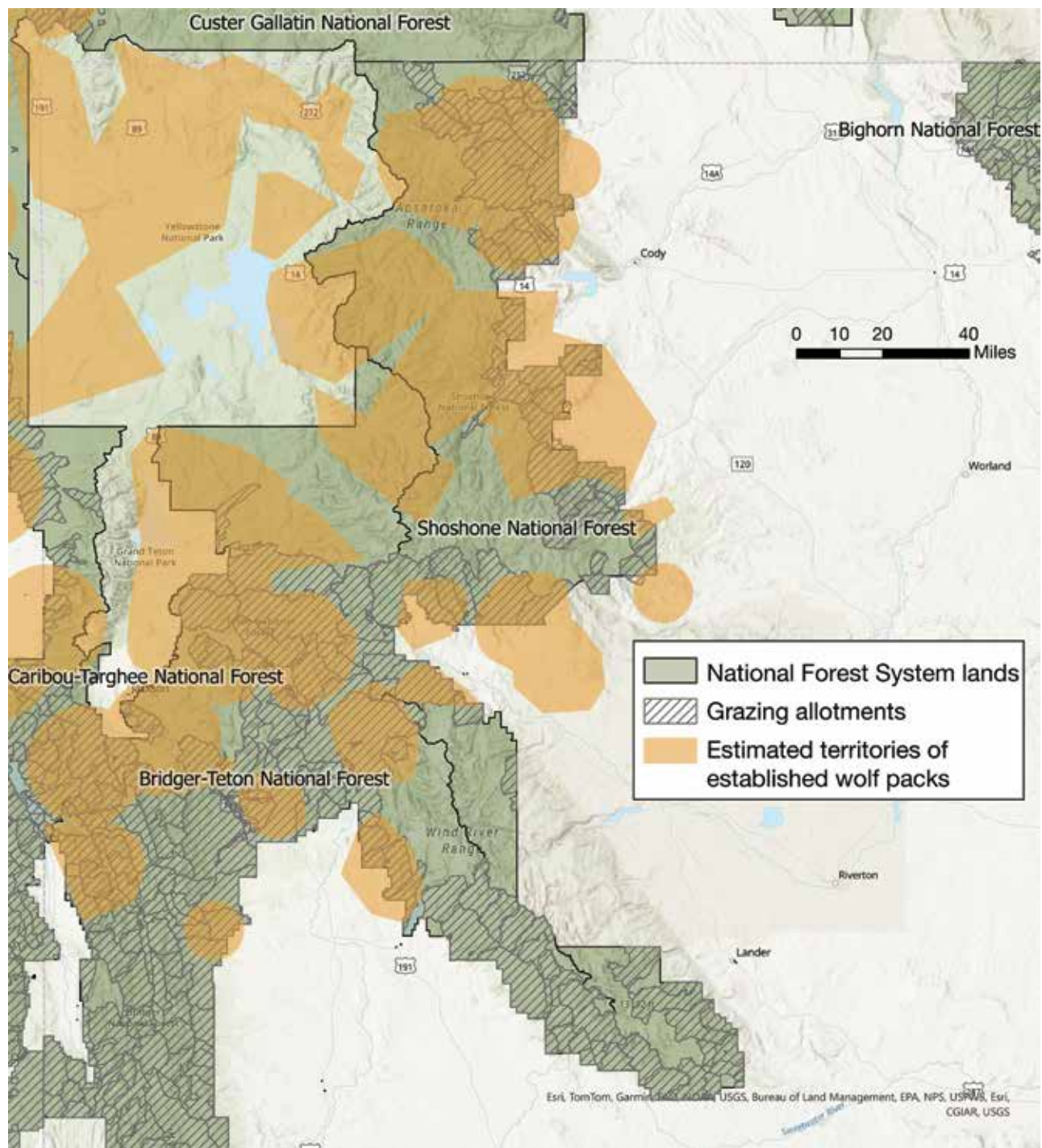


Figure 5.5—Estimated wolf pack territories on the Shoshone National Forest and neighboring areas, overlaid on U.S. Department of Agriculture, Forest Service grazing allotments. Pack territories represent the minimum known groups of wolves at the time of the monitoring effort and are likely to vary from year to year. Map by Robert Anderson. Source: WGFD (2023).

accordingly, and hunting is allowed during the open season. Interviewees noted that currently, conflicts between wolves and livestock on the SNF are on a “downslope” or moving toward a “steady state,” consistent with statewide trends.

Respondents noted multiple factors as contributing to conflict dynamics in the region. Geographically, several

emphasized that conflict between wolves and livestock occurred in “hot spots” where good open range for livestock overlaps with wolf habitat, and more specifically, in several key drainages near the borders of Yellowstone National Park and along the Absaroka Front. According to interviewees, hot spots also overlap with territories for

denning and rendezvous, areas widely acknowledged as conflict zones. Respondents noted that cow/calf operators suffer more significant losses than those who run yearlings, partly because calves are so much more vulnerable to predators. As noted earlier, there are no longer many sheep operators on the SNF (only two in 2020, according to interviewees).

Interviewees also noted several important points about the temporality of conflicts. For example, conflicts in and around the SNF begin in late March and peak in August, decreasing again in late autumn. In spring, conflicts occur mostly on private lands, where many producers calve. Conflicts on national forest allotments are more prominent in summer months after producers have turned out livestock to higher elevation pastures that overlap with wolf territories, before returning to private land in September or October. Over several years, conflicts often appear to follow a relatively predictable “cycle,” according to some interview participants. Individual wolves that are frequent depredators are typically removed, but if this doesn’t work, then entire packs may be removed for 1 year, temporarily reducing predations. However, a new pack often recolonizes the area 1 or 2 years later, starting the cycle again. One interviewee suggested that conflict occurs more often with large operators because they have the most livestock on their allotments, meaning more opportunity for geographic overlap with wolf territories.

From the standpoint of social conflict in and around the SNF, multiple interviewees noted periods of federal control as being especially tense. Social attitudes were “very negative,” and included instances of wolf poaching, according to one Forest Service employee. Another interviewee from the WGFD recalled that when the wolves’ returned to SNF, “It was shoot, shovel, and shut up. There was a lot of that that went on. Wolves that you would collar on one day; within two weeks, somebody had already poached ‘em.”

Some interviewees attributed these negative attitudes to perceptions about how wolves affect elk and livestock, including interactions between all three. “A lotta people just have the idea that anything that eats an ungulate is not good,” explained one interviewee, who went on to explain how increased pressure from wolves on elk has been a source of tension for the region’s outfitting communities who use the SNF and surrounding wildlands for professionally organized hunting trips. Furthermore, interviewees stressed that in the fall, elk

migrations draw wolves into valley bottoms where livestock tend to concentrate, thus increasing the potential for wolf-livestock interactions, especially on private lands. Shifting elk populations can also cause challenges for local producers where ungulates compete with livestock for forage or contribute to the spread of diseases such as brucellosis. However, interviewees emphasized that conflicts between wolves and livestock are most often associated with a handful of permittees (five or six ranch owners) whose private land and ranch operations are located near the SNF and include associated public forest grazing allotments.

According to interviewees, social tensions in and around the SNF continue to oscillate around the efficacy of predator management, with wolves sustaining a level of polarity for local communities: “There’s not a lot of middle ground opinion,” noted one interviewee. However, interviewees emphasized that since the return of state-led management in 2017, there have been shifts in the level of social conflict from earlier years: “it’s changing” and “improving,” explained one Forest Service staff member. Observations of social conflict at the state-level were also noted as relevant for attitudes in and around the SNF. As one Forest Service employee noted, “things changed a little bit” when wolves became a game animal (meaning delisted and under state management). “If you don’t like wolves, you take your rifle, and you go huntin’ in a legal season.” At the same time, though representatives from the livestock and outfitting communities have tended “to be the dominant voices” in the region, the landscape of stakeholders has also “gotten broader,” much like social dynamics across Wyoming more generally. For example, wildlife enthusiasts now have a stronger presence. As one local WGFD employee noted, “I see people when I’m up tracking wolves that are out to see them and take pictures of them and stuff like that that you used to never see.”

Approaches to Managing Wolf-Livestock Conflict on the Shoshone National Forest

A variety of tools for wolf-livestock conflict management are being used on the SNF (table 5.2). Lethal control was the most cited strategy by interviewees, or the “tool that’s being leaned on heavily” to mitigate conflicts between livestock and wolves for the SNF and its surrounding private lands. As one interviewee noted:

Table 5.2—Approaches for managing wolf-livestock conflict used on the Shoshone National Forest

Approach	Implementor(s)	Perceived effectiveness among interviewees
Lethal removal	WTGMAs: landowners with permits, WGFD, APHIS Predatory animal area: Landowners/residents year-round without permits	Perceived as being the most effective strategy, particularly when an agency uses targeted removal, but it is perceived as only a temporary solution.
Public hunting	WTGMAs: members of the public (managed by WGFD)	Particularly useful for improving social relations within communities who want more “local control”.
Monitoring wolf populations and sharing location data with permittees and agencies	WGFD	Helps permittees avoid wolves; helps agencies target removal of depredating animals.
Management flexibility on grazing allotments	Shoshone National Forest managers and permittees	Mixed effectiveness, a temporary solution, may entail negative tradeoffs for permittee.
Range riding	Permittees and those they hire	Mainly effective for reconnaissance purposes such as finding livestock kills.
Compensation programs for wolf-killed livestock	Wyoming state programs	Effective for reducing social tension and building wolf tolerance.

APHIS = U.S. Department of Agriculture, Animal and Plant Health Inspection Service; WGFD = Wyoming Game and Fish Department; WTGMA = Wolf Trophy Game Management Area.

I applaud people for trying to figure out different ways to do things, but the bottom line is, in the real world, the only thing that really works is just to remove wolves when they get into conflict.

Lethal control in Wyoming can refer to landowners legally removing wolves with permits within the WTGMA, or as predator control within the Predatory Animal Area. But the strategic and targeted removal of individuals or packs by WGFD—and by extension, WS, which often conducts lethal removal on behalf of WGFD—was described as the most effective approach. Importantly, several interviewees emphasized that the social lives of wolves are complex. Effective lethal control requires a sophisticated understanding of pack dynamics to remove select individuals or packs that will best reduce damage to livestock. Limitations of lethal control were also noted, as removal is ultimately, in the eyes of interviewees, only a temporary solution because wolves repopulate or recolonize suitable habitat.

Apart from lethal removal of wolves, interviewees cited monitoring of wolf populations via collar data and use of trail cameras to provide permittees with information about wolf locations so they could employ avoidance strategies as helpful for reducing conflict. Interviewees also described how having access to collar data provided a valuable benefit for local landowners and enhanced WGFD efforts for more targeted removal by enabling them to identify and locate depredating individuals or packs. Compensation programs

were also noted by interviewees as contributions to the region’s conflict reduction approach. Calving outside of wolf territories, switching operations to yearlings only, and running more “aggressive” cattle breeds such as Salers as opposed to Black Angus were all noted strategies for conflict reduction offered by interview participants. Prompt removal and disposal of livestock carcasses when predations do occur were also said to be important.

Some local livestock producers have adopted nonlethal deterrence strategies such as range riding, fladry, noise-makers, and electric fences, though with varying degrees of success and several noted limitations. Interviewees emphasized that strategies that required extensive materials, such as fladry or fencing, were most appropriate to smaller acreages and private land contexts. In this way, the nature of national forest allotments limits the usefulness of many nonlethal deterrents. As one interviewee from the Forest Service noted,

When they turn out on the forest, it’s really a different situation. It’s a much less controlled environment. A lot of these allotments, they’re big, they’re rugged, the cattle might be well dispersed. It’s just more difficult to manage closely than it would be when they’re all down on the hay fields at the home place.

Another interviewee underscored the point this way:

I'd like a lot of the ideas that people come up with to try and mitigate depredation issues, but as far as real-world applications and the reality of them, most of them are just a feelgood thing for people. They just don't work in a working ranch application. We got guys that are calving right now in 5,000-acre pastures. They're calving 3,000 head of cows. You can't have those cows in a pasture that's ringed with turbo fladry and expect that to be a realistic thing... If people want to put stuff in a nice little box and say, well, if you only do this, then wolves won't attack your livestock... In a perfect world it would be, but it just—we just don't live in that situation.

Interviewees also noted ecological challenges associated with some nonlethal approaches. For example, fencing initiatives aimed at deterring predators can negatively affect other migratory animals such as elk and deer.

Interviewees noted that range riding was used on SNF allotments with some effect but was not viewed as a “silver bullet” for conflict reduction. Cited challenges to range rider effectiveness included the large size of allotments and the cost and labor-intensive nature of the practice. Additionally, the timing of conflicts posed a challenge to range riders. As one interviewee lamented,

Unless they're gonna be out there riding with those cattle all night and be a presence, most of our depredations happen at night or first thing in the morning. What are you going to do? You're not going to have people out there riding around all night. Even if you do, so say you're in this 10,000-acre pasture and you got one group of 200 head of cows that are over here, and another group of 400 [that are] 4 miles away. How do you determine—it's just a shot in the dark of whether or not you're gonna be at the right group of cattle in the right place at the right time.

Other interviewees observed that the financial costs and increased labor requirements associated with practices like range riding make this strategy viable only for operators with the financial resources to take on the extra labor. For most other producers, “It's just an impossibility to hire enough riders to make a big difference.” Instead, “the biggest thing we would see here with hiring more riders is that they would probably find more kills.” This point

underscores a frequently shared opinion amongst interviewees—rather than a strategy for reducing predation, range riding should be considered a reconnaissance technique, perhaps most useful for rapidly identifying verifiable kills for compensation. It can be otherwise challenging to demonstrate that a kill is the result of wolf predation versus some other cause.

Lastly, the state's compensation program was another noted factor in improving social tensions among the region's livestock operators. Although it may not be changing producers' attitudes toward wolves, several interviewees suggested that it helped build tolerance for wolves' presence and ease social tensions between producers and WGFD by conveying a sense of empathy and responsiveness. However, interviewees raised concerns about compensation's role in disincentivizing more active conflict reduction strategies. Compensation programs are also not available for outfitter-guides whose businesses revolve around elk and deer hunting and who are concerned about wolves reducing populations of these prey species.

With respect to the role of the SNF and its range management program, interviewees emphasized that flexibility—being able to “change things as soon as possible...whether you need to move the cattle or remove some wolves”—supported conflict reduction on public allotments. Examples of this type of flexibility included resting allotments or pastures with high conflict potential and approving cow camp locations that allow for greater human presence, which is believed to deter wolves. However, taking nonuse or resting allotments may mean that producers must find alternate summer pastures on private lands, which may be in short supply or cost more to lease. In addition to nonuse, our survey found that delayed turnout onto allotments, changing allotments to avoid wolves, and changing the timing or order of pasture rotations to avoid wolves were management strategies that had been tried on the SNF, with mixed effectiveness. Importantly, however, these tended to be viewed as temporary solutions.

Apart from management flexibility on allotments, the Forest Service managers we interviewed generally felt that they had a more minor role to play in wolf-livestock conflict management compared with other management agencies and stakeholder groups. “To me it often feels like we're a little bit on the sidelines with this issue. I feel like other agencies are much more directly involved,” described one Forest Service employee. Although staff from the Forest

Service periodically meet with managers from WGFD and WS to discuss issues related to wolves on the forest, interviewees explained that WGFD is the primary management decision-maker. Forest Service managers may be informed if lethal removal occurs on the SNF, but they are rarely consulted. In this way, the relationship between WGFD and the SNF revolves around information sharing, as opposed to decision-making. Non-SNF interviewees characterized the SNF as accommodating of WGFD management decisions and actions. At the same time, they found the SNF as accommodating of permittees, providing them with the management flexibility needed in the allotment management plan and annual operating instructions, to the extent possible, to respond to wolf conflicts.

Summary and Key Findings

The return of the wolf to the SNF and surrounding Greater Yellowstone Ecosystem was a celebrated story of conservation success. However, the oscillation of Wyoming state policy over time, and the uncertainty it has brought to managing wolf-livestock interactions, has been a significant source of social tension for rural communities in northwestern Wyoming, especially for those invested in the region's agricultural and outfitting-guide industries. At the same time, now multiple decades into wolf restoration, interviewees with agency backgrounds were largely united in the sense that conflict and conflict management have declined and reached a level of stability or "steady state," especially with respect to the number of negative wolf-livestock interactions. Our case study participants attribute much of this trajectory to Wyoming's jurisdictional landscape and its varied management areas (WTGMA, Predatory Animal Area, etc.), which offer a level of management customization in addition to an outsized role for lethal control by the state and through public hunting in reducing negative wolf-livestock interactions. Also particular to Wyoming is the state's heavy emphasis on close monitoring, which enables WGFD to maintain wolf numbers at near recovery levels. In contrast, Montana and Idaho have seen greater increases in wolf numbers. This, and support for state-led wolf management among Wyoming's agricultural communities, ultimately supports the perception expressed by multiple interviewees that Wyoming has achieved "sustainable management."

Furthermore, to the extent that Wyoming has reached a set of strategies for management that "works," interviewees also acknowledge important limitations with respect to wolf conservation and tolerance. "We're never gonna please everybody," noted one WGFD employee. Other specific challenges included adoption of nonlethal measures by local producers. As one interviewee noted, there is "lots of stuff available" for landowner use, "but we don't have a lot of participation from the livestock owners to actually implement those, and that's really where the line comes in." This type of comment also speaks to a broader challenge noted by interviewees related to the limitations of Forest Service programs to influence wolf-livestock dynamics—many of the activities most centrally related to conflict reduction (i.e. lethal control, nonlethal tool adoption) are outside of the direct purview of Forest Service managers, and in the latter case, have limited usefulness on Forest Service grazing allotments. Furthermore, interviewees acknowledged structural constraints, as "reductions" and "consolidations" in funding have "hobbled" the agency and reduced capacity or "manpower." In this sense, the approach to conflict for Wyoming, and in particular on the SNF, must also be understood within a broader national context influencing resource management in the region and on federal lands. As one interviewee noted, the Forest Service is ultimately "constrained by bureaucratic issues that occur several times zones away."

Nevertheless, interviewees shared multiple lessons Wyoming and the SNF can offer for wolf-livestock conflict mitigation. First, multiple interviewees emphasized the importance of effective communication among the various resource management agencies (e.g., Forest Service; U.S. Department of the Interior, Bureau of Land Management; WGFD; WS), as well as among agency personnel and members of the local public (including landowners affected by wolf-livestock conflict). For interviewees, the sentiment that "communication is key" reflected how Forest Service managers could gain much by both "actively" listening and making "sure everybody's on the same page"—i.e., that communication is critical to working cooperatively with other agencies and managing different agency roles and responsibilities. Part of this process is making sure that both agency employees and members of the public understand different agency roles and responsibilities. This helps Forest

Service employees “stay in their lane,” and members of the public know what Forest Service managers can and can not do to help resolve conflict. Relatedly, taking time and spending effort to build relationships was a noted dimension of successful management. For several interviewees, this included spending dedicated time working closely with permittees and rural landowners affected by wolves. One interviewee pointed out that WGFD’s capacity to bring extra personnel to conflict management—the agency has a department section that specializes in large carnivores—enables effective management response, communicates to producers that WGFD is investing resources in managing wolves to help minimize conflict, and “builds tolerance.” Lastly, interviewees said that an important step toward reducing conflict was to depoliticize the presence and management of wolves, making them a “normal” part of the landscape, while acknowledging that wolf management is inherently challenging. As one Forest Service employee explained, “It might get worse before it gets better...but it’s gonna work out” given enough time.

Chapter 6: Wallowa-Whitman National Forest, Oregon

Introduction

The Wallowa-Whitman National Forest (WWNF) covers more than 2.4 million acres in northeastern Oregon, spanning portions of Wallowa, Union, Baker, and Grant Counties, and includes the east side of the Elkhorn Mountains and the Wallowa Mountains (fig. 6.1). The WWNF includes the U.S. Department of Agriculture, Forest Service La Grande and Whitman Ranger Districts and the Wallowa Mountains Office, which administers the Eagle Cap and Wallowa Valley Ranger Districts and the Hells Canyon National Recreation Area that spans the Oregon-Idaho border. The western portion of the WWNF is contiguous with both the Umatilla National Forest to the north and west, and the Malheur National Forest to the southwest. The WWNF is characterized by steep, rugged terrain, with elevations ranging from 875 to 9,845 feet. The forest

includes areas with a wide range of precipitation levels and significant variation in ecosystem types, including dense forests and open shrublands and grasslands (USDA FS, n.d.f). The WWNF supports high levels of biological diversity, including many listed endangered species, and was described by one interviewee as “a very intact [ecological] community.” Residents describe the region as remote and isolated from the surrounding world, even more so than other parts of the rural American West. One livestock producer that we interviewed described the WWNF as “a fortress” and characterized local residents as having an attitude of “let’s keep the rest of the world at arm’s length.”

The human population of the area surrounding the WWNF is growing but much more slowly than in many other areas of the rural American West. Wallowa, Union, and Baker Counties (where the WWNF is primarily located)

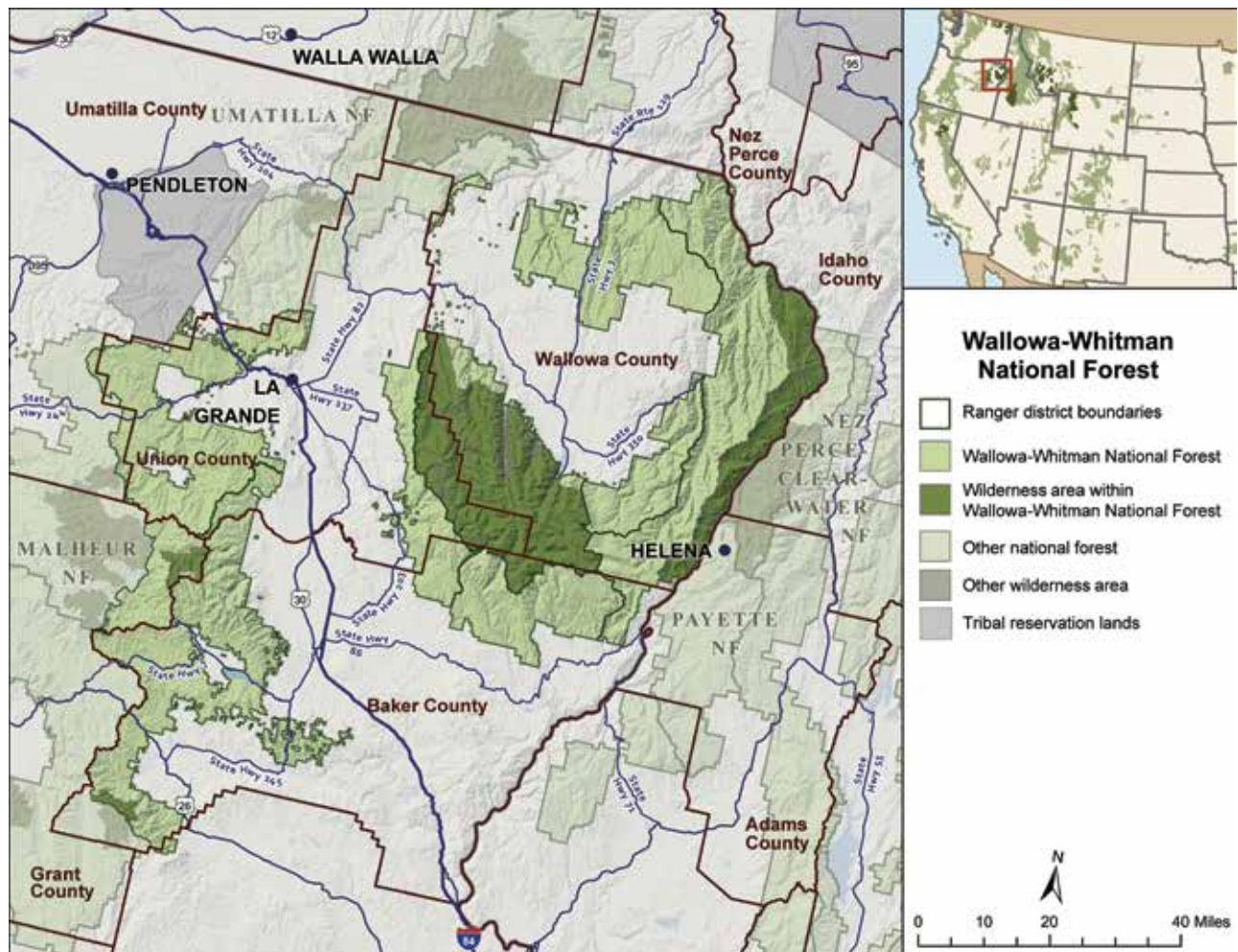


Figure 6.1—Wallowa-Whitman National Forest, Oregon. Map by Abigail Kaminski.

saw only a 22.4 percent increase in population over the period of 1970–2020, compared to 61.7 percent in the United States. Over the same period, personal income grew by 129.1 percent compared to 243.9 percent in the United States (Headwaters Economics 2023). The economic profile of the region shows the significant continuing role of natural resource industries; 6.4 percent of employment is in the timber industry compared to 0.6 percent in the United States, and 9.3 percent is in agriculture compared to 1.4 percent in the United States (Headwaters Economics 2023). Agricultural production is a core component of the region's economic and cultural landscape. National Forest System lands comprise 45.6 percent of all lands in these three counties compared to 8.4 percent in the United States (Headwaters Economics 2023). Researchers have estimated that the WWNF directly supports a range of local employment opportunities (related to forest management, agency

operations, and recreation, for example) for a total of 1,110 jobs in 2019. Of these, 320 were associated with livestock grazing on the WWNF, including 220 direct jobs that generated \$1.2 million in labor income (USDA FS 2022).

Following their extirpation from the contiguous United States in the early 20th century, and subsequent reintroduction into Idaho in the mid-1990s, gray wolves began to disperse into the WWNF from Idaho in the late 1990s. These were the first confirmed wolves in Oregon in the contemporary period; some were killed, while at least one was trapped and returned (relocated) to Idaho. The state began a proactive planning process that led to the original Oregon Wolf Conservation and Management Plan, which was approved in 2005, prior to any known wolves being established permanently in the state (ODFW 2005). The first confirmed resident packs in the state were in the northeastern part of Oregon (on or near the Umatilla and Wallowa-Whitman National Forests) beginning

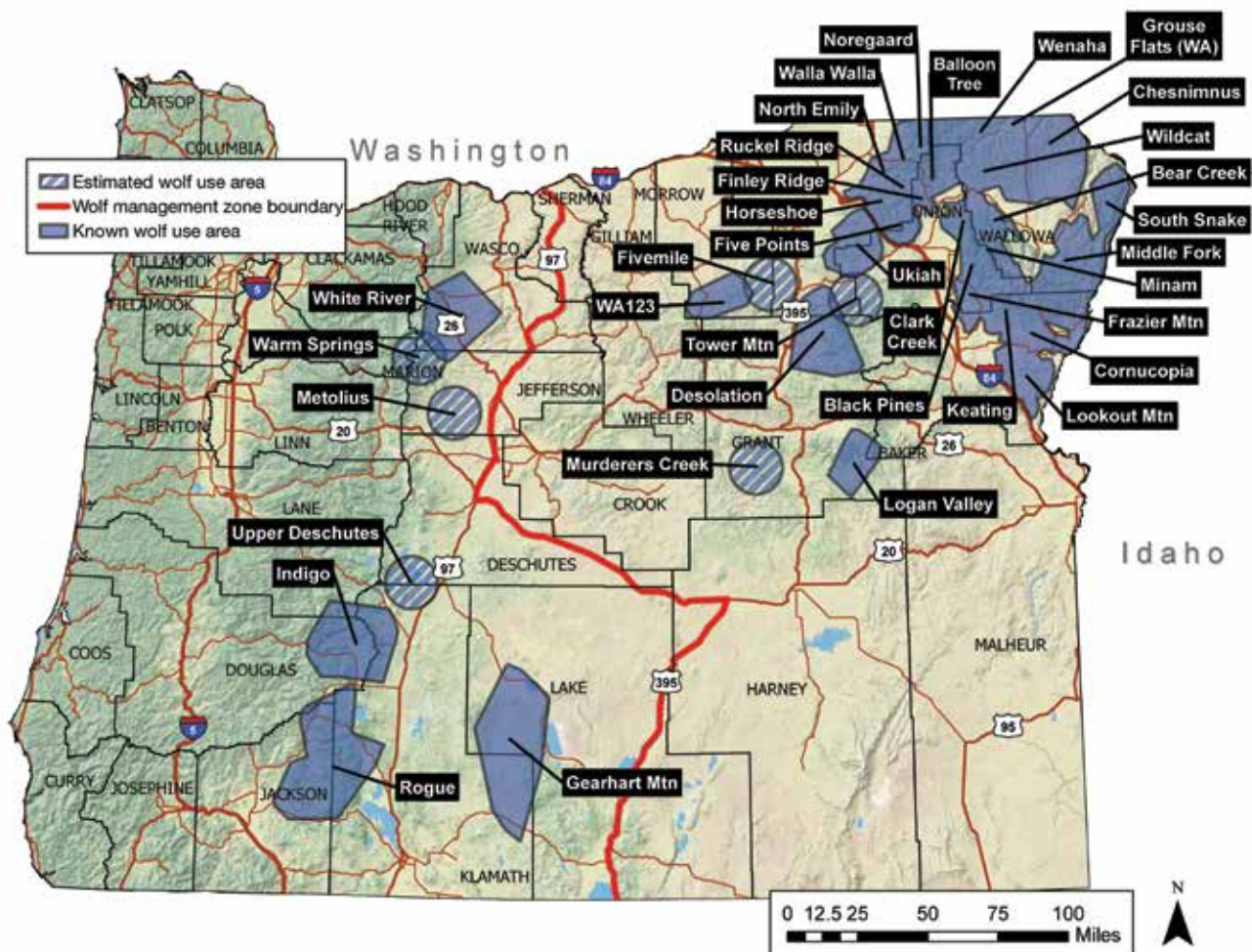


Figure 6.2—Known wolf territories in Oregon, 2022. Reproduced from ODFW (2023).

in 2008, and the population in that region grew consistently until recently leveling off, while the broader population statewide has continued to grow (ODFW 2023). There was no active reintroduction in Oregon at any point (ODFW 2024). Wolves have dispersed westward across Oregon (and from there to California), though most of the state's population is still in northeastern Oregon (ODFW 2023). About 14 known wolf packs currently occupy some portion of the WWNF, primarily in the Wallowa Mountains (the eastern portion of the forest), with additional wolves in surrounding areas, including on the neighboring Umatilla National Forest to the north and west (fig. 6.2). At the same time, the WWNF had 90 grazing permittees who were authorized to graze livestock on the forest's 107 active grazing allotments in 2020 (table 6.1).

Conflicts between wolves and livestock on the WWNF have occurred since the wolf's return to the region and remain a significant concern for the forest's grazing permittees.

This case study is based on research methods discussed in chapter 2, including survey, interviews, and literature and document review. We interviewed 12 individuals associated with wolf-livestock conflict on the WWNF: 5 current or former U.S. Department of Agriculture, Forest Service staff members; 1 Oregon Department of Fish and Wildlife (ODFW) staff member, 1 U.S. Fish and Wildlife Service (USFWS) staff member, 3 livestock producers/permittees, and 2 environmental/wolf advocates. We supplemented interviews with data from other sources, including agency websites, reports, and a review of both gray and scientific literature.

Table 6.1—Summary of wolf and livestock statuses for the Wallowa-Whitman National Forest (WWNF), Oregon

Fast fact	WWNF data
Estimated year first resident wolf pack reestablished in Oregon	2008
Estimated year first resident wolf pack reestablished on the WWNF	2008
Estimated wolf population in Oregon, 2022	At least 178 wolves in 38 packs, ^a including 17 breeding pairs (ODFW 2023). These numbers represent minimum counts.
Estimated wolf population on the WWNF, 2022	At least 69 wolves in 14 packs, including 7 breeding pairs (see ODFW 2023: 5–6). This total does not include wolves on the neighboring Umatilla National Forest and other surrounding areas.
Number of permittees with active grazing permits on the WWNF, FY 2022	92 ^b
Number of grazing allotments on the WWNF, FY 2022	105 active, 19 vacant ^b
Number of permitted cattle (and HM), FY 2022	Cows with nursing calves: 37,563 (130,276 HM) ^b
Number of permitted sheep (and HM), FY 2022	Ewes with lambs: 3,369 (15,118 HM) ^b
Number of permitted horses or mules (and HM), FY 2022	87 (296 HM) ^b
Estimated number of allotments on the WWNF where wolves were present, 2020	WWNF managers estimated that 75 percent of allotments are affected. Interviewees noted that wolves have not yet established on the southwesternmost portion of the forest, in western Baker County, but otherwise that the possibility of wolf presence on WWNF lands is perceived to be ubiquitous. Active den locations and pack territories vary from year to year. ^c
Estimated impacts of wolves on the WWNF, 2020	Most, if not all, permittees affected. ^c

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a This "pack" count includes groups of two to three wolves, although Oregon officially defines a pack as four or more wolves traveling together in winter. Their official count is 24 packs plus 14 groups of 2 to 3 wolves.

^b Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

^c Data source: 2021 case study interviews.

Wolves and Wolf Management in Oregon

The wolf population in Oregon has steadily grown from 2008 to the present, with at least 178 wolves in the state at last count in 2022 (fig. 6.3) (ODFW 2023). For federal listing status, wolves in the eastern portion of Oregon are considered part of the Northern Rocky Mountain population segment, which also includes Montana, Idaho, Wyoming, and eastern Washington. Wolves in this area were removed from federal Endangered Species Act (ESA 1973) listing in 2011 (fig. 6.4). Wolves in western Oregon (and nationwide) were also federally delisted beginning in January 2021, but the delisting was suspended in February 2022, leaving wolves protected at the federal level in the western portion of the state. At the state level, the Oregon Fish and Wildlife Commission (OFWC) removed wolves from the state's endangered species list in 2015 and now considers them a "special status game animal" in the state (ODFW 2019a). ODFW is the state's lead agency for wolf management and collaborates with the USFWS to manage wolves in the federally listed portion of the state; they monitor the wolf population closely by trapping and collaring wolves as well as via wildlife cameras and public reports.

The state's recovery plan was first approved by OFWC in 2005 and updated in 2010 and 2019 (see ODFW 2019a). It defines two management zones (fig. 6.4), lays out allowable

wolf management activities over three phases of recovery (see ODFW 2019a: 31 for details on management activities permitted by phase), and provides criteria for moving through the phases. The West Management Zone (WMZ) is in Phase I as of 2023, representing the early stages of recovery. However, in 2022 the WMZ reached the threshold of four breeding pairs. If the WMZ sustains that number for 3 consecutive years, it will transition to Phase II. The East Management Zone (EMZ) is in Phase III, which allows for more active management. A key difference between these phases is that Phase III allows management via "controlled take," such as trapping or controlled hunts, if they are approved by the OFWC. However, the OFWC has not yet considered any public hunting or trapping of wolves in either zone because of the small statewide population. In all phases, lethal removal in cases of chronic predation is allowed; however, this policy is superseded by federal Endangered Species Act listing in the WMZ and the portion of the EMZ that falls in the federally listed area. As of 2023, the federal listing boundary represents a more significant management delineation than the state zone line because federal policy prohibits all lethal take of wolves in the western part of the state. However, the plan is written with the expectation that the two-zone approach allows for the prospect of different management policies (potentially including legal hunting) in one zone but not

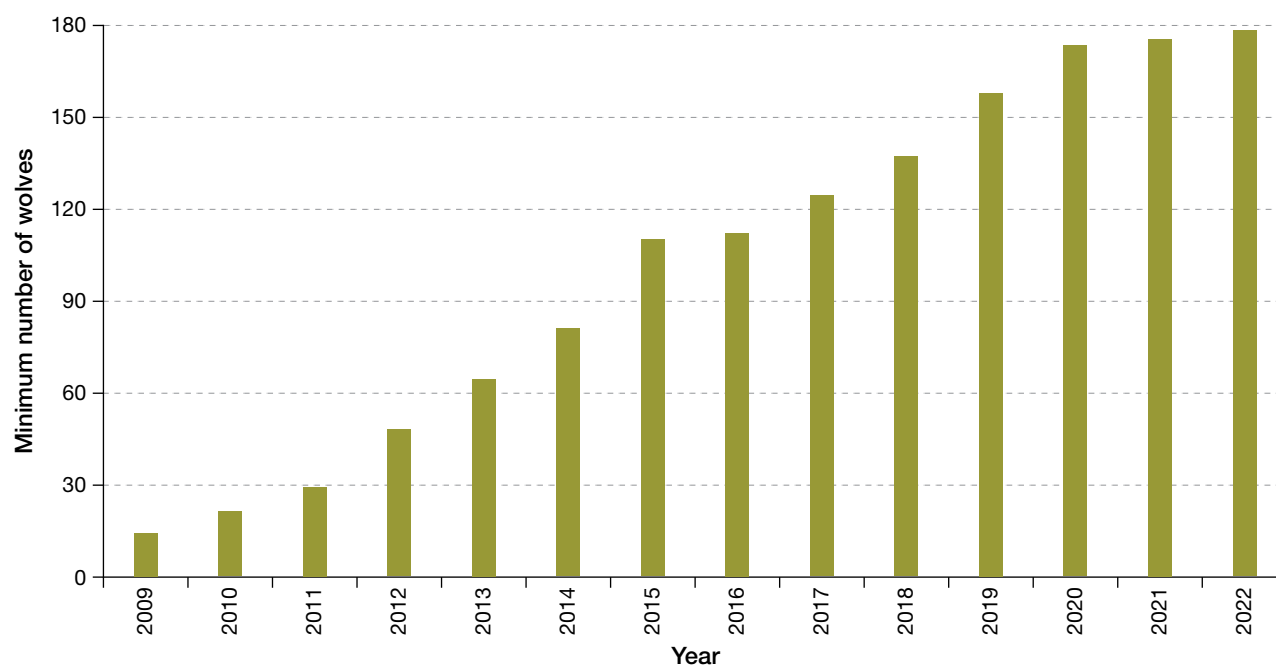


Figure 6.3—Minimum wolf count in Oregon, 2009–2022. Source: ODFW (2023).

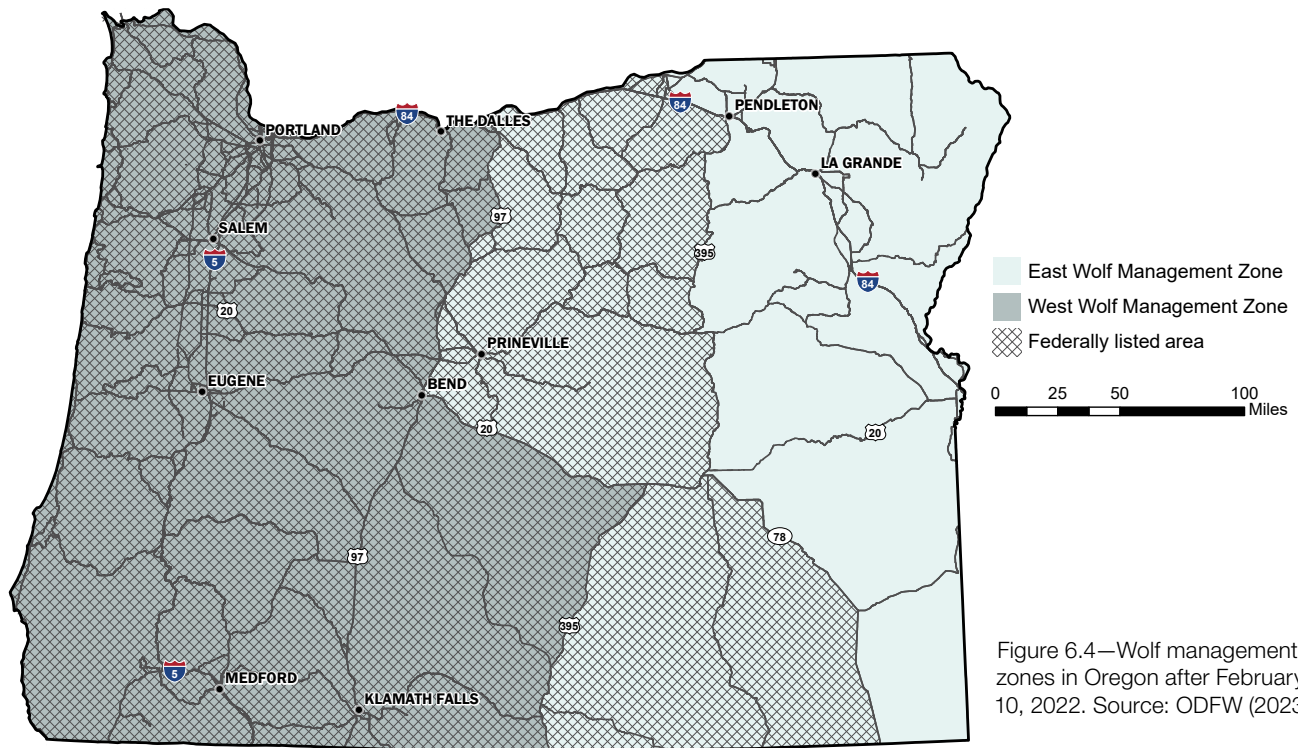


Figure 6.4—Wolf management zones in Oregon after February 10, 2022. Source: ODFW (2023).

the other. The reapproval process in 2019 for the state plan was highly contentious. Multiple conservation organizations withdrew from the collaborative planning process, citing concerns that the state was moving toward allowing hunting or allowing more killing of wolves.

Wolf-Livestock Conflict in Oregon

In 2022, ODFW confirmed 74 dead or injured livestock as wolf attacks, representing an increasing trend over the past few years and an increase of 55 percent over 2021 (fig. 6.5a) (ODFW 2023). ODFW notes that this increase is broadly associated with the increasing wolf population over a 13-year period, although recent years (2019–present) show a substantial increase in predation events despite relatively slow population growth (fig. 6.5b). At least 19 different wolf packs (about half of the known wolf packs established in the state) were involved in at least one predation event, and 9 packs attacked livestock five or more times. Eighty-five percent of the confirmed predation events occurred on private land (see ODFW 2023 for detailed information on documented depredation events and wolf population data).

Since 2011, compensation for livestock lost because of wolves has been paid through the Oregon Department of Agriculture (ODA). Under the Wolf Depredation Compensation and Financial Assistance Grant Program,

counties can apply for reimbursement for producers' losses of livestock or working dogs (injured, killed, or missing), as well as funding to assist with nonlethal conflict mitigation measures. ODFW investigates dead or injured livestock to confirm whether wolves were the cause, and then generally pays fair market value for confirmed or probable wolf-killed livestock. Each county has its own board that sets parameters for its implementation of the compensation program. In 2022, ODA paid \$393,682 in grants across 12 different counties to be used for both compensation for livestock losses and nonlethal measures (ODFW 2023).

Lethal removal of wolves in response to conflict situations is generally conducted by ODFW. Lethal removal to address wolf-livestock conflict has only been used in the eastern portion of the state where wolves are federally delisted. In the Endangered Species Act listing area, all lethal take falls under the authority of the USFWS. State policy does allow livestock owners in the federally delisted area to kill a wolf caught in the act of attacking livestock, but otherwise requires that all lethal removal of wolves be conducted or approved by ODFW, with coordination with the USFWS where federally listed. Livestock producers are required to implement appropriate nonlethal measures intended to reduce wolf predation before ODFW can consider lethal removal, and ODFW investigates

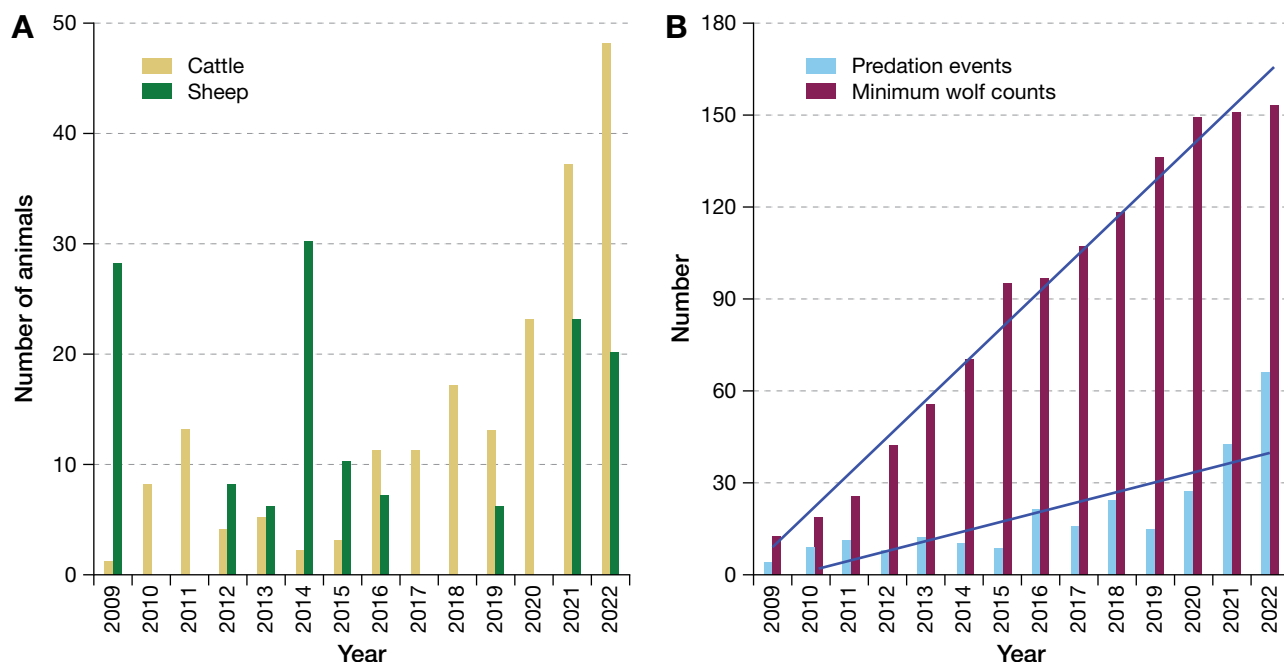


Figure 6.5—(A) Number of confirmed cattle and sheep deaths from wolves and (B) trends in confirmed predation events and minimum wolf counts in Oregon, 2009–2022. Source: ODFW (2023: figs. 7 and 8).

reported livestock losses to confirm wolf predation before conducting lethal removal (ODFW 2019a). Six wolves were removed in response to chronic predation in 2022 (ODFW 2023), slightly higher than the typical annual count. ODFW has reported a total of 26 wolves lethally removed since 2015 (ODFW 2016, 2017, 2018, 2019b, 2020, 2021, 2022, 2023).

Per the state management plan, USDA Animal and Plant Health Inspection Service, Wildlife Services (WS), the federal agency that frequently assists with wolf removal elsewhere across the American West, is authorized to assist ODFW in wolf removal in Phase III. However, WS has been less involved with lethal removal of wolves in Oregon than in Idaho, Montana, and Wyoming (though more involved than in Washington, where WS has not conducted lethal removal since 2015, or California, where lethal removal has not been used at all). In about 2010, WS was “pulled back” (in the words of one interviewee) and “no longer allowed to do depredation investigations” in Oregon. Around the same time, a lawsuit brought by environmental groups temporarily prevented all lethal removal of wolves in Oregon. This lawsuit was resolved in 2013, with the adoption of state rules that required lethal removal to be authorized by ODFW, as well as emphasizing the use of nonlethal measures. Since then, ODFW has been the lead agency for all lethal removal in Oregon. Recently, however, WS has increased their involvement in the region, including

conducting lethal removals in 2022 (acting as the agent of a landowner who had received a wolf kill permit from ODFW) as well as assisting producers in Oregon with nonlethal measures.

Wolf-Livestock Conflict on the Wallawa-Whitman National Forest

At the end of 2022, there were a minimum of 69 wolves in at least 14 packs with territories significantly overlapping the WWNF (see figs. 6.2 and 6.6) (ODFW 2023). The wolf population on the forest has grown consistently since 2008. According to our survey of Forest Service managers, established pack territories occupy most or all the suitable wolf habitat on the forest, the only national forest at that level of wolf occupation in Oregon but typical of others nearby in Idaho. In the words of one local Forest Service manager, “the habitat has filled in, and there’s very little ground now that doesn’t have a wolf pack occupying it. So just about wherever you go in suitable wolf habitat, there is a wolf pack.” Another Forest Service manager said, “the packs have established very well, and [there are] a lot of them, which has provided for a lot of challenges with management.” At the same time, one interviewee noted that wolves have not yet occupied the Whitman Ranger District, noting that in their view, not all viable wolf habitat in the region has been filled.

The level of reported wolf-livestock conflict on the WWNF is high—1 of only 5 national forests in our survey of 42 to report this level and one of the only two, along with the Colville National Forest, that is ranked high in the Forest Service's Pacific Northwest Region (Region 6). The WWNF has long been, in the words of one longtime land and wildlife manager in the area, “the hotspot for wolves in Oregon.” In 2022, wolf-livestock predation was reported in multiple areas of the WWNF, and wolves were lethally removed in the Chesnimnus and Horseshoe packs (see fig. 6.2) by issuing kill permits to affected producers. Permittees interviewed on the WWNF mentioned that the documented livestock mortality and injury numbers do not accurately represent the scale of wolf-livestock conflict, suggesting that many wolf-related livestock mortalities go uncounted. Wolf advocates in the area offered the counterargument that major wolf impacts on the cattle industry are overblown.

The landscape of the WWNF is rugged, which makes deterrence techniques difficult on grazing allotments. However, interviewees reported that conflicts here tend to occur more on private rather than public lands; National Forest System lands are largely at higher elevation, and most wolf predation has been down in the valleys. Several interviewees emphasized timing, describing two specific “windows” for likely wolf predation. The first is of small calves during the calving season in spring, the second is during the fall once calves are weaned from mother cows. An ODFW manager noted that depredation on livestock tends to decrease, in their experience, during the summer months, which they attribute to “abundant natural prey” of young wild ungulates. Many interviewees also mentioned the spatial specificity of conflict—as one land manager put it, “it’s very localized”—emphasizing that wolves’ chosen den locations are likely to become sites of conflict because of “opportunistic” attacks by wolves happening upon livestock that are nearby. As one permittee put it, “when they den up on you, you’re just—you’re sunk, basically.”

Multiple managers and permittees point to ecological dynamics around the timing of prey availability as key to understanding conflict. They point out that wolves will generally choose the easiest prey available, and thus are more likely to come after livestock in times and places when wild prey are difficult to find; as one permittee put it, “Predators are going to move to the next available species.” Several interviewees noted that there has been repeated conflict in certain places, with no clear-cut evidence as

to why, raising questions of whether wolf predation of livestock is associated with specific wolves (i.e., a learned behavior of livestock predation) or landscape conditions. In one Forest Service manager's words, conflict is “pretty random,” as “some [wolves] go after the calves, and others don’t.” A USFWS manager asked rhetorically, “Is it really those wolves, or is that location, that territory, that is more prone to wolves attacking livestock? That’s a tricky thing to tease out.” An ODFW manager suggested that producers’ practices can create higher livestock vulnerability:

It has to do with the husbandry... you have these young, vulnerable calves out there... wolves can kill pretty much anything, but they don’t choose to. They choose the things that have the lowest risk of injury to the wolf.

Some interviewees did point to “problem wolves” that repeatedly attack livestock; as one Forest Service manager put it, “Once one individual in a pack figures out that it’s fairly easy to kill cattle, you’ll often see repeated depredations from that same pack.” However, predation of livestock was most frequently described by managers as opportunistic, the result of chance encounters and unpredictable variables, rather than a learned and repeated behavior on the part of the wolves.

Some interviewees contended that coexistence between wolves and livestock could be achieved through a spatial solution (see Martin et al. 2021), by not putting livestock in areas that are known to be good wolf habitat and thus reducing overlap between vulnerable livestock and wolves. One Forest Service manager said, “The animals start figuring out where they can persist, and people figure out where they can tolerate that species.” ODFW staff (and other interviewees) suggested that hazing wolves by using nonlethal munitions (e.g., paintballs, beanbags, “cracker” shotgun shells) can also be a useful tool for achieving the spatial dimension of coexistence, describing an instance in which they successfully encouraged a certain wolf pack to avoid livestock areas:

We had a lot of hazing... with the helicopter and cracker shells, intense hazing... It took a long time to do. It wasn’t an overnight thing. We didn’t smack them on the nose once... It was a whole ‘nother year before they stopped coming into the valley... because they probably got sick of the hazing.

One permittee said,

They keep their distance now... we don't shoot at them a lot because they're not close enough to shoot at anyway. They're always there watching, but... it's just kind of a mutual respect that they know we're there now, so then maybe they're gonna go chase the elk or something over on this other ridge, rather than come down to where we're at.

Despite this success, managers noted that achieving such spatial solutions to wolf-livestock conflict across the whole of the WWNF is unlikely. Wolves move rapidly and unpredictably across large areas, and will only shift to other areas of the forest. According to another permittee, "The original intention was that we'd go after wolves enough to get 'em to leave the country, but that's also impossible in a lot of this country."

On the social side, the return of wolves to the WWNF has been a deeply polarizing issue, described by one wolf advocate as "a litmus test" for local politics. Multiple interviewees note that the wolf issue ties into underlying political divides over government authority, urban-rural divisions, and fears about changing rural land use. Several interviewees described a growing level of acceptance, suggesting that social conflict over wolves has moderated somewhat over time, even as wolf-livestock conflict continues, with a growing recognition on the part of livestock producers and rural residents that wolves are here to stay. As one local resident put it, "The temperature of the hostility, the public hostility, [has] declined over about 3 or 4 years," and a Forest Service manager noted, "They're here. We're going to have to do things to live with them and figure out how to coexist. I think that's definitely a much more prevalent way of thinking now." Even as many livestock producers work to adapt their practices, others remain resistant, and see the ongoing wolf challenge as a threat to their livelihood and way of life. As one permittee stated, "Right now, it's hard times for people, family ranches, small ranches... we are a remnant... there's so many things that are trying to hammer us into nonexistence."

Forest Service managers who we interviewed tended to take a middle ground on the polarized issue; some joined wolf advocates in suggesting that the number of wolf attacks on livestock on the WWNF is actually relatively low, and suggested that the wolf issue perhaps gets more attention than it really merits. At the same time, managers also noted

that there are other significant impacts in addition to dead or injured livestock, such as weight loss and behavioral change in cattle. Emphasizing that conflict is more of an issue on private than public lands, Forest Service managers tended to downplay their own role in the issue, stating that they play little or no role in shaping wolf policy and emphasizing that they are "not in the business of managing wolves" and should "not overstep their bounds." Yet as one ODFW manager noted, depredations on private land may simply be easier to find and document than those in rugged terrain on allotments, and the issues of weight loss, impacts on fertility, and behavioral change are all relevant to the federal land setting.

One ODFW staff member noted that the decentralized process by which Oregon manages wolf conflict, with compensation managed at the county scale, means that "every county is very different from the next county. There's no consistency across the state." Meanwhile, several permittees were critical of the state's compensation program, arguing that ODFW is "very reluctant" to confirm wolf-killed livestock, and that the compensation paid is inadequate to cover the actual impacts. For wolf advocates, on the other hand, compensation creates "perverse incentives where you get paid for the outcome we don't want, which is dead cows," and therefore does not actually encourage proactive efforts to reduce conflict.

Approaches to Managing Wolf-Livestock Conflict on the Wallowa-Whitman National Forest

A range of nonlethal tools and techniques for conflict mitigation have been attempted on the WWNF, with mixed results (table 6.2). The Western Landowners' Alliance, with funding from the USDA Natural Resources Conservation Service, has recently been working with producers in the region to support and assess the effectiveness of range riding, fladry, Foxlights, and carcass removal (Wertz 2022). Similarly, WS researchers working with producers across multiple states, including Oregon, are examining the effectiveness of fladry, fencing, and other deterrents (Carlisle et al. 2023). However, the size of grazing allotments and difficult terrain are commonly cited as impediments to the use of nonlethal deterrents on National Forest System lands; these tools are used by some producers on private lands in the area but not often on allotments. As one USFWS manager put it, "On national forest land, a lot of the tools that we

Table 6.2—Approaches to managing wolf-livestock conflict on the Wallowa-Whitman National Forest (WWNF)

Approach	Implementor(s)	Perceived effectiveness among interviewees
Range riding/human presence	Permittees, hired range riders	Perceived to be among the most effective nonlethal techniques by those using it but challenging owing to allotment characteristics and difficult to apply at large scale.
Other nonlethal tools (e.g., fladry, noisemakers, lights)	Permittees; supported by state compensation program, NGOs, WS	Somewhat successful in specific contexts. Tools fixed in place (e.g., fladry, Foxlights, radio-activated guard [RAG] boxes) are useful for protecting calving pastures but generally insufficient at the scale of Forest Service allotments. Some use noisemakers to try to make wolves aware of human presence from a greater distance.
Husbandry to reduce vulnerability	Permittees	Debated. Carcass removal is difficult in remote areas. Many permittees remove sick/injured livestock, but others have been criticized for calving on the range or leaving livestock out over the winter.
Low-stress livestock handling	Permittees	Effective per those using it. Herding livestock so they gather together for improved defense is perceived to reduce vulnerability to wolves.
Management flexibility on allotments	WWNF managers, permittees	Can be helpful, but flexibility is limited by Forest Service management regulations and NEPA.
Lethal removal	ODFW, producers	Perceived to be effective at least in the short term, but efficacy is contested by wolf advocates. There is debate over whether incremental removal targeted at individual wolves vs. pack removal is more beneficial. Use may contribute to social conflict at the state level even if it arguably increases tolerance locally.
Compensation programs	ODFW via local counties	Helpful but arguably insufficient to cover the full cost of livestock impacts. Critics note that it may reduce producer incentives to avoid conflict in proactive ways.
Reconnaissance of wolf presence	ODFW, permittees	Mixed effectiveness. Locations of den sites or other use areas can potentially help producers to avoid turning livestock out near wolves. Constrained by limited data sharing and unpredictable wolf presence on allotments.

NEPA = National Environmental Policy Act (NEPA 1969); NGO = nongovernmental organization; ODFW = Oregon Department of Fish and Wildlife; WS = U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services.

use are harder to use there because you’re talking about big, big pastures..., you can’t do it up on a national forest allotment.” In the view of an ODFW manager, “Tools are not an option on open-range cattle except for... tools that require a human being to be present holding the tool,” such as spotlights or air horns. Multiple interviewees, including Forest Service staff, ODFW staff, and permittees, reported that the most effective technique in their experience has been to increase human presence on the range.

While the state does provide some financial support for range riders, it has been difficult to find people to do the job, and managers said that most producers “do the work themselves” by spending more time with livestock. Permittees, however, noted multiple challenges associated with range riding, including the difficulty of covering very large allotments, the rugged terrain, and the fact that most wolf attacks occur at night. One permittee described success with human presence on their own

operation on a small allotment, but noted that it is very time- and cost-intensive to manage livestock in this way and would be difficult to scale up for their neighbors working in larger allotments:

It’s steep. It’s tough terrain.... They would have to have riders just with those cows, moving them around all the time, and [I’m] not saying that they couldn’t do it, but it would almost be time prohibitive, cost prohibitive to really do it.

They reported that “we basically live with our cattle” during the grazing season to keep them safe in these conditions and described shooting guns and other noisemakers to make their presence known to the wolves. Multiple interviewees described such hazing techniques as behavioral conditioning to “make [wolves] be afraid of humans,” as one permittee described it, and thus to establish the “mutual respect” by which wolves will learn to avoid certain areas

(see Anderson et al. 2023 on the use of animal fear in wolf-livestock conflict management).

Permittees using such techniques also emphasized the value of keeping livestock gathered together as an effective tool for “reducing vulnerability.” They have used low-stress livestock handling techniques (learned from producers operating in Montana) to train their cattle to gather themselves defensively, reducing the need for full-time human presence. Some producers operating in the WWNF described this as a key element of an ongoing “paradigm shift” in livestock production in wolf territory, which they characterized as growing acceptance of the permanence of the wolf population and willingness to collaborate and adopt nonlethal approaches. These producers cited husbandry techniques that promote herding cattle together as a key success, as was an emphasis on increased human presence with livestock. Both ODFW staff and producers making this shift toward nonlethal coexistence thus emphasized that changes to livestock management and behavior are key elements of the solution to wolf-livestock conflict.

However, Forest Service staff reported that the level of attention paid by producers to their livestock on allotments is highly variable, and that while such labor-intensive changes to husbandry practices are frequently discussed and have been successfully adopted by some permittees, they are not yet commonplace practices on the WWNF. ODFW staff noted that, at the other end of the spectrum, there are some permittees who are calving on their allotments, which in their view simply invites conflict and “makes wolves look bad.” Wolf advocates and those livestock producers who are supportive of nonlethal efforts were critical of other producers, saying “they don’t want to learn this” and won’t put in the effort that it takes to coexist with wolves. Instead, some reported seeing mitigation efforts as simply a step in the process required by the state to justify lethal removal. In this way, producers’ willingness to adopt nonlethal techniques is highly politicized, seen by some as representative of their overall viewpoint on wolf return.

ODFW monitors the wolf population in Oregon, with data about wolf presence at the pack scale (see fig. 6.2). They may share information about wolf presence, such as den locations, directly with permittees. ODFW staff said that they aim to maximize transparency in sharing their monitoring data, while also acknowledging concerns about data potentially being used to target wolves. Interviewees

offered mixed perspectives on how transparent this process is, with some noting that range riders could be more effective if they had a better idea where the wolves were. Forest Service managers noted that they are not necessarily made aware of wolf movements, and often do not know when there has been wolf predation, unless they are informed directly by the permittee or asked by ODFW to change the cattle rotation or to verify that the livestock were authorized.

Forest Service managers described their own ongoing efforts to be flexible in response to wolf-livestock conflict, such as “changing the timing that individual pastures were occupied so that cows would be less likely to be in the same pasture as the den site during that period of denning.” Despite these efforts, both wolf advocates and permittees described a lack of flexibility on the part of the Forest Service because of the stringency of regulations around grazing permits. For one permittee, the Forest Service range managers

Find themselves in these boxes that they can’t really get out of. ... There are things that livestock producers could do to greatly reduce their livestock risk, but they can’t do it because the Forest Service says they can’t, even though it’s things that actually may help.

Another permittee said, “They need to get a range person that can look beyond the book... don’t be a stickler for, ‘Well, the plan says we can only do this. [The National Environmental Policy Act] NEPA says this is all we can do.’”

Indeed, Forest Service managers frequently cited NEPA requirements (NEPA 1969) as the limiting factor on their flexibility in management. One such manager reported the following:

The two main tools... under the control of the Forest Service with regard to reducing conflict are having vacant allotments with functional infrastructure to be able to move cattle around in an emergency, and/or being able to change season of use and timing of grazing... but that flexibility would have to be written into the NEPA that the allotment management plan was analyzed under... since we only renew the NEPA every 10 or 20 years, we don’t have flexibility to change those dates... we don’t usually have flexibility beyond two weeks in either direction.

A Forest Service manager also noted that

We just don't have hardly any vacant allotments. We have cows on every acre..., if we had vacant allotments, you could have something to offer the permittee: "Hey, let's try using this allotment this summer since you have a wolf den in your allotment."

On the other hand, an ODFW manager was critical of some of the husbandry practices used by permittees on the forest, suggesting that the Forest Service is "not setting appropriate measures" related to calving on the range, which is allowed in some areas; or leaving livestock out in the winter, which is not. For instance, one interviewee describes a permittee who

Left his cows out every winter for the last 6 years...very, very much increasing the risk to the livestock because they were out there in the winter where the wolves are... I've learned that that's what he does... The Forest Service knows it, and the Forest Service could change that.

Interviewees offered a range of perspectives on Oregon's process regarding lethal removal of wolves in conflict situations. Many interviewees (including permittees and ODFW staff) argued that lethal removal is an effective tool, at least in the short term, to address known predation situations. One producer suggested that making "lethal control a little bit easier, although it's still not easy, [has] helped matters." An ODFW manager similarly noted that conflict may have been exacerbated during the period when they were unable to conduct lethal removal because of federal Endangered Species Act listing. ODFW is not eager to act unnecessarily, however, and tends to use incremental rather than full pack removal and only after attempting nonlethal techniques as required by the Oregon Wolf Conservation and Management Plan (ODFW 2019a). Some producers felt that removal takes too long because of the state's requirements on implementing nonlethal tools first. "There's this song and dance" about it that slows action too much, one producer noted. Forest Service managers reported that many producers want to see more frequent and aggressive use of lethal removal. According to one, "The only thing [permittees] really want is the wolves removed... That's usually their endpoint." Permittees took care to frame this

as necessary management and not indiscriminate wolf killing: "We don't wanna shoot one unless we have to." Both managers and permittees framed lethal removal as a necessary part of conflict mitigation and often pointed to more permissive removal policies in states with recovered wolf populations as a model for wolf management.

Multiple Forest Service managers were critical of the incremental approach, suggesting that this method may not help, or may even make conflict worse; as one manager noted, "Once you break the pack up, then you get different packs, and you get all unsettled territory. You get unsettled wolves. Then you might actually just exacerbate the problem." In this way, they argued that incremental removal may be "more a political strategy than one born out of effectiveness." However, ODFW staff defended their track record of careful, targeted use of lethal removal to eliminate individual wolves that have previously attacked livestock, which they see as a tool for influencing wolf behavior to prevent future livestock predation. Interviewees also offered differing views of how lethal removal impacts social tolerance (cf. Anderson 2021). For ODFW, the move to issue kill permits directly to producers in conflict situations marks a significant shift. An ODFW manager noted that it "makes tolerance and acceptance far higher because [producers] have the ability to carry a gun now and shoot a wolf." But wolf advocates disagreed; one advocate noted the following:

Science... has shown that when you kill wolves... you actually send a message that they're less valuable and you actually start to see decreased social tolerance... killing the wildlife is actually directly counterproductive.

These perspectives reflect an open question in the scientific literature regarding whether lethal predator removal amounts to "turning up" or "turning down the heat" on human-wildlife conflict (Treves et al. 2019). In this way, Oregon's approach to lethal removal may provide an opportunity for further social and ecological study: examining the effects of lethal control by permittees as opposed to government agents in terms of the number of wolves killed, the capacity for reducing future wolf predation of livestock, and the impact of both factors on social dynamics in the region.

Summary and Key Findings

The WWNF has long been a hotspot of wolf conflict in Oregon, as one of the first areas in the state to contend with wolf return and a location with recurrent conflict occurring over the period of wolf return since the mid-2000s. Like elsewhere in the American West, many of the available nonlethal tools for conflict mitigation have been found to have limited effectiveness in the context of WWNF grazing allotments, leading to significant challenges for producers working in wolf territory, which includes essentially all permittees on the WWNF. Despite the continuing conflict, though, some managers and permittees there described the forest as a success story for coexistence with wolves. They explained that social conflict over wolves has gradually leveled off as local residents and permittees realize that perhaps some of their worst fears regarding wolf return were not accurate: “Fear has opened over more to knowledge,” in the words of one ODFW employee. A Forest Service manager suggested that permittees initially “thought that it was going to ruin their lives, [but that] hasn’t come to fruition.” One WWNF grazing permittee described this realization, as well as an accompanying shift in their own husbandry practices, in terms of a “paradigm shift” underway in the local livestock industry as the wolf population expands in the region. They pointed to the growing use of and emphasis on livestock husbandry techniques, such as human presence on the range both to keep livestock gathered together and to scare wolves away, and the use of low-stress livestock handling techniques to encourage herding instincts in livestock. At the same time, they emphasized that such efforts are very cost- and labor-intensive. For these reasons and more, other permittees were skeptical that the WWNF should be interpreted as a success, pointing to continuing conflict as a major challenge for the livestock industry.

Oregon state policy regarding wolf management has significant effects on human-wolf-livestock conflict dynamics on the WWNF. Although wolves are not officially listed as an endangered species in eastern Oregon, the state has not approved hunting and makes significant efforts to avoid the use of lethal removal when possible. In this way, Oregon wolf policy has more in common with the other west coast states (Washington and California), in contrast to states with more aggressive use of lethal approaches that include both hunting and targeted control (Idaho, Montana, and Wyoming). For livestock producers

who see themselves as having more in common with their neighbors in Idaho than with the western portion of their own state, this policy difference is seen as a key driver of the local conflict. The state does provide compensation for livestock losses and distributes money for nonlethal measures to local counties. In contrast to other places in the west where there are very active collaboratives investing in nonlethal measures and coexistence efforts, however, the WWNF has seen relatively little organized effort around coexistence measures, such as range riding, leaving it largely to permittees to determine whether to adapt these practices or not.

The Forest Service plays a relatively small role in efforts to mitigate conflict on the WWNF, especially because most occurrences of livestock predation by wolves have occurred on private, low-elevation lands rather than on grazing allotments. Forest Service staff on the WWNF, like elsewhere, emphasized that they are not a wildlife agency, and definitely “not in the business of managing wolves.” Nonetheless, some Forest Service managers do see an increased need for their own involvement as a liaison between permittees and state wildlife managers to mitigate conflict; as one manager noted, “I find it very valuable to have a close relationship... to help me be a conduit between the permittees and ODFW.” As another Forest Service manager put it,

It’s a partnership between the state wildlife agency and the federal land management agency—one manages the habitat, one manages the species—it makes sense to be co-managers with that and do a lot of coordination.

As one ODFW manager noted, the Forest Service also plays a crucial role when it comes to managing the timing, location, and size of livestock released onto the range, with important implications for their vulnerability to wolves. Because of the need for collaborative, cross-institutional work, managers emphasized the importance of the social dimensions of the conflict, suggesting that range managers in places with wolves should be trained in social skills related to promoting trust and collaboration between stakeholders, recognizing that the challenge of wolf-livestock conflict has as much or more to do with the human dimensions of the conflict than with ecological management.

Chapter 7: Colville National Forest, Washington

Introduction

The Colville National Forest (CNF) covers 1.1 million acres in northeastern Washington, spanning Ferry, Stevens, and Pend Oreille Counties, and comprises four U.S. Department of Agriculture, Forest Service ranger districts (fig. 7.1). The forest includes much of two densely forested mountain ranges, the Selkirk and Kettle Ranges, separated by a valley that includes farm and ranch lands as well as the towns of Kettle Falls and Colville. In the words of the Forest Service,

The ecology of the Colville [National Forest] is highly diverse, with forests ranging from ponderosa pine [*Pinus ponderosa* Lawson & C. Lawson] and Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] on drier sites to western [redcedar] [*Thuja plicata* Donn ex D. Don]], western hemlock [*Tsuga*

heterophylla (Raf.) Sarg.], western white pine [*Pinus monticola* Douglas ex D. Don]] and an excellent variety of deciduous species on wetter sites... Topography is varied, ranging from rounded mountain slopes at low elevations to high peaks and basins above 7,300 feet in elevation [USDA FS, n.d.c].

The CNF provides favorable habitat for both gray wolves (*Canis lupus*) and livestock that graze on leased allotments.

The three counties of northeastern Washington where the CNF is located are growing rapidly, with human population more than doubling over the period of 1970–2020 (150.8 percent positive change in population, compared to 61.7 percent growth in the United States), while personal income grew by more than five times (Headwaters Economics 2023). Nonlabor income, especially transfer payments (such as retirement, disability and unemployment benefits, as well

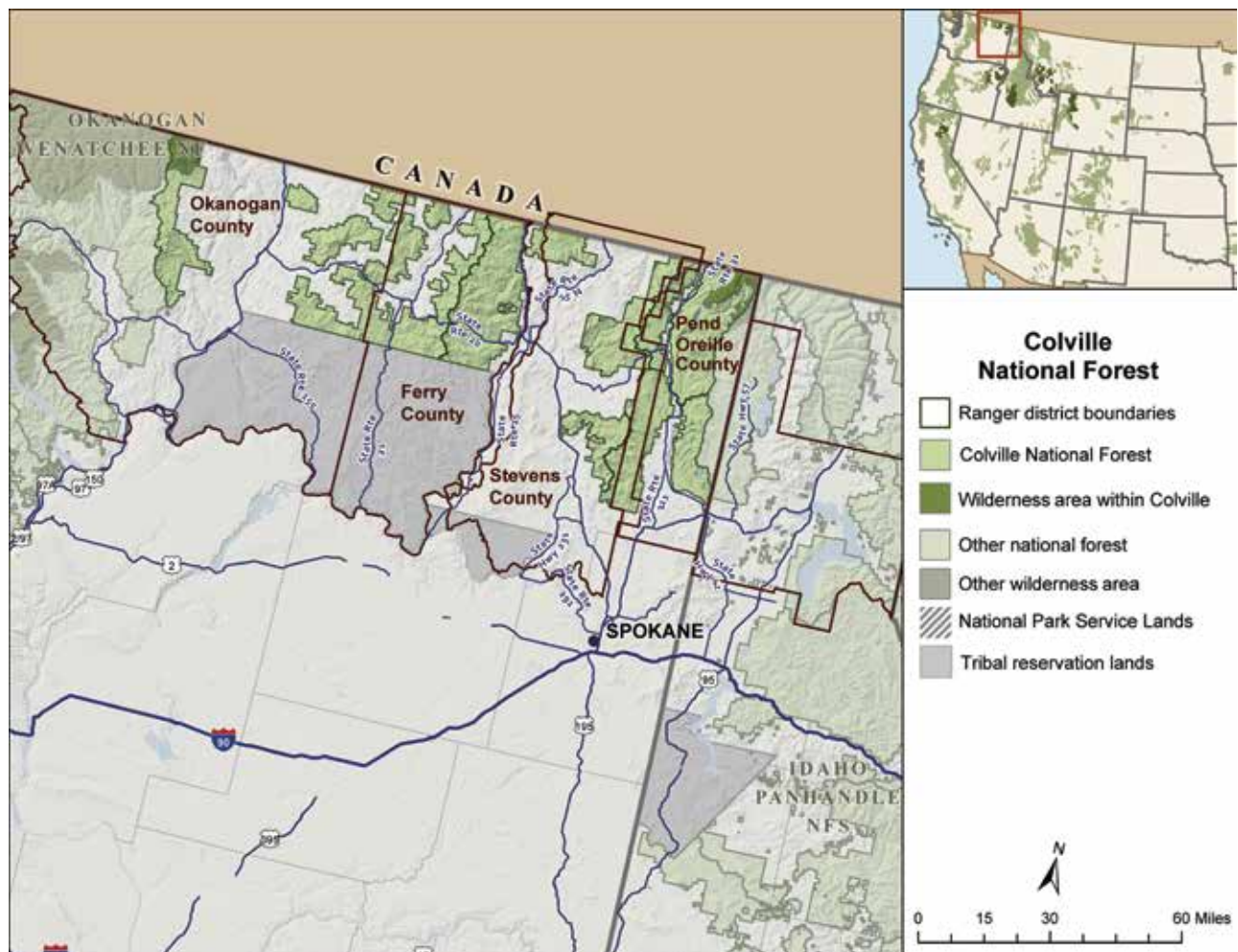


Figure 7.1—Colville National Forest, Washington. Map by Abigail Kaminski.

as Medicare and Medicaid payments) have grown most rapidly, but labor earnings are also on the rise (Headwaters Economics 2023). The economic profile of the region shows the significant role of natural resource industries, with 6.5 percent of employment in the timber industry (compared to 0.6 percent in the United States) and 7.3 percent in agriculture (compared to 1.4 percent in the United States).

Agriculture and timber production thus remain core components of the region's economic and cultural landscape (Headwaters Economics 2023). National Forest System lands comprise 30.8 percent of all land across the three counties, compared to 8.4 percent in the United States; the proportion is particularly high in Pend Oreille County, 57.8 percent, and lower in Stevens County, 13.6 percent (Headwaters Economics 2023). The government sector is the leading employer in the region. In 2019, the CNF supported an estimated 1,760 jobs in the region, including 1,160 jobs in forest products. The livestock grazing program alone supported an estimated 70 jobs (USDA FS 2022).

The first resident wolf pack to be confirmed in Washington by the Washington Department of Fish and Wildlife (WDFW) was in Okanogan County to the west of the CNF

in 2008. Gray wolves began to recolonize the state in the 21st century, following their extirpation around the 1930s, dispersing into northeastern Washington from growing populations in neighboring British Columbia, Idaho, and beyond. Soon thereafter (about 2009), resident wolves were confirmed on the CNF, and the population in that region has grown consistently up to the present day. As of 2022, at least 73 wolves occupied some portion of the forest (see WDFW 2023). At the same time, the CNF has 28 grazing permittees who were authorized to graze livestock on the forest's 43 active grazing allotments in 2022 (table 7.1). Wolf-livestock interactions and conflicts on the CNF and surrounding areas have been a persistent source of human conflict around wolf management in Washington since 2008 and were a motivating force in the development of this research project, as Forest Service managers on the CNF sought insights and lessons learned from other national forests dealing with wolf-livestock conflict.

This case study is based on research methods discussed in chapter 2, including surveys, interviews, and literature and document review. We interviewed seven new individuals associated with wolf-livestock conflict on the CNF,

Table 7.1—Summary of wolf and livestock statuses for the Colville National Forest (CNF), Washington

Fast fact	CNF data
Estimated year first resident wolf pack reestablished in Washington	2008
Estimated year first resident wolf pack reestablished on the CNF	2009
Estimated wolf population in Washington, 2022	At least 216 wolves in 37 packs (WDFW 2023), including 26 breeding pairs. These numbers represent minimum counts.
Estimated wolf population on the CNF, 2022	At least 73 wolves in 15 packs. These numbers represent minimum counts, based on pack size estimates (WDFW 2023: 16–18).
Number of permittees with active grazing permits on the CNF, FY 2022	28 ^a
Number of grazing allotments on the CNF, FY 2022	43 active, 14 vacant ^a
Number of permitted cattle (and HM), FY 2022	Cows with calves: 6,900 (28,025 HM) ^a
Number of permitted sheep (and HM), FY 2022	None ^a
Number of permitted horses or mules (and HM), FY 2022	None ^a
Estimated number of allotments on the CNF where wolves were present, 2020	Most, if not all, in the perception of Forest Service managers and livestock producers interviewed. Active den locations and pack territories vary, but the possibility of wolf presence on CNF grazing lands is perceived to be ubiquitous.
Estimated impacts of wolves on the CNF, 2020	Most, if not all, permittees affected. ^b

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

^b Data source: case study survey respondents.

complementing eight interviews previously conducted by the primary author in prior research with interviewees directly connected to this forest (see Anderson 2021). Interviewees included three Forest Service staff members, four WDFW staff members, four livestock producers/permittees, two environmental/wolf advocates, and two local residents involved in efforts to mitigate conflict. We supplemented interviews with data from other sources, including the author's prior research related to the Washington context as well as extensive participant-observation at Wolf Advisory Group meetings, WDFW public meetings and webinars, Washington Fish and Wildlife Commission meetings, and other public events related to wolf management in Washington (Anderson 2022).

Wolves and Wolf Management in Washington

Wolves in the eastern portion of Washington are part of the Northern Rocky Mountain distinct population segment, as legally defined for federal Endangered Species Act (ESA 1973) purposes, which also includes Montana, Idaho, Wyoming, and eastern Oregon. This portion of the wolf population was removed from federal Endangered Species Act listing in 2011. However, Washington state also listed

wolves as endangered beginning in 1980, though no wolves were known to be present in the state at the time. Despite the federal delisting in part of the state, wolves remain protected as a state-listed endangered species throughout Washington, which prohibits public harvest (i.e., hunting and trapping). They also remain protected by federal Endangered Species Act listing in the western portion of the state. Wolf management policies are laid out in the state's Wolf Conservation and Management Plan (Wiles et al. 2011). This plan designates three recovery regions and sets criteria for recovery based on the number of breeding pairs in each region, regardless of the total growth in wolf population statewide, making state delisting dependent on a significant degree of geographic dispersal throughout the state.

Though the wolf population in Washington averaged 23 percent annual growth from 2008 to 2022 (fig. 7.2), wolves remain largely concentrated in the northeast corner of the state (fig. 7.3) and have not dispersed west and south as much as state wildlife managers had hoped. A large proportion of the state's wolf population resides in and around the CNF, as well as on the lands of the Confederated Tribes of the Colville Reservation immediately to the south, which are managed under a separate management plan (Colville

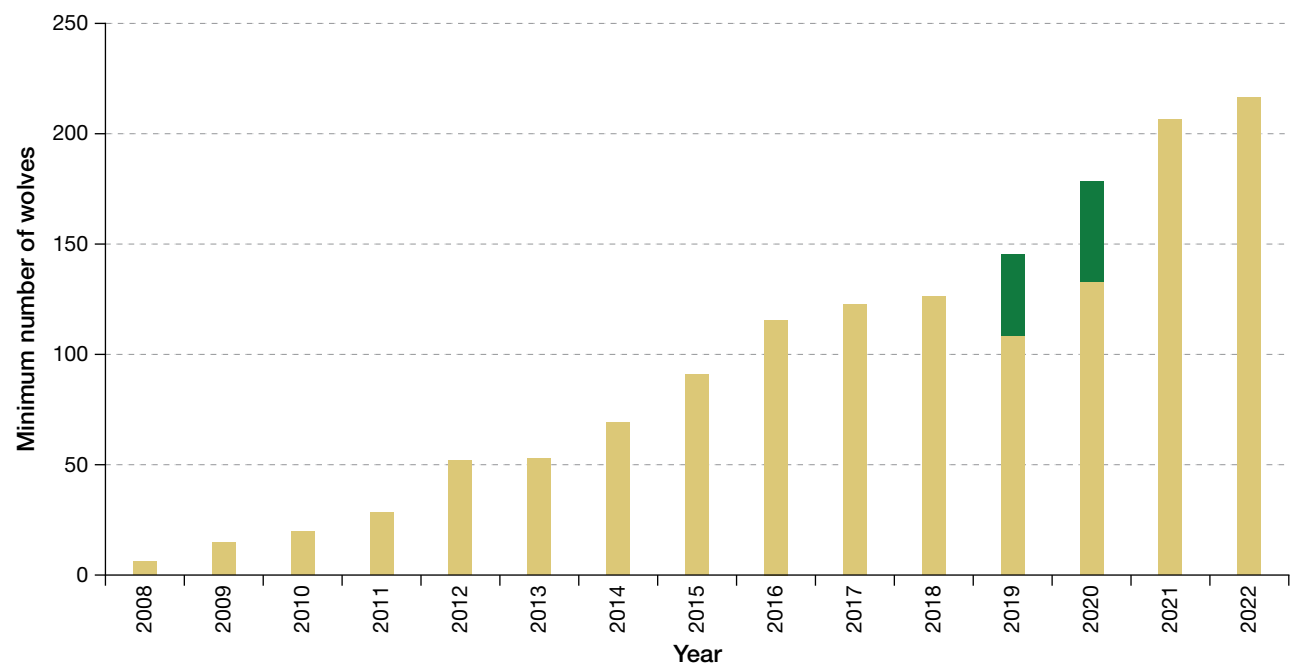


Figure 7.2—Minimum wolf count in Washington, 2008–2022. Green portions of bars for 2019 and 2020 represent the estimated number of wolves on lands of the Confederated Tribes of the Colville Reservation, which did not participate in the state's monitoring efforts during those 2 years. Source: WDFW (2023).

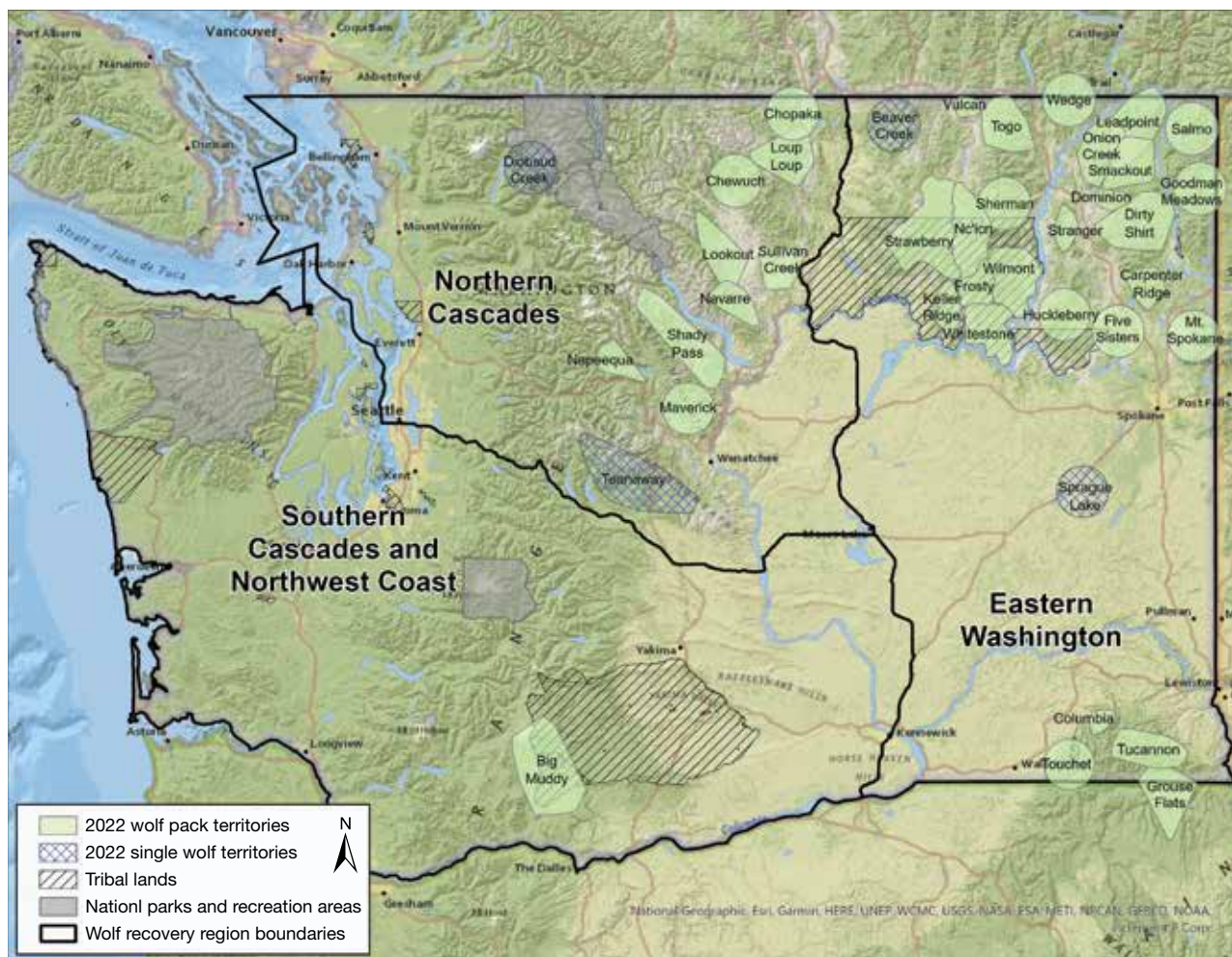


Figure 7.3—Known wolf territories in Washington, 2022. Source: WDFW (2023).

Confederated Tribes Fish and Wildlife Department 2017) and not subject to state and federal regulations.¹

WDFW monitors the wolf population closely, primarily through live-trapping and collaring efforts as well as via wildlife cameras and public reports. They also respond to wolf-livestock conflict situations, verify whether livestock injuries and losses are the result of wolf attacks, and support livestock producers' implementation of nonlethal conflict mitigation tools. Livestock injured or killed by wolves are eligible for financial compensation after verification by WDFW staff. The state's compensation program pays for the

full amount of the verified loss on acreage up to 100 acres and double that amount in areas of larger acreage, based on the assumption in the latter case that multiple livestock are likely to be missing (WDFW, n.d.a). State policy does allow livestock owners to kill a wolf caught in the act of attacking livestock but otherwise requires that all lethal removal of wolves be coordinated by WDFW. Lethal removal of wolves in response to conflict situations is conducted by WDFW, at the discretion of the agency director and only after criteria spelled out in the state's Wolf-Livestock Interaction Protocol (WDFW 2020) are met. The criteria include the occurrence of multiple livestock predation events within a specified period (three events in 30 days or four events in 10 months) and the prior implementation of appropriate nonlethal deterrence measures by the producer (see WDFW 2020: 17–18 for the detailed criteria). From 2012 to 2022, 40 wolves were removed (killed) statewide (including six in 2022), all but one in northeastern Washington.

¹ This report does not substantively address wolf-livestock conflict management on the Colville Reservation. Representatives of the Confederated Tribes of the Colville Reservation did not reply to multiple requests for interviews, which we interpreted as an implicit declination to outside research. According to Forest Service managers, the Confederated Tribes of the Colville Reservation have played a very minor role in management related to the Colville National Forest.

The making of state policy for wolf management, and especially lethal removal, has been contentious in Washington. The state has convened a Wolf Advisory Group (WAG) consisting of stakeholders including hunters, livestock producers, and environmental advocates to advise WDFW's wolf management and has used practices of "conservation conflict transformation" (Madden 2015, Madden and McQuinn 2014) to attempt to reduce social conflict among stakeholders. However, these efforts have often been perceived as slow-moving and contentious because of the range of social values and norms regarding wolf management in Washington (Anderson 2021). In 2022, the Washington Fish and Wildlife Commission discussed, but decided against, replacing the guidance provided by the Wolf-Livestock Interaction Protocol with a legally binding rule to codify procedures for the use of nonlethal deterrents and criteria for lethal removal under state law (WDFW, n.d.b). Meanwhile, WDFW has also initiated planning conversations in anticipation of state-level delisting of wolves as an endangered species if the population successfully expands across the state's recovery regions. Changes to the state's policy after delisting may have significant impacts on wolf management and conflict.

Wolf-Livestock Conflict in Washington

In 2022, WDFW confirmed 15 cattle and 2 sheep killed by wolves statewide and an additional 9 cattle injured (WDFW 2023). This was slightly higher than the typical annual number of confirmed wolf-killed livestock over the period 2012–2022 (fig. 7.4). WDFW also found one calf mortality and two calf injuries that were probable additional wolf attacks. Seven wolf packs were involved in at least one confirmed livestock predation per pack. WDFW lethally removed six wolves in response to wolf-livestock conflict, which was higher than the annual average statewide (WDFW lethally removed 40 wolves over the period 2012–2022, averaging 3.6 per year) (WDFW 2023). Notably, many stakeholders reported that a significant proportion of wolf-livestock conflict in Washington has occurred on National Forest System lands. According to Hanley et al. (2018), "around 30 [percent] of livestock depredations in the [Northern Rocky Mountain region] from 1987 to 2015 occurred on grazing allotments. In contrast... 80 [percent] of verified livestock depredations by recolonizing wolves in Washington have occurred on grazing allotments." Given the distribution of wolves in Washington, this means this predation has occurred mainly on the CNF. However, a Forest Service manager on that forest noted that the geographical distribution of wolf-livestock conflict has

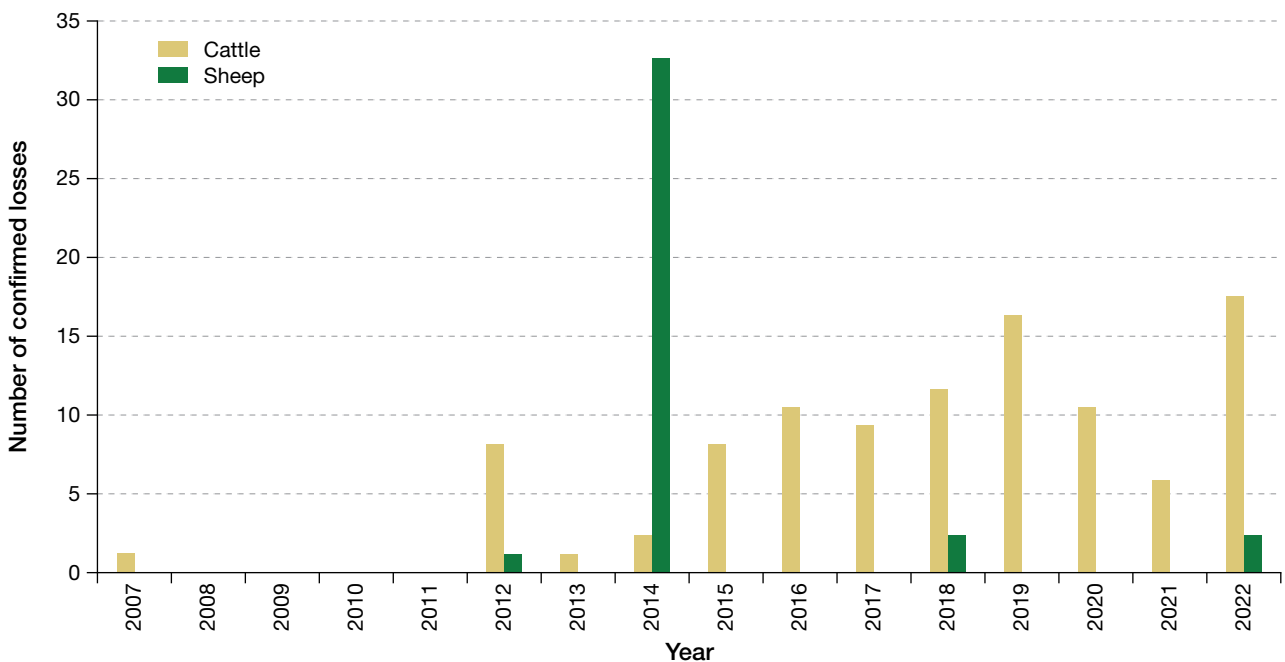


Figure 7.4—Total number of confirmed wolf-caused livestock mortalities in Washington, 2007–2022. Source: WDFW (2023).

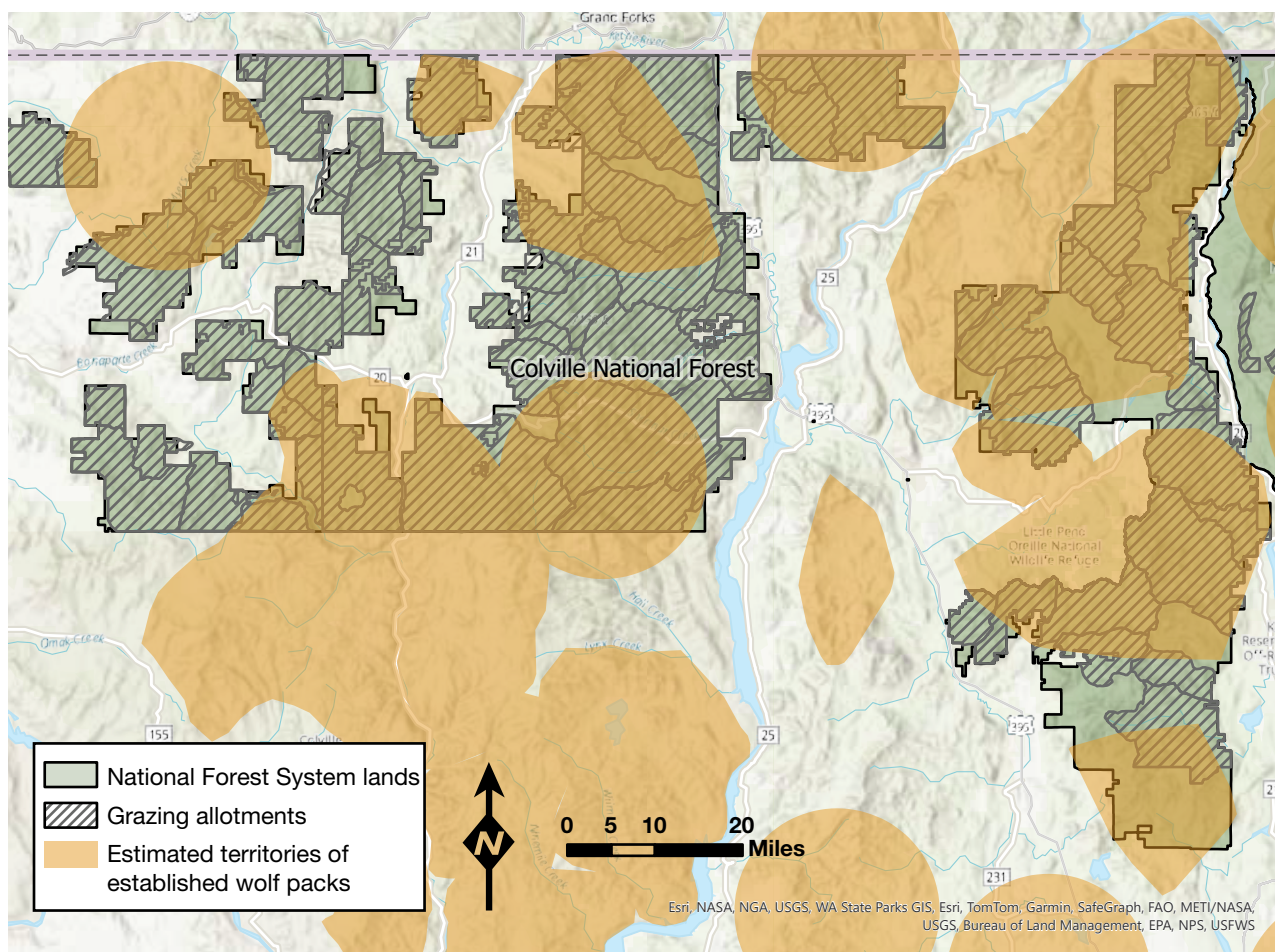


Figure 7.5—Estimated wolf pack territories in the Colville National Forest area (overlaid on U.S. Department of Agriculture, Forest Service grazing allotments). Pack territories represent the minimum known groups of wolves at the time of the monitoring effort and are likely to vary from year to year. Map by Robert Anderson. Source: WDFW (2023).

changed over time: “We used to have almost all the depredations on national forest land, and now the majority of depredations are taking place on private land outside of our grazing season.” The reasons for this change are not clear, but the geography of predation over the period of 2012–2022 contributed to pressure on Forest Service managers on the CNF to address conflict.

WDFW staff emphasized in interviews that, although wolf-livestock conflicts generally occur every year, most wolf packs in the state (about 80 percent) are not involved in any conflict. This figure has been consistent over the years of wolf recovery in Washington and is often emphasized by both WDFW and wolf conservation advocates. Livestock producers, however, claimed that the documented livestock mortality and injury numbers do not accurately represent the scale of wolf-livestock conflict, suggesting that many wolf-related livestock mortalities go uncounted. One manager said,

A 1-percent loss rate [for livestock on allotments] 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.

Such losses cannot be confirmed as wolf kills in the absence of direct evidence (e.g., bite marks on carcasses), but as one Forest Service manager reported,

It’s hard to account for some of the direct or even indirect losses that do occur. We’ve found that if livestock are killed on the national forest, we don’t always find all the carcasses. If you don’t find them within a few days, they can almost be completely consumed.

A permittee agreed: “If they [WDFW] 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.” A Forest Service

manager also pointed to other outcomes beside mortality as having significant impacts on permittees' businesses: "Calves are comin' up with a lower weight," which represents a "larger economic loss than the few numbers of confirmed depredations [indicate]." One permittee claimed that "when you put wolves in with them, 20 percent don't breed." WDFW is strongly committed to mitigating conflict using nonlethal measures whenever possible, while reserving lethal removal of wolves as a final "tool in the toolbox" when needed. WDFW reports that it spent a total of \$1,632,569 on wolf management activities in 2021, including \$56,788 for reimbursements related to nonlethal conflict mitigation expenses, \$231,708 for range riders contracted by WDFW (additional range riders are employed by nonprofit organizations and livestock producers), \$14,427 for compensation for livestock losses caused by wolves, \$119,541 for lethal removal operations, and \$1,210,105 for wolf management and research activities (WDFW 2023).

From the wolf advocate point of view (expressed in interviews, and frequently in public comments at WAG meetings), Washington's sociopolitical context represents an opportunity to do things differently from other states across the Western United States regarding wolf management, with a higher level of protection for the species. The phrase, "This is Washington, and we're different" was repeated frequently in interviews, both by wolf advocates and (sometimes derisively) by livestock producers. From the former's perspective, success is measured by the relatively small number of wolves killed in Washington; for example, one conservation nonprofit recently argued that Washington's wolf management is "the best in the West," (Conservation Northwest 2022) based on the low rate of intentional human-caused wolf mortality, which they estimate at 3.8 percent of the state's wolf population annually. By comparison, Idaho, Montana, and Wyoming each have human-caused wolf mortality rates over 20 percent (Conservation Northwest 2022, see also Boyd 2022).

Wolf advocacy groups in Washington have successfully argued for using lethal removal only as a last-resort tool. In the words of one advocate, "If there is a problem you respond, but you're not just killing [wolves] indiscriminately." These groups have actively and successfully lobbied against what they see as such "indiscriminate"

killing. Following a 2015 lawsuit,² U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) is no longer involved with the lethal removal of wolves in Washington. The courts determined that the operations conducted by WS were noncompliant with state law in the absence of a complete environmental impact statement. Since 2015, WDFW has conducted all lethal removal of wolves in Washington and only after repeated predations have occurred and nonlethal conflict reduction efforts have been made, as noted above.

The state's conflict program thus explicitly emphasizes "influencing/changing wolf behavior" to reduce conflict (the stated goal of the Wolf-Livestock Interaction Protocol), suggesting that coexistence is dependent on efforts to modify wolf behavior through a combination of lethal and nonlethal deterrence, or eliminating the wolves that are not deterred via lethal removal (see Anderson et al. 2023). Though the state's suite of conflict mitigation approaches includes adaptations to animal husbandry practices to reduce predation risk, this approach tends to place an emphasis on wolf behavior as the central problem. Repeated emphasis by WDFW on the fact that 80 percent of wolf packs don't attack livestock drives home the key idea of the "problem wolf," or wolf pack, that has learned to see livestock as a food source. Nonlethal techniques are framed as tools for preventing wolf behavior that targets livestock as prey or encouraging wolves back toward wild prey, and removal is used only to eliminate problem wolves or packs.

Critics of Washington's approach (including both permittees and sympathetic Forest Service managers interviewed) noted that the high level of protection for wolves and emphasis on nonlethal tools only contributes to conflict by limiting the available management tools, such as hunting and lethal removal. As one Forest Service manager put it, "The wolf population is not at risk of becoming extinct, but... a lot of people [feel that] one wolf being killed is too many." They argue for a more "holistic approach" to wolf-livestock conflict mitigation based on wolf population management "like wildlife managers should do," which could include both hunting and faster use of lethal removal in conflict situations. As one permittee described it, "The thing that everybody misses [is that] the wolf is not the problem. It's the laws and policies around the wolf,"

² *Cascadia Wildlands, et al. v. Woodruff, et al.*, 3:15-cv-05132-RJB US (2015).

referring specifically to the differences in state protection that make their experience of wolf-livestock conflict different from the experience of ranchers in states such as Idaho or Montana.

Social conflict and controversy over the management of wolves in Washington often hinges on these issues and especially state restrictions on the use of lethal removal, which members of the WAG have discussed extensively over the past several years (Anderson 2021). Both grazing permittees and environmental advocates stated that they do not feel that they are represented well in state decision-making processes, with permittees suggesting that the state's policy is driven by "west-side liberal values" (referring to the Seattle and Olympia metropolitan areas). Wolf advocates counter that decision-making processes overemphasize the interests of livestock producers, or as one advocate said, "The WAG is not representative of the body politic of Washington." Wolf advocates frequently call for fewer removals and more nonlethal efforts, while producers would like to see removal done faster and more often.

Wolves and Wolf-Livestock Conflict on the Colville National Forest

At the end of 2022, there were about 15 packs representing a minimum of 73 wolves with territories substantially overlapping the Colville National Forest, plus at least 8 more packs on nearby private, tribal, or other lands (fig. 7.5) (see WDFW 2023: 18). Both Forest Service and WDFW staff noted that the wolf population has expanded faster here than elsewhere in the state. One WDFW manager described a "significant recolonization of wolves... particularly in northeast Washington associated with the area around the Colville National Forest." Forest Service staff said 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." As illustrated in figure 7.5, known wolf pack territories overlap extensively with nearly all the CNF grazing allotments.

According to our survey data, most, if not all, permittees on the CNF have experienced wolf-livestock conflict, either directly or indirectly. Most wolf-livestock conflicts in Washington have taken place on the CNF, and all but one of the state's 40 lethal wolf removals have occurred in this region, according to WDFW's annual reporting (Becker et

al. 2014, 2015, 2016; WDFW 2017, 2018, 2019, 2020, 2021, 2022, 2023). Though wolves and wolf-livestock conflict are found in other areas of the state, the density of the wolf population and level of conflict on the CNF have made northeast Washington central to the state-level conversation about wolf management and policy.

Nearly all the interviewees identified the region's rugged terrain and dense vegetation—where "you wouldn't know if [a cow] was there 50 feet away," in the words of one local resident—as key factors contributing to the risk of wolf predation of livestock (fig. 7.6). One local resident who works closely with range riders described the size of the grazing allotments as a challenge: "There's one allotment that we're riding that's 59,000 acres... There's no way [to] get more human eyes on cattle every day." These features make the CNF a very difficult landscape on which to protect cattle because they routinely spread widely across the landscape, disappear into the vegetation, and are very difficult to keep track of.

Many interviewees also suggested that a low density of wild ungulate prey here contributes to conflict, based on the assumption that wolves that cannot find wild prey are more likely to attack livestock. There "should be a robust population of ungulates, but we're not seeing them," says one Forest Service manager, and both permittees and managers make the same observation that "when a wolf gets hungry, he's gonna find something to eat." The Washington Predator-Prey Project, a joint research effort by WDFW and the University of Washington, is conducting ongoing ecological research regarding such predator-prey dynamics, including at study sites on the CNF (Washington Predator-Prey Project, n.d.). Findings from this ongoing research may help to address questions about predator-prey dynamics that relate to wolf-livestock interactions and inform the state's wildlife management efforts. Results from this study show, for example, that the white-tailed deer population in northeastern Washington is relatively stable, in contrast to claims that deer are in decline because of wolves (Francovich 2022b, Ganz et al. 2024). As of 2024, the complete findings of the Washington Predator-Prey Project have not yet been formally published.

Producers and Forest Service managers described substantial, ongoing nonlethal efforts to reduce conflict (discussed below). One Forest Service manager suggested that they have already tried "all the different techniques that have been presented and are on the table," but explained that the level of investment being made in these tools is



Figure 7.6—Cattle graze in dense vegetation on the Colville National Forest, Washington. Photo by Robert Anderson.

unsustainable. Some interviewees described progress in nonlethal efforts, but others noted that the level of wolf-livestock conflict is only getting worse from year to year, or at least “not getting any better.” Recurrent livestock predation has occurred in specific places within the CNF, such as the territory associated with the Wedge pack (see fig. 7.3) and the Kettle Range in Ferry County (where wolves were repeatedly removed in 2016–2019). It has also recurred with new wolves even after lethal removal of wolf packs from these areas; these are sometimes described as “chronic conflict areas.” WDFW has made efforts to work with producers in these areas to develop localized conflict plans. However, a Forest Service manager noted that conflict also occurs somewhat unpredictably across the landscape, varying in location from year to year, “There’s really no rhyme or reason as far as predicting it.”

Social conflict over wolf management is especially high in the region surrounding the CNF because the state’s wolf population is concentrated there, and conflict is exacerbated by the lack of dispersal to other parts of the state. By all accounts, the public response to wolf return in the

region was negative since their return to Washington. It is arguably only getting worse, though perspectives on this trend vary; one Forest Service manager suggested that social acceptance for wolves has grown somewhat as it has “become common knowledge [that wolves are] here to stay,” but others said that there is “very little social acceptance for wolf recovery in eastern Washington,” that “we’re losing ground on tolerance,” and that “relations are at an all-time low.” One Forest Service manager noted that these challenging social dynamics may lead to higher wolf mortality: “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 [when] people feel like their only options might be to take things into their own hands.” For example, six wolves were found poisoned in the Wedge pack territory in February 2022 (Taylor 2022), an incident that was under investigation by WDFW.

Interviewees described highly polarized and politicized viewpoints on the state’s efforts to manage wolf-livestock conflict, with local land managers saying that the “external community [of Washington] doesn’t understand” and that

people who “have no experience with it still form opinions that are very strong” based on “what they watch on TV.” A wolf advocate counters that the state is “not paying attention [to public opinion] but just to ranchers.” Permittees, Forest Service staff, and WDFW staff alike describe significant mutual distrust between parties, especially on the part of livestock producers toward government in general and WDFW specifically. In one permittee’s words, “the relationship is extremely dysfunctional, and there’s no trust between permittees and the Department of Fish and Wildlife.”

This conflict plays into west-east (urban-rural, left-right) political divides within Washington, since state wolf policy attempts to address the values and perspectives of the state as a whole, which may be misaligned with those of rural residents in the areas most affected by wolves (Dietsch et al. 2016, Responsive Management 2019, van Eeden et al. 2021b). As one permittee described it,

Politicians can control this state with the votes that they can see from standing in the Space Needle [tower in downtown Seattle]... there is so much population over there [in western Washington], and they think so much alike, and they think so much different from us.

The wolf issue is, therefore, deeply polarized and ties into broader concerns about rural development, land use change, and livestock grazing on federal lands. Environmental advocates contend that grazing has negative ecological effects and is “degrading public resources,” while livestock producers suggested that the viability of the ranching economy is essential for sustaining open space and thus biodiversity (see Sheridan 2001, 2007). One permittee described their fears that wolves will drive them out of business as being about much more than just making a living; without ranches in operation, they said, the land will get “chopped up in twenties” and developed, becoming “no good for wildlife at all, full up of houses and dogs.”

Wolf-livestock conflict on the CNF has been the focus of local and national media attention (e.g., Read 2019, Sherriff 2022), with a particular focus on one grazing permittee, the Diamond M Ranch in Laurier, Washington. This permittee has experienced repeated livestock predation by wolves on the allotments they graze, leading to multiple wolves being killed, and has become the target of criticism from the environmental community. One such criticism is that the state has now killed at least 26 wolves on behalf of this single

producer (see Read 2019). Wolf advocates interviewed said that livestock producers on the CNF, and especially the Diamond M Ranch, have been unwilling to make reasonable efforts to adapt their business model to accommodate wolf return, and that the wolves should not suffer for the sake of the extractive and government-subsidized livestock industry. They perceive a key barrier to conflict mitigation in the unwillingness of producers such as the Diamond M Ranch to adapt, such as by adopting nonlethal measures. One advocate noted that,

Some people just don’t want to adapt... 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.

Some even suggested that some ranchers in the area are actively trying to attract wolf-livestock conflict, rather than reduce it, to force the state to implement lethal removal of wolves.

Producers interviewed countered that they are already doing all they can to adapt, pointing to ongoing range riding and other nonlethal efforts. They also noted that the number of livestock attacked (and wolves killed) is generally proportional to the number of livestock on the landscape (with the Diamond M Ranch being among the largest operators in the region) and not the result of a single producer’s practices. Producers asserted that the impacts of wolves make it impossible to run ranches, driving them out of business and contributing to changing rural land use: “It’s killing our industry... who wants to get into cattle right now when they can see what’s going on?” According to one permittee, several neighboring permittees have sold their permits and quit raising livestock because of the stress, economic impacts, and social turmoil related to wolf conflict. In both interviews and public statements (e.g., at WAG meetings), many livestock producers have asked for more aggressive use of lethal removal. They suggested that they know the crucial tool for reducing conflict—lethal removal—but the state’s protection of wolves is forcing them to “sit on their hands” when it comes to addressing conflict.

Land and wildlife managers preferred science-based management decisions and suggested that the wolf issue has become overly politicized, with management decisions that are based on politics and social values rather than science. But the best available science on the issue also often contains significant uncertainty. For example,

the effectiveness of many tools for wolf-livestock conflict deterrence, including both lethal and nonlethal approaches, has not yet been adequately tested (see van Eeden et al. 2018). The science also frequently becomes politicized, with competing appeals to the scientific literature making it difficult to say what amounts to neutral, objectively “scientific” management (see Sullivan et al. 2022). The high level of conflict requires Forest Service range managers to devote a comparatively great deal of their time to the wolf issue—and motivates them to seek insights from wolf-livestock management elsewhere.

Approaches to Managing Wolf-Livestock Conflict on the Colville National Forest

Producers, nongovernmental organizations (NGOs), WDFW, and CNF managers have attempted to use many nonlethal tools and techniques for conflict mitigation on the CNF (table 7.2). These include increased human presence

(e.g., range riders); changes to husbandry practices to reduce vulnerability of livestock (e.g., removal of carcasses and injured animals; delayed turnout of livestock; protection of calving areas); and the use of nonlethal deterrents, including fladry, Foxlights, radio-activated guard (RAG) boxes, and others. Interviewees described many of these as at least somewhat successful, but their use is very context specific. Interviewees added that the size of allotments, coupled with density of vegetation and rugged terrain, makes the use of most known tools and techniques for wolf-livestock conflict mitigation insufficient on CNF grazing allotments. For instance, fixed-in-place tools such as fladry, Foxlights, or RAG boxes are often seen to be reasonably effective on the scale of a calving pasture, but are not scalable to an allotment: as one Forest Service manager put it, “Maybe you deter them from a salt block, but you’re not going to deter them across the 5,000-acre pasture.”

WDFW conflict specialists work closely with willing permittees to try to find effective nonlethal tools because

Table 7.2—Approaches for managing wolf-livestock conflict most used on the Colville National Forest (CNF)

Approach	Implementor(s)	Perceived effectiveness among interviewees
Range riding/ human presence	Riders contracted by WDFW or NGOs, or employed by permittees	Debated. Many see it as highly effective, while others do not. Arguably helps to monitor wolf presence and livestock status, implement husbandry techniques, and support use of deterrent tools, but some riders see their primary role being to locate and document predations rather than prevent them.
Husbandry to reduce vulnerability	Permittees, NGOs	Mixed effectiveness. Carcass removal is difficult in remote areas; many permittees remove sick or injured livestock, but many also say that wolves will attack even healthy cattle.
Nonlethal deterrents (noisemakers, lights, etc.)	Permittees (often in collaboration with WDFW), NGOs	Somewhat successful in specific contexts. Tools fixed in place (e.g., fladry, Foxlights, radio-activated guard [RAG] boxes) are useful for protecting calving pastures but generally insufficient at the scale of CNF allotments. Deterrent tools carried by range riders may be useful if wolves are encountered, which is relatively rare.
Lethal removal	WDFW	Debated. Perceived by many producers as effective; efficacy is contested by wolf advocates. Use may contribute to social conflict at the state level even if it arguably increases tolerance locally.
Management flexibility on allotments	CNF managers and permittees	Mixed effectiveness. Constrained by ubiquitous wolf presence on allotments and by CNF management regulations/NEPA and managers’ perceived decision space.
Compensation for livestock losses	WDFW	Mixed effectiveness. Helpful to some producers, but arguably insufficient to cover the full cost of livestock impacts. Constrained by lack of trust for WDFW; some producers are unwilling to accept funding from or cooperate with the state.
Reconnaissance of wolf presence	WDFW, permittees	Mixed effectiveness. Locations of den sites or other use areas can potentially help producers avoid turning livestock out near wolves. Constrained by limited data sharing and ubiquitous and unpredictable wolf presence on allotments.

the state requires efforts at nonlethal mitigation before authorizing lethal removal. In the context of repeated conflict on large allotments, WDFW is strongly supportive of range riding, describing it as “one of the best tools to minimize the chance that you will have livestock conflict.” One Forest Service manager described range riding as “the mother-ship of tools” because range riders can move around the landscape to monitor both livestock and wolf presence and deploy other nonlethal tools at the appropriate time and place. WDFW and other organizations—including a local livestock producers’ organization, the Cattle Producers of Washington, and a local NGO, the Northeast Washington Wolf-Cattle Collaborative—have invested significantly in range riding programs on the CNF. However, range riders must patrol very large allotments, and as one manager noted, “you’d need an army of range riders” to effectively cover the grazing lands of the CNF.

Moreover, there is ongoing debate over exactly what range riding means and how it should be done, with differing relative emphases on animal husbandry practices, wolf deterrence, or searching for evidence of wolf predation on livestock (Parks and Messmer 2016). In interviews, some managers and many producers and riders (especially those affiliated with the Cattle Producers of Washington) described range riding primarily as a tool for documenting the number of predations (“It helps you find the dead stuff,” as one Forest Service manager put it) with implications including the payout of compensation funds and the use of lethal removal. Meanwhile, conservation advocates as well as WDFW managers, Northeast Washington Wolf-Cattle Collaborative riders, and other stakeholders (in interviews, and in discussion at the WAG) described range riding as a tool for conflict mitigation. This includes a diverse range of activities, potentially including proactive husbandry, such as “trying to bunch their cattle... look for injured, sick, or anything like that to remove them off the landscape;” human presence to “make the wolves... more leery,” as one range rider described it; and the deployment of appropriate wolf deterrents at the right time and place.

Many interviewees, including livestock producers, wildlife managers (WDFW), and land managers (Forest Service) described lethal removal of wolves as an effective and necessary tool, although perspectives vary on how frequently and under what conditions it should be used, amid the very politicized debate over this topic. Multiple permittees and land managers said that lethal removal or hunting, or both

are the basis for success of nonlethal techniques, because they instill fear in wolves. “If you shoot one [wolf]... then the others see that,” asserted one permittee; another said, “Right now these wolves have no reason to be afraid of humans,” but if you “gave them a reason, other wolves would be a lot more receptive to nonlethals.” Permittees therefore contend that “the best nonlethal is a good lethal” (for a deeper discussion of stakeholders’ perspectives on using wolves’ fear of humans as a conflict mitigation tactic on the CNF, see Anderson et al. 2023).

Some producers and Forest Service staff described the current mitigation effort as an “unsustainable” level of investment in nonlethal tools, and cited the state policies on wolf protection, especially the limitations on the use of lethal removal, as a key barrier to conflict mitigation. One Forest Service manager suggested that in their view, having a hunting season for wolves would be the most useful tool for reducing conflict; hunting “actually could change the habituation of animals and what they associate with human presence, so maybe you could have more wolves on the landscape with less conflict” (cf. Richardson 2022). However, managers and permittees alike acknowledged that hunting will likely remain off the table in Washington for sociopolitical reasons—“it’s highly polarizing,” in the words of one Forest Service manager—and thus advocated primarily for faster and more frequent removal of problem wolves. On the other hand, wolf advocates cited Washington’s emphasis on nonlethal approaches as a success and said that the major barrier to further reducing conflict lies in producers’ unwillingness to adopt nonlethal tools. Amid this conflict, WDFW often seeks to play a mediating role, but their relationship with the livestock producer community has often been strained. Many interviewees cited the lack of trust between stakeholders as a key barrier to progress on wolf management. The state’s compensation program aims to build such trust, and cooperation, by providing financial compensation for livestock losses, but its overall impact on the social conflict is unclear. Interviewees noted that some permittees are unwilling to accept compensation from the state because, in their view, doing so would imply acceptance of the state’s effort to conserve and protect wolves.

Wolf advocates have contended, including through recent lawsuits, that the Forest Service should do more to address the issue via their authority over grazing permits. Forest Service staff cooperate with WDFW to assess conflict-related flexibility on grazing permits, such as

changing turnout dates or pasture rotations, but are resistant to doing too much and going beyond the scope of their perceived role. Frequently suggested practices, such as moving livestock to different allotments, are impractical given that nearly every allotment on the CNF could potentially have significant wolf activity. Forest Service managers said that they are already doing what they can in the context of their management mandate:

Anytime there is something within our authority that has the potential to reduce risk, we absolutely do that...., changing the pasture rotation, changing the on or off dates...., authorizing range rider camps....; when it's suggested that this could be something that would work, I can't think of a time when we haven't done that. Now there's two things we said we're unwilling to do. One is close any allotment due to wolves, and the other is to cancel any permit, to tell a permittee they can't graze on their allotment. Other than that, everything's on the table, and we've done most things.

This refusal to consider closing allotments stands in contrast to the perspective of the wolf advocates, who suggested that grazing in heavily forested and rugged terrain, with cattle spread widely across large areas, invites wolf predation of livestock and is therefore inappropriate. This perspective was shared in a recent call from wildlife scientists to “rewild” the Western United States by eliminating livestock grazing from a substantial portion of national forests within the gray wolf’s range (Ripple et al. 2022). Forest Service managers interviewed, however, emphasized that they intended to “stay in their lane,” which includes managing grazing as an accepted use of the multiple-use landscape, and that it is not their role to manage wildlife nor to tell livestock producers what to do. As one Forest Service manager noted,

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.

Forest Service managers interviewed were generally supportive of ongoing efforts around range riding and other nonlethal programs but also called for more frequent and faster lethal removal by the state.

Summary and Key Findings

As the primary hotspot of wolf conflict in Washington, and home to most of the state’s wolf population, the CNF plays an outsized role in the conversation about wolf management in Washington state. The state conflict program’s strong emphasis on nonlethal efforts to reduce wolf-livestock conflict and corresponding limitations on the lethal removal of wolves are important drivers of human-wolf-livestock conflict dynamics on the CNF. Like elsewhere, many of the available nonlethal tools for conflict mitigation are not perceived to be highly effective on large, rugged, remote national forest allotments. Significant investments in range riding, as perhaps the most appropriate nonlethal mitigation tool in this context, have been made on the CNF by both the state and local NGOs, yet its purpose and effectiveness remain matters of debate. Even as many wolf advocates described Washington’s wolf management as a success, citing low levels of wolf mortality, Forest Service managers and other stakeholders interviewed on the CNF were hesitant to claim substantial successes, pointing to high levels of ongoing social conflict over wolves.

Washington’s sociopolitical context, in which hunting wolves is not allowed and lethal removal of wolves often leads to increased social conflict, plays a major role in differentiating this national forest case study from those in other states with comparable ecological conditions and tensions. Many Forest Service managers pointed to state policies and regulations that are out of their hands as key factors driving the conflict on the CNF. This case highlights the important difference between direct wolf-livestock conflict, which is arguably relatively low on the forest, and social conflict over wolves and livestock, which remains quite high. The geographic divide within Washington is an important dynamic in the social conflict, with public opinion diverging between rural eastern Washington, including the CNF region where much of the state’s wolf-livestock conflict occurs, and more urbanized western Washington, where wolves have not (yet) returned. The state’s policy attempts to bridge the divide, but often leaves stakeholders on both sides unsatisfied, and contributes to significant frustration on the part of many residents in the CNF region.

Managers interviewed at both the Forest Service and WDFW are hopeful that wolves will soon expand to other recovery regions and thus be delisted in the state, perhaps triggering a shift in state policy toward increased use of

lethal tools, akin to elsewhere in the Rocky Mountains. They say that this may reduce conflict, because once “everybody knows [the population has] recovered... the conflict dies down a little bit,” and this may “help bring more normalcy to wolf management.” This hope stands in stark contrast to the environmental community’s expectation that “this is Washington, and we’re different,” and their hope that the region can be a forerunner in developing less lethal approaches to human-wolf-livestock coexistence. As van Eeden et al. (2021a) note, the level of public support for wildlife conservation, and wolf conservation specifically, in Washington may provide opportunities for innovative models of conservation funding for (rancher-led) human-wolf coexistence, but these have yet to be effectively adopted on the CNF.

Acknowledging that the absence of trust between parties has been a major barrier to reducing conflict on the CNF, Forest Service managers suggested that building relationships between stakeholders before conflict begins is a critical step. Forest Service managers emphasized that conflict between wolves and livestock is inevitable in places where they overlap on the landscape—“we’re gonna expect conflict”—and that ideas of peaceful coexistence between people, wolves, and livestock are unrealistic (see Martin et al. 2021). They said that the best managers can do is to plan for wolf-livestock conflict and try to ensure “open communication, collaboration, [and] coordination,” and to serve as a liaison between other parties. Forest Service staff emphasized that WDFW staff and the livestock producers themselves are the key players involved in directly addressing conflict, and they generally see a limited role for Forest Service intervention. At the same time, one Forest Service manager noted that this attitude itself may be a barrier to other managers taking proactive action, observing that dealing with wolf-livestock conflict is “something that could be perceived as additional work,” and noting that it marks a significant shift for managers to “understand that it’s gonna be a part of *your* work.” Forest Service managers on the CNF emphasized that serving as a liaison between these groups to facilitate communication should be done before conflict arises, if possible. As one Forest Service manager noted,

Build those relationships and have those conversations early.... It’s not a good place to have some depredation event that occurred and then [be] wondering, who should I talk to?

Because National Forest System lands are a place where wolves and livestock share space, Forest Service managers are in a critical intermediary position as mediators and as liaisons to encourage communication and collaboration between producers, state agencies, wolf advocates, and other stakeholders.

Chapter 8: Lassen National Forest, California

Introduction

The Lassen National Forest (LNF) was established in 1905, and today covers 1.2 million acres across seven counties in northeastern California. Lands associated with the LNF are part of the traditional territories of multiple indigenous groups, including the historical Atsugewi, Yana, Yahi, and Maidu people, and the present-day Pit River Tribe, Susanville Indian Rancheria, Redding Rancheria, and Mountain Maidu people (USDI NPS 2022). This region is known as “the Crossroads,” where Sierra Nevada granite, Cascades lava, Modoc plateau, and Great Basin sagebrush meet and blend (USDA FS, n.d.e). The LNF also contains two river systems (the Susan and Feather Rivers), many lakes, and volcanic landscapes (e.g., cinder cones and lava flows). The forest includes three U.S. Department of Agriculture, Forest Service ranger districts—Almanor, Eagle Lake, and Hat Creek—with lands surrounding Lassen Volcanic National Park and including

three designated wilderness areas: Caribou Wilderness, Ishi Wilderness, and Thousand Lakes Wilderness (fig. 8.1). To the northwest lies the Shasta-Trinity National Forest, and to the southeast is the Plumas National Forest.

The seven counties¹ of northeastern California surrounding the LNF are diverse, ranging from the third least populous county in the state (Modoc) to Butte and Shasta Counties (with populations that are more than 200,000 and 150,000, respectively, and home to the metropolitan areas of Chico and Redding, respectively). Government is the largest employer in the region and in five of the counties, and the second largest (after health-care and social assistance) in Butte and Shasta Counties (Headwaters Economics 2023). Aside from a handful of

¹ Butte, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Tehama Counties.

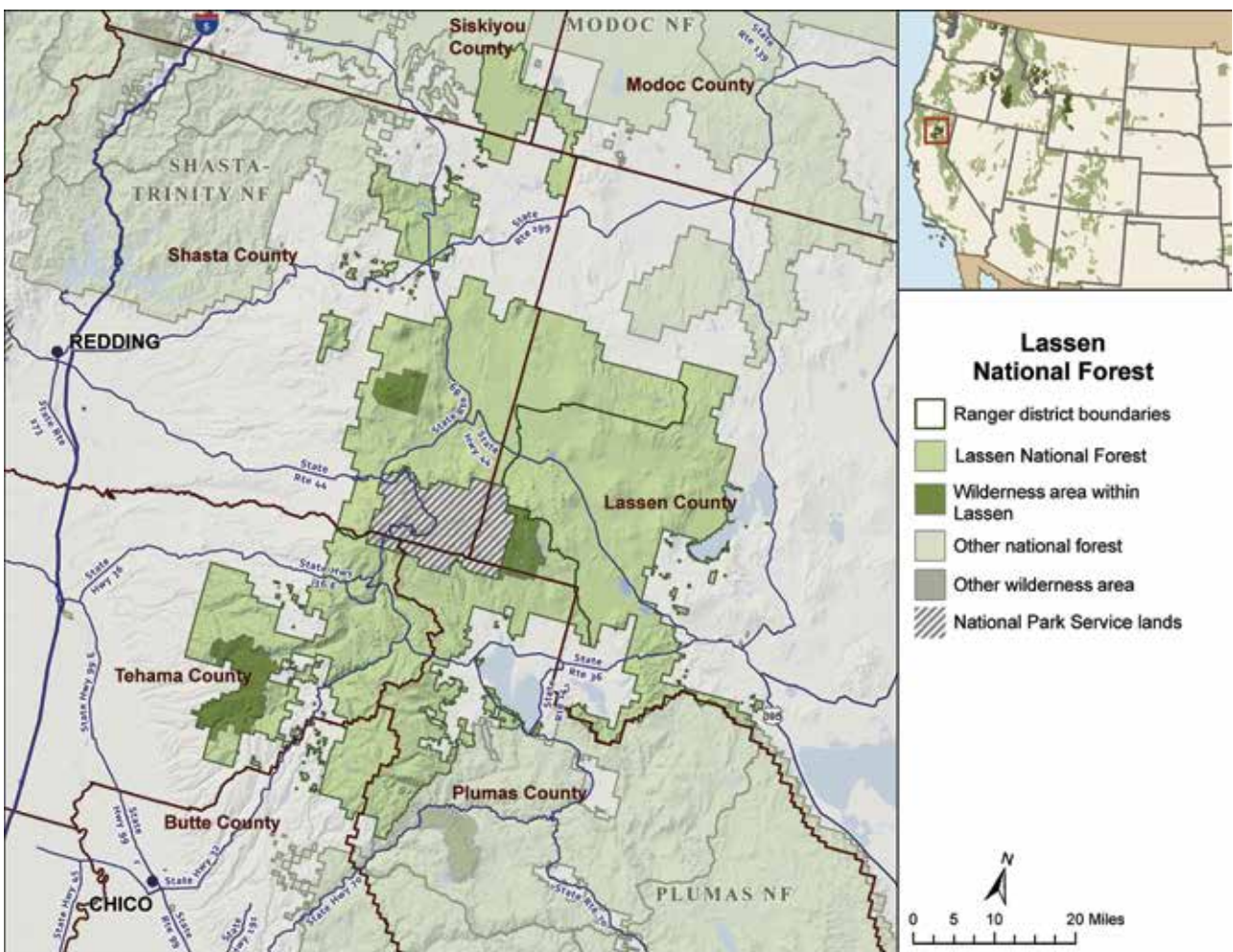


Figure 8.1—Lassen National Forest, California. Map by Abigail Kaminski.

smaller urban centers, the region remains predominantly rural, with federal lands making up more than half of the land area. This region has predominantly voted Republican in recent elections—in contrast with much of the rest of California.

The LNF is managed for multiple use, with significant timber, recreation, grazing, and conservation concerns (USDA FS, n.d.e). Livestock grazing has taken place in the region since before the establishment of the national forest, with transient sheep production giving way to cattle beginning in the late 1920s. Since the 1970s, however, a process of “recombining and eliminating uneconomical allotments” took place, with former sheep ranges converted to cattle or closed because of riparian and other resource management concerns (Menke et al. 1996). The 1992–1993 Land and Resource Management Plan identified about 410,000 acres “suitable for livestock grazing,” a mixed landscape including annual grasslands, meadows interspersed with timber, and sagebrush and perennial grass meadows (USDA FS 1992: 3–17). In 2022, the LNF had 17 active permittees grazing a total of 32,853 cattle across the forest’s 43 active allotments, generally from June through October (with no sheep grazed on the forest) (table 8.1). In 2019, the LNF supported an estimated 890 local jobs, representing \$41,121,000 in local labor income and \$59,332,000

in gross domestic product, with 270,000 recreational visits and significant timber production (23,765 hundred cubic feet [CCF] of sawtimber and 25,113 CCF of fuelwood) (USDA FS 2022). The LNF grazing program supported an estimated 40 local jobs, representing \$1.2 million in labor income (USDA FS 2022).

Gray wolves (*Canis lupus*) were extirpated from California in the 1920s but began returning via dispersal from source populations in the Pacific Northwest in the early 2010s. The collared Oregon wolf known as OR-7 entered California in late 2011, the first wild wolf in the state in almost 90 years. Several more radio-collared wolves—along with an unknown number of uncollared dispersers—have since arrived. The first pack established in California was the Shasta pack, formed from uncollared animals in Siskiyou County. The Shasta pack was first and last detected in 2015 and is believed to no longer exist—the leading theory regarding this disappearance is illegal removal via a poisoned livestock carcass (CDFW, n.d.b). In 2016, a new pair of wolves arrived on the LNF, with a litter the following year—additional packs continue to form from its offspring and other dispersers (CDFW 2022). Given wolves’ recent arrival and their relatively small numbers, wolf-livestock issues in California have been a low-level concern for U.S. Department of Agriculture, Forest Service

Table 8.1—Summary of wolf and livestock statuses for the Lassen National Forest (LNF), California

Fast fact	LNF data
Estimated year first resident wolf pack reestablished in California	2015 (first wolf arrived 2011)
Estimated year first resident wolf pack reestablished on the LNF	2017
Estimated wolf population in California, 2021	3 packs, at least 16 wolves (CDFW 2023b)
Estimated wolf population on the LNF, 2021	1 pack, at least 6 wolves (CDFW 2023b)
Number of permittees with active grazing permits on the LNF, FY 2022	17 ^a
Number of grazing allotments on the LNF, FY 2022	43 active, 10 vacant ^a
Number of permitted cattle (and HM), FY 2022	Cows with nursing calves: 29,809 (81,458 HM) ^a Mature cows with no calves: 2,771 (7,028 HM) ^a Yearlings (9–18 months): 222 (909 HM) ^a Bulls: 51 (114 HM) ^a
Number of permitted sheep (and HM), FY 2022	None ^a
Number of permitted horses and burros (and HM), FY 2022	None ^a
Estimated number of allotments on LNF where wolves were present, 2020	8–10 ^b
Estimated impacts of wolves on the LNF, 2020	3–4 permittees affected ^b

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a Data source: U.S. Department of Agriculture, Forest Service, Rangeland Information Management System (internal database).

^b Data source: survey respondents corroborated where possible through interviews. Numbers have not been independently verified and may vary over time.

managers thus far, but expanding populations promise greater wolf-livestock interaction going forward.

This case study is based on research methods discussed in chapter 2, including surveys, interviews, and literature and document review. We interviewed 12 individuals associated with wolf-livestock conflict on the LNF, including 4 national forest employees (1 biologist, 1 staff officer, and 2 range specialists); 3 representatives of the California Department of Fish and Wildlife (CDFW); 1 representative of the University of California Cooperative Extension program; 1 representative of the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS); 1 California environmental nongovernmental organization (NGO) director working on wolf issues; and 2 regional livestock producers. We supplemented interviews with data from other sources, including agency websites, reports, and scientific literature.

Wolves and Wolf Management in California

Wolves in California remain in the early stages of population recovery, with strict state-level protections under the California Endangered Species Act in addition to federal Endangered Species Act (ESA 1973) protections—there is currently no allowable take (i.e., lethal control, hunting, or harassment) of wolves in the state. CDFW manages wolves according to a state management plan developed in 2016 by the California Wolf Stakeholder Working Group (CDFW, n.d.a). There are currently no federally mandated population goals for wolf recovery in California; CDFW's mandate is to manage the species to the point at which listing under the California Endangered Species Act is no longer warranted (Kovacs et al. 2016). For a history of California's known wolves, see *California's Known Wolves—Past and Present* (CDFW 2022) as well as CDFW's gray wolf website (CDFW, n.d.b). CDFW management includes a collaring and monitoring program as well as public education and communication in collaboration with stakeholders and other agencies. WS plays a key role in the promotion and provision of tools and techniques to interested producers through the state's nonlethal coordinator (Strong 2019, USDA APHIS 2020). Prior to 2021, there was no compensation in place for livestock losses, although CDFW recently launched a wolf-livestock compensation pilot program (CDFW 2021).

The Lassen pack uses a broad area of western Lassen County and northern Plumas County, including portions of

the LNF (fig. 8.2), with a home range of about 332 square miles, a drop from an estimated 500 square miles following the Dixie Fire (CDFW 2023b). As noted, this was the second wolf pack documented in the state, although one or more wolves may have been in the area for several years prior to CDFW detection and formal recognition. According to CDFW's wolf specialist, the original breeding male (CA-08M) was the offspring of OR-7, while the breeding female (LAS01F) may have come from Wyoming (see California Wolf Center, n.d.). The Lassen pack had its first litter in 2017 with four pups, and has had at least one litter each year since: five pups in 2018, five pups in 2019, two litters (a total of nine pups) in 2020, five pups in 2021, and five pups 2022 (for additional demographic details, see CDFW 2023b). According to the Center for Biological Diversity, the pack now has “at least a dozen family members” (Petri 2022).

Wolf-Livestock Conflict in California

Thus far, wolf predation on livestock in California has been limited to a handful of producers given the relatively low population and limited range of wolves in the state; as one WS representative noted, “...maybe a dozen different livestock producers [have] had problems with them” based on proximity. Opposition from producers is primarily framed around livestock loss and the economic impacts of predation, yet even “fairly low” numbers are experienced as a significant change from the past. As one LNF biologist noted, “For 90 years... nobody in California had to deal with wolves...; when they came back..., I was surprised by the immediate animosity.” Impacts vary by scale of production; while bigger operators can take losses and still make a profit, smaller operators often cannot. As one Forest Service rangeland management specialist put it, “If it was 100 head and they killed 10, that's 10-percent loss. If they kill 10 but you have 300 head, that's only 3-percent loss.”

Even for producers yet to experience losses, there is a sense of looming threat in the face of increasing wolf numbers and range. As one CDFW biologist noted, “It's like the boogeyman's coming in.” California ranchers contend with other predators (e.g., black bears and mountain lions), but wolves are “new,” according to one WS representative,

They haven't been here long enough. They [livestock producers] know what the bear does, they know what the lion does, and the impacts they've had from that. They don't know what the impacts will be from these wolves.



Figure 8.2—Approximate area of gray wolf activity in California, May 2023. This map displays the approximate boundaries of known resident California wolf territories based on the best available data (e.g., GPS collar locations, trail camera images, tracks, and confirmed sightings). The locations of dispersing wolves are not included, as dispersing wolves travel widely and their movements are unpredictable. Source: CDFW (2023a).

Both a Forest Service rangeland management specialist and a University of California Cooperative Extension director noted that ranchers have generally been “not thrilled” about the return of wolves, while an environmental NGO director emphasized the challenges of “having one more predator on the landscape,” particularly given “razor-thin” economic margins.

The California Cattlemen’s Association has a wolf working group, but one Forest Service ecosystem staff officer noted that many members “didn’t even participate” with earlier collaborative efforts because they “didn’t wanna give credence to having wolves on the landscape.” For some ranchers, losing

any animals to wolves is unacceptable—a position that can make collaboration and adaptive efforts toward coexistence a challenge. Attitudes toward wolves can tend toward the hyperbolic (Houston et al. 2010). The uneven impacts of wolves—varying based on pack structure, geography, prey base, livestock management practices, and socioeconomic context, among other factors—are difficult to separate from other pressures on producers. Some permittees noted that wolf impacts might be “the straw that will break the camel’s back in terms of us eventually walking away from those allotments.”

CDFW has sought to learn from other states’ experiences and head off controversy through active stakeholder

involvement. This has included collaborative creation of the state wolf management plan between 2013 and 2016 (Kovacs et al. 2016); as an environmental program director noted, despite “very diverse views” most of those involved were “singing from the same hymn book.” Environmental organizations such as Defenders of Wildlife have expressed respect for CDFW for taking the lead on collaboration and facilitation, in turn seeking to work “directly with live-stock producers” and “more closely...with the agencies” following a “pragmatic” and “solutions-oriented” approach. Notably, there is no longer a formal working group active around wolf issues in the state, perhaps because of existing strict protections. While CDFW has continued to track the impacts of wolves, collaborating with WS to conduct investigations of suspected livestock predations—reports are available on the CDFW website dating back to 2015—there are no direct management interventions in place for responding to instances of predation nor, prior to late 2021, any funds available for livestock loss compensation.

According to our interviewees, both hunters and ranchers express concerns for the future given uncertainty surrounding the long-term impacts of growing wolf numbers on deer, elk, and antelope populations. As one LNF permittee put it, “I guess that’s part of the fear... as these wolves become established, they’ll be more dependent on livestock rather than the native wildlife.” One LNF district biologist commented on the state’s “handicap” in managing large predators, generally, and potential tensions with current practices around deer management. However, despite the wishes of some rural residents and livestock producers, it appears unlikely that lethal control—much less wolf hunting seasons—will be enacted in the foreseeable future, given state policies around other megafauna predators and the broader political climate in California. For instance, relatively numerous black bears are subject to a limited hunting season and depredation permitting, while mountain lions have special protections under the California Wildlife Protection Act,² prohibiting hunting or take with limited exceptions.

Despite the unavailability of lethal management tools in California, Forest Service agents noted “surprise” at “the lack of poaching,” particularly given rumors surrounding the disappearance of the Shasta pack. One rangeland management specialist explained that,

I certainly hear guys in the coffee shop talking about...the old three S’s... shoot, shovel, and shut up..., but I really don’t see any of them doing it. I think it’s just—there’s too much risk.

However, given the strict protections of the California Endangered Species Act and CDFW management policy, there may be greater motivation for producers to use nonlethal tools and techniques as wolf populations increase.

As in much of the world, wolf conflict in California is a terrain over which other social struggles play out, including urban-rural divides, antigovernment attitudes, and broader political polarization. Reactions appear to divide along geographical and livelihood lines. Among the general population of the state, there has been a good degree of interest in returning wolves based on their novelty, “romantic interest,” and wilderness associations. It is “neat” to have wolves back, as one WS representative put it, even if few have seen them. For many rural residents, however, animosity was immediate, with livestock producers viewing wolves, as an environmental NGO director noted, as “another thing that [they] have to deal with.” Northeastern California, where wolves have thus far largely settled, is broadly conservative, with local fish and game commissions at times publicly “against wolves,” making local discourse “a one-sided conversation,” according to one LNF wildlife biologist.

Wolf-Livestock Conflict on the Lassen National Forest

A few large livestock operations account for most of the grazing on the LNF. Cattle graze on mixed terrain, across timbered and dry open areas, sagebrush, and hilly regions, and animals are typically dispersed on the landscape to reduce range impacts. The average rancher in the region sees their cattle every couple of weeks—ranging from every few days to a few times a season. The Forest Service administers 10-year grazing permits, conducts range-land monitoring, and performs day-to-day administration during the summer field season, but is otherwise relatively hands-off. One district wildlife biologist on the LNF noted, “Our range staff does not closely manage permittees or the animals.” A rangeland management specialist explained, “We allow them to graze.... Then they have to manage... their cows their own way. We’re not telling them where to put them, how many to put here or there.”

The Lassen pack’s territory is primarily on the Eagle Lake Ranger District and parts of the Almanor Ranger

² California Wildlife Protection Act of 1990; Proposition 117.

District, overlapping with the Plumas National Forest to the south (fig. 8.3). According to our survey data, the pack occupies “some” of the suitable habitat on the LNF. Livestock predations on the forest generally occur midsummer through fall over a limited range. Survey responses characterized Lassen pack predation impacts as “moderate,” affecting 8 to 10 allotments and 3 to 4 permittees. Anecdotally, however, the LNF has not seen either heavy predation or intense livestock stress responses. Given relatively low population numbers and limited range, it is difficult to determine specific circumstances affecting predation patterns.

Producer attitudes around wolves vary. Some have had hardly any trouble: “At this point, the wolves are just kind of a side note,” while others rank wolves as a major concern: “up there at the top.” As one permittee noted, “I suppose if it’s one pack, it’s not the end of the world, but who knows how far that’s gonna go?” Another mentioned, “There’s essentially one wolf pack up there that’s wreaking havoc. If there were three or four, I could only imagine the devastation.” For Forest Service employees, wolf issues have remained at most a minor concern. One district wildlife biologist explained, “Depredation is not even a Forest Service issue, it’s a state issue.” This reflects the fact that

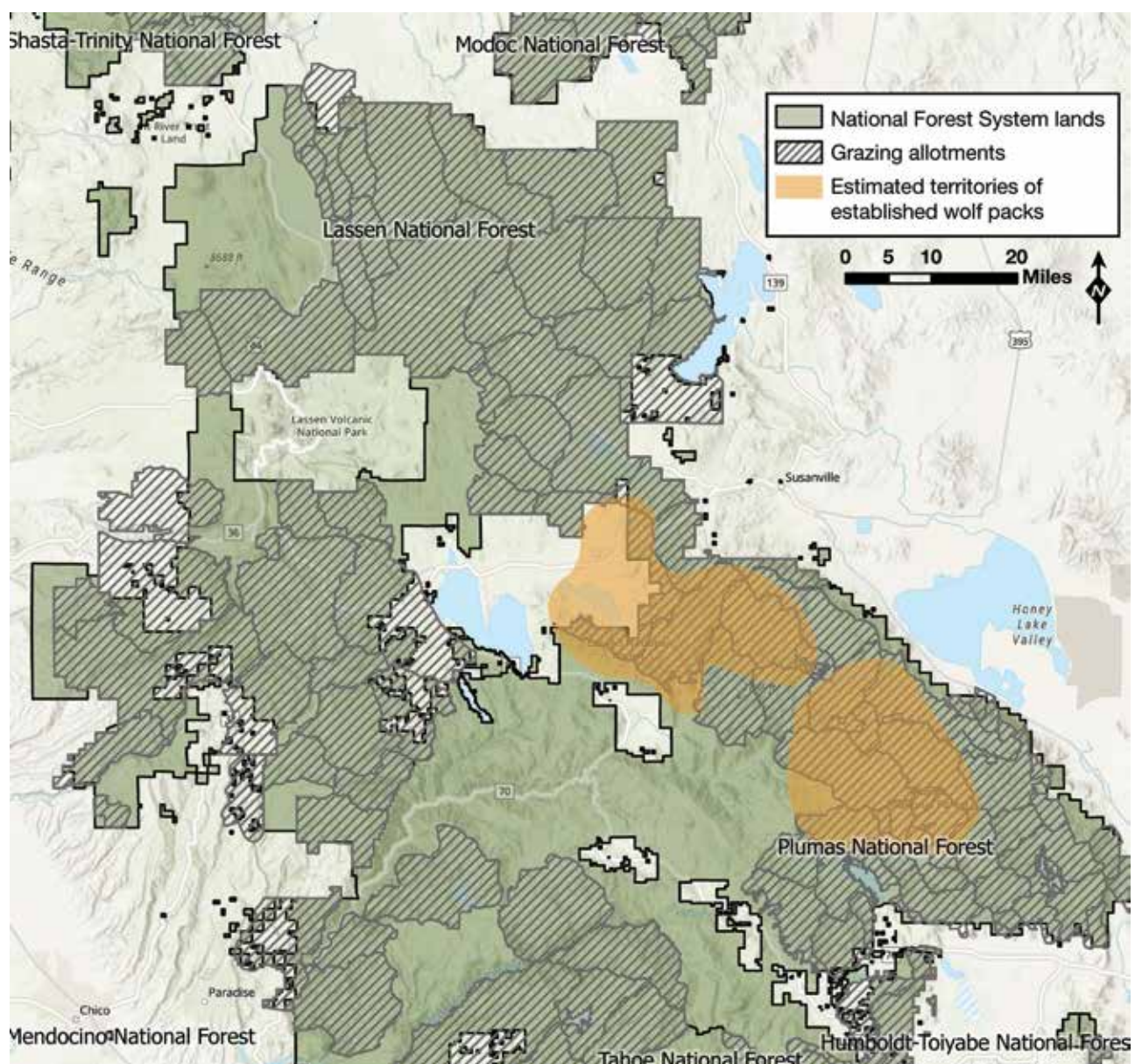


Figure 8.3—Estimated wolf pack territories on the Lassen National Forest and neighboring areas (CDFW 2023a), overlaid on U.S. Department of Agriculture, Forest Service grazing allotments. Pack territories represent the minimum known groups of wolves at the time of the monitoring effort and are likely to vary from year to year. Map by Robert Anderson.

CDFW, rather than the Forest Service, manages wolves in California. This attitude, however, fits with a broader hands-off approach to range issues on the part of LNF managers. Forest Service rangeland specialists expressed a lack of knowledge regarding producer decision-making and practices: “I don’t know how much they’re doing as far as... gathering [cattle] up or doing all the things they recommend. I just don’t have that information. They’re not telling us.” While such an approach is thought to keep forest leadership and ranchers happy—“a good range program is a quiet range program,” according to one district biologist—it may run counter to reducing predation, and hence the long-term interests of livestock producers, as wolf populations continue to expand. Nevertheless, these sentiments also likely reflect the low levels of wolf-livestock conflict on the LNF to date.

Approaches to Managing Wolf-Livestock Conflict on the Lassen National Forest

As noted, under both the federal and state Endangered Species Acts listing protections, there is currently no lethal management of wolves in California, putting the emphasis instead on nonlethal tools and techniques for reducing wolf-livestock conflict. These include reconnaissance, husbandry, and deterrent strategies (table 8.2) (see Martin 2021b, Stone et al. 2017). When livestock predation occurs, WS partners with CDFW to verify damages, and increasingly works to provide tools and training via the state nonlethal coordinator position (Strong 2019, USDA APHIS 2020). Permittees have generally expressed a positive view of WS, whose agents serve as “trusted partners” in the promotion and deployment of tools such as fladry and range riding, according to an environmental NGO director. However, given the limited geography of recovering wolf populations

and the relatively small number of affected producers, there has yet to be significant demand. As one WS representative put it, “We’re just getting our feet off the ground here.”

For CDFW, there is no difference in management between public and private lands. However, the “tools are different,” according to a University of California Cooperative Extension director, given the scale, remoteness, and terrain of National Forest System lands. Or, as an environmental NGO director put it, “We’re not gonna be putting fladry up on a 60,000-acre allotment.” The Forest Service has thus far played a minimal role around promotion of nonlethal tools and techniques: “...they just seem like they weren’t really involved,” according to a CDFW wolf specialist. WS has also not worked to deploy tools on Forest Service lands “because there’s [been] no request for that yet.” As mentioned, Forest Service managers frame predation as “a state issue” and “commitment-free” for the LNF, according to one district wildlife biologist, at least so far. Another rangeland management specialist confirmed: “Right now, it’s not a huge problem... We haven’t really been too involved.” Work is limited instead to helping the state “keep tabs on these animals” and “passing on the word” from CDFW to permittees via in-house biologists.

CDFW, in turn, provides guidelines to the Forest Service regarding “working around wolves” and areas to avoid when grazing. “They tell us where the rendezvous points are, what areas to avoid,” according to one rangeland management specialist. The Forest Service communicates this to permittees, although another rangeland management specialist noted, “We pretty much just refer them to the state for all the legal things.” According to our 2020 survey, there is conflict prevention language in allotment management plans limiting operating periods and restricting livestock activities within a designated distance from places with high wolf activity, such as wolf dens and rendezvous sites.

Table 8.2—Approaches for managing wolf-livestock conflict on the Lassen National Forest

Approach	Implementor(s)	Perceived effectiveness among interviewees
Human presence (range riding)	WS, permittees	Mixed. Promoted by environmental nongovernmental organizations and WS, but some producers express skepticism.
Nonlethal deterrents (fladry, Foxlights, “scare boxes”)	WS, permittees	Early stages statewide, largely on private lands. Limited use on national forest given scale and costs (“no request for that yet”).
Wolf monitoring and communication (cameras, radio collars, public reporting)	CDFW, Lassen National Forest, members of the public	Data on wolf movement and presence viewed as important; valued by permittees, “very helpful,” but time lags can create problems. For CDFW, “public reporting is a great tool.”

CDFW = California Department of Fish and Wildlife; WS = U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services.

Reconnaissance

CDFW conducts camera- and collar-based wolf monitoring, the former in collaboration with the Forest Service. Such methods provide important data on wolf movement and presence, supplemented by public reporting—“Public reporting is a great tool,” noted one CDFW wolf specialist—on-the-ground tracking, and demographic extrapolation. Collar data, while not in real time, are a valued source of information for permittees, as one noted, wolves will “show up in the area, and...they [CDFW] get a feel for them if they’re just passing through, or... they’ll say, ‘Well, you might need to go check this’... They communicated that, and that’s very helpful.” However, monitoring wolf populations is complex and costly, given growing numbers. Only some wolves are collared, and between dispersers and communication lags, problems can arise. As another permittee noted, “It’s effective for the ones that are collared to the extent that we can get the data [from CDFW]... I mean, that’s helpful, and we go and find dead cattle, but it’s a little bit too late.”

Husbandry

Only cattle are currently permitted to graze on the LNF, so livestock guardian dogs (often used with sheep production) have been absent there, although research efforts with other dog breeds are being piloted. Carcass removal and composting are often used on private lands, according to one permittee: “more in the winter, on the feed grounds.” However, one WS representative noted that “there’s no real system worked out yet in California for [carcass removal],” particularly given the logistical challenges of extensive federal lands and black bear scavenging. One permittee on the LNF remarked that

the bear population is pretty substantial in California right now, and so the wolves would make a kill, and we couldn’t even document that it was a wolf kill because the bears would come right in... They eat practically bones and everything.

Attitudes toward range riding in the state have been mixed. Some environmental NGOs and WS have promoted the practice, but so far it “hasn’t been well embraced,” according to a University of California Cooperative Extension director. Many producers expressed skepticism around the effectiveness of riders on the region’s heavily wooded terrain, especially with wolves more active

at night and riders using daylight hours. There was also hesitation with having “somebody strange coming in, and going through their cows,” according to a WS representative, and one permittee even referred to it as “kind of a joke.” Other permittees, however, have had success with range riding, but generally when they were already actively managing grazing (and absent any specific training for working alongside wolves).

Deterrents

On private lands, according to our interviews, WS has used fladry along with “scare boxes” (which produce random patterns of noise) and Foxlights (which do the same with light) to deter wolves, emphasizing using these tools in combination to increase their effect and reduce the likelihood of habituation. Many interviewees, however, noted limitations of deterrents, which are particularly labor intensive on more extensive public range. As one WS representative noted,

If you only have one scare box, it might be placed in one area, and then the other area might get hit. ...There’s a lot of man-hours put out for it, a lot of maintenance... you just don’t put it up and walk away from it... if you’re only out there once a week or maybe once every two weeks, there’s a lot that could go wrong with it.

Fladry is also “not cheap,” the WS representative noted; it costs about \$700 per quarter mile, with electrified turbo fladry costing even more. According to our interviews, Defenders of Wildlife has played a key role in purchasing and providing fladry to WS and CDFW, and WS has a trailer to store, organize, and move the “bulky and awkward” fladry around the state. Yet despite limitations, fladry does appear to be effective when people “know what they’re doing,” according to one state biologist, and when cattle are trained to it. As CDFW staff noted, “So far we’ve not had an incident with fladry” and “we haven’t had a kill within fladry in California yet.” However, given the scale and remoteness of Forest Service grazing lands, usage has been largely limited to private holdings.

Thus far, nonlethal tools and techniques developed elsewhere in the region have been used to only a limited extent in California, and even less so on the LNF. Producer attitudes toward these tools are “really variable,” with some convinced “there’s no point in it,” as a University

of California Cooperative Extension director noted. One rancher specified that “there’s just nothing that we can do” on Forest Service lands. The same director noted that others “are very open and willing and want to try almost anything, because they see it as a potential growing issue,” even seeking out tools from WS directly. Most are “in the middle,” however, “just seeing how it goes” and exploring new strategies based on “word of mouth.”

When ranchers deploy these tools themselves it “really helps,” given WS’s minimal staffing. Yet producer skepticism—often based on stories rather than direct experience—can undermine efforts. Still, both permittees and managers expressed appreciation for those state and federal employees putting in the work to communicate and build relationships, somewhat regardless of the effectiveness of the tools themselves. As a WS representative noted,

That, to some producers, means a lot, that somebody’s trying to do something instead of just feeling like they’re out there by themselves. There’s been producers that may not have a lot of faith in it [nonlethal approaches], but they always ask for it the next year.

Summary and Key Findings

Wolf recovery in California is still in its early stages. CDFW has attempted to learn from the experiences of other states—“we have the benefit of coming last,” according to the state’s wolf specialist—while contending with the particularities of California politics and regulations. Although it may be too early to give advice to those concerned with wolf return, managers and stakeholders have an eye toward the future. Wolves seem set to continue increasing in population and range; indeed, between the beginning of this study and the time of writing, California has gone from one to three documented packs. While it is unlikely that ranchers will ever be completely accepting of wolves—“there’s always gonna be a level of uneasiness,” according to a University of California Cooperative Extension director, and CDFW expects wolf-livestock conflict to continue—producers and agencies can “continue learning and be adaptive” amid dynamic circumstances.

Given this uncertainty, many stress the value of communication for reducing misinformation and fear. This includes timely sharing of information on wolf presence by CDFW and between the Forest Service and permittees, as well

as collaboration between agencies and with livestock producers. Listening to producer concerns and promoting respect, trust, and transparency (e.g., around the limits of what agencies such as the Forest Service can and cannot do) were seen as essential, with successes attributed to the efforts of “a handful of state employees” who do good work with limited budgets. As one district biologist noted, “I think they’ve done a remarkable job given all the limited resources they have.” These efforts are often limited by a lack of adequate staffing and resources, both at the state level—one rangeland management specialist noted, “I haven’t heard from the state folks at all, but we do invite them to our meetings [with permittees]”—and at the Forest Service, which has seen the retirement of key range program staff. As a University of California Cooperative Extension director put it, “There’s limitations in terms of number of people and capacity to be everywhere.” Similarly, nonlethal tools and techniques, the only management interventions available to producers under the California Endangered Species Act, have associated costs: labor, time, resources, and the growing pains associated with shifting long-established practices. For some LNF permittees “on the seasoned side of the age spectrum,” according to one LNF ecosystem staff officer, “it’s gettin’ to be too much work.” Others demonstrate “a reluctance to change habits,” as a district biologist put it. There was widespread recognition among interviewees of the need for a longer-term economic compensation program for livestock predation, which was discussed in environmental justice tones—as one permittee put it, “I don’t think it’s fair that cattle producers bear 100 percent of the cost.”

Unlike with other listed or sensitive species, having wolves on the LNF has thus far not significantly affected Forest Service range program workloads. Most managers have not yet had to consider wolf issues as a problem for the Forest Service specifically, leaving grazing management unchanged and decisions relating to wolf-livestock interactions and conflict management up to permittees and the state. Yet because “something has changed in the system,” as an environmental NGO director noted—and given the known and expected impacts of wolf presence for permittees—changes in grazing management practices on allotments and in Forest Service managers’ roles in conflict mitigation may soon be required. As the agency in charge of the landscapes where wolves and livestock are most likely to encounter each other, particularly in the summer

months, there is an opportunity for the Forest Service to play a more intentional and active role. Some environmental organizations recommend stricter requirements (e.g., use of nonlethal tools in permits and allotment management plans or annual operating instructions) and better enforcement (e.g., conducting overdue allotment monitoring and National Environmental Policy Act [NEPA 1969] analysis) and point to the role that the Forest Service can play in facilitating shifts in producer practices toward coexistence. Some LNF staff noted that a clearer stance around grazing standards and guidelines, including “proper range management” and greater flexibility around use, timing, and movement of livestock (perhaps via “reserve allotments,” as an environmental NGO director suggested), might help promote wolf-livestock coexistence and Forest Service multiple-use aims. Coexistence doesn’t mean zero impacts or no change from the past. It will likely require, as a University of California Cooperative Extension director noted, “some layer of extra management and expense involved in grazing livestock” as well as more active engagement and learning on the part of Forest Service managers.

Chapter 9: Cross-Case Comparison

The return of wolves to the American West presents new challenges and complexities for the governance and sustainable management of federal grazing lands, as both producers and managers confront the presence of another predator on the landscape whose future impacts on livestock are uncertain. Sharing landscapes with recovering wolf populations can affect land access and use: as one manager on the Lassen National Forest noted, wolves bring with them “a disruption of [ranchers’] usual routines,” including the potential of no longer “being able to graze as much as they would have.” For U.S. Department of Agriculture, Forest Service managers, wolves add a new factor in calculations around multiple-use management and raise questions about the roles and responsibilities of Forest Service resource managers in mitigating conflict on federal grazing allotments vis-à-vis those of other agencies and institutions involved with the wolf question.

Wolf presence and grazing programs differed among case study national forests in important ways (table 9.1). Idaho, Montana, and Wyoming have had wolves for at least a decade longer than Oregon and Washington, and for at least two decades longer than California. Nevertheless, wolf population numbers on the national forests that we studied in these states were roughly the same, except for the Lassen National Forest in California, where wolves didn’t become established until 2017 (one wolf pack, at least 6 wolves). The number of permittees with active grazing permits varied widely across national forests, as did the number affected by wolves.¹

Interviewees offered a wide range of explanations that may account for the apparent differential impacts from wolf presence, including the following, among other factors:

- Differences in the geography and local density of wolf and livestock distribution on allotments
- Livestock class grazed (e.g., sheep versus cattle)
- Approaches to grazing management

- Use of lethal or nonlethal tools and techniques for conflict deterrence
- Behavioral adaptations by wolves (e.g., to be “more aggressive” or “more leery”)
- Local prey abundance
- Definition of what it means to be “affected” by wolves

Interviewees also noted that many of these factors are likely to change over time as wolf populations begin to stabilize within a region over the years following their initial establishment, and livestock, wolves, and people begin to adapt to one another’s presence. While the high levels of conflict reported on the Wallowa-Whitman and Colville National Forests align with some interviewees’ perceptions of a typical conflict “trajectory”—an initial spike in conflict followed by a “leveling-off” over time—it is important to note other key differences between these cases, especially the social and policy context of the relevant states (discussed below). Further research, ideally using a longitudinal study design, would be needed to address in detail how the above factors interrelate, and whether and how those factors lead to changes in wolf impacts over time (cf. Pettersson et al. 2021).

Importantly, we also observed that cross-case differences entail not only differences in wolf impacts on livestock but also differences in human perceptions and definitions of conflict and coexistence. One national forest may have high levels of sociopolitical controversy surrounding wolves, despite relatively low levels of livestock predation. Another national forest may have high levels of livestock predation but relatively low social conflict, arguably due to a degree of shared public support for management policies and practices. However, other national forests may experience social conflict or controversy over the same or similar management policies, leading to conflict in both social and ecological dimensions. Such differences are difficult to assess in the absence of greater cross-regional dialogue and common metrics—another space for future research.

This report represents a first step toward a comparative analysis of the various efforts to address wolf-livestock conflict and coexistence, which are too frequently siloed into their local contexts, not only in the American West but around the world (see Bisi and Kurki 2008, Ghosal et al. 2015, Rutherford 2022, Zscheischler and Friedrich

¹ Despite roughly similar wolf population numbers reported on the five national forests (all our cases minus Lassen), the percentage of permittees affected varied widely, from about 5 percent on the Beaverhead-Deerlodge National Forest to most if not all permittees on the Colville and Wallowa-Whitman National Forests. However, our survey did not include a precise definition of “affected,” allowing for a great deal of interpretation by our respondents, and so such comparisons are not necessarily useful.

Table 9.1—Cross-case comparison of wolf and livestock statuses for case studies on national forests (NF) in six American West states^a

Wolf and livestock statuses	Idaho (Boise NF)	Montana (Beaverhead-Deerlodge NF)	Wyoming (Shoshone NF)	Oregon (Wallowa-Whitman NF)	Washington (Colville NF)	California (Lassen NF)
Estimated year first resident wolf pack reestablished in state	1995/1996	1979	1996	2008	2008	2015 (first wolf arrived 2011)
Estimated year first resident wolf pack reestablished on the national forest	1995/1996	1996	1996	2008	2009	2017
Estimated wolf population in the state ^b	About 1,270 wolves	1,144 wolves, 192 packs	At least 314 wolves, 40 packs	At least 178 wolves, 38 packs	At least 216 wolves, 37 packs	At least 16 wolves, 3 packs
Estimated wolf population on the NF (as of most recent monitoring effort)	8–12 packs	About 10 packs	72–112 wolves, 12–14 packs	At least 69 wolves, 14 packs	At least 73 wolves, 15 packs	At least 6 wolves, 1 pack
Number of permittees with active grazing permits on the NF, FY 2022	35	215	61	92	28	17
Number of grazing allotments on the NF, FY 2022	46 active, 12 vacant	224 active, 18 vacant	92 active, 2 vacant	105 active, 19 vacant	43 active, 14 vacant	43 active, 10 vacant
Number of permitted cattle, all classes combined, FY 2022	113,887 HM	390,946 HM	118,299 HM	130,276 HM	28,025 HM	89,509 HM
Number of permitted sheep, all classes combined, FY 2022	283,883 HM	19,825 HM	2,004 HM	15,118 HM	0	0
Number of permitted horses or mules, FY 2022	1,747 HM	1,176 HM	2,012 HM	296 HM	0	0
Estimated number of allotments on NF where wolves were present, 2020	50	About 100	Most allotments in the northern portion of the NF	About 75 percent of allotments	Most, if not all, allotments	8–10
Estimated number of permittees affected by wolves on the NF, 2020	3 sheep producers, 1 cattle producer (11 percent)	10 (5 percent)	About 25 (41 percent)	Most, if not all (90–100 percent)	Most, if not all (90–100 percent)	3–4 (18–24 percent)

FY = fiscal year; HM = head month, which is one month that one animal (one adult cow, cow/calf pair, or horse; or five sheep or goats) spends on National Forest System lands (USDA FS 2020).

^a See individual fast facts tables (first table in each case study chapter) for data sources and further details.

^b As of most recent monitoring effort. Wolf population monitoring varies from state to state. See box 9.3, below.

2022). In assessing these cases in relation to one another, our social science research reveals emergent, crosscutting themes that can be used in turn to guide future investigations and interventions around wolf-livestock conflict and coexistence on Forest Service lands and beyond. In what follows, we explore six key themes that emerged from a cross-case comparison:

- The key role of physical geography in wolf-livestock conflict and mitigation
- The regional and state-level social dynamics within which wolf-livestock conflict is embedded
- The economic constraints many permittees face in mitigating wolf-livestock conflict
- The variable state policy context of wolf management, which influences wolf-livestock conflict on national forests
- The social aspects of coexistence interventions
- The role of Forest Service managers in wolf-livestock conflict mitigation on federal lands

Physical Geography Matters: Large, Rugged, and Remote

Wolf-livestock conflict in the American West is a persistent feature across a range of landscape types. While concern often centers on the impacts of predation on privately owned livestock, much of wolf-livestock interaction—and hence conflict—takes place on federal lands owing to the historical geography of livestock grazing in the West (Rowley 1985). Such interactions often take place on national forest grazing allotments as livestock follow the “green up” from private ranches and U.S. Department of the Interior, Bureau of Land Management (BLM) lands in the winter to mountainous Forest Service ranges in the summer. The annual summer turnout of livestock onto grazing allotments can coincide with gray wolves’ reproduction cycles, which many interviewees perceive as contributing to a recurrent pattern of annual conflict. As one permittee on the Boise National Forest noted, “Our problems with wolves really start picking up... later in the summer, once those packs have a set of pups running around,” suggesting that conflict is the result of the wolves’ increased dietary needs. However, the timing of conflict varies from place to place, with some permittees and managers reporting relatively continuous conflict throughout the year and offering a range

of competing explanations for the spatial and temporal patterns of conflict.

In the years since wolf return, multiple government agencies and nonprofit organizations have made significant efforts to develop and deploy diverse tools and techniques aimed at reducing predation of livestock by wolves and thus seeking to mitigate conflict—mirroring and in conversation with carnivore-livestock conflicts and coexistence efforts around the world (Moreira-Arce et al. 2018, Much et al. 2018, Wilkinson et al. 2020). These interventions have, by and large, emphasized the **technical** side of coexistence, as seen in the suite of new deterrents now on offer for producers in the region (e.g., turbo fladry, Foxlights, radio-activated guard boxes) (see table 1.1). However, as we have argued elsewhere (Martin et al. 2021), the **location** in which these tools are to be used—specifically, federal grazing allotments—poses a different set of challenges for their deployment and effectiveness compared with the private lands context, a fact that has been largely overlooked. Interviewees from all six case-study national forests noted how the biophysical and topographic qualities of Forest Service grazing allotments, which we characterize as **large**, **rugged**, and **remote** landscapes, create particular and underappreciated obstacles for the deployment of conflict reduction interventions (Anderson et al., in press).

Our interviewees described many of the nonlethal tools and techniques recommended by advocates and agencies for reducing livestock predation as inappropriate or nonviable on extensive, rugged, and remote National Forest System lands. For example, fladry, although described by one U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) specialist in Idaho as “a very good tool in the right situation,” was widely observed to be unsuitable to most grazing allotment contexts. Producers and herders pointed to fence posts that were difficult to transport and deploy in roadless and rocky backcountry ranges, as well as the impracticality of fencing on larger scales. The same WS specialist pointed out that “the cattle are grazing in a 50,000-acre BLM allotment, or a 50,000-acre Forest Service allotment... There’s no way you could put fladry around all that. In those situations, it’s totally unrealistic.” Range riding, also perceived as an effective approach for reducing conflict if used with a consistent presence, was likewise limited by scale and terrain. One permittee on the Wallowa-Whitman National Forest noted,

It's steep. It's tough terrain... They would have to have riders just with those cows, moving them around all the time... [I'm] not saying that they couldn't do it, but it would almost be time prohibitive, cost prohibitive.

Similarly, livestock guardian dogs were generally well-regarded by sheep producers, but one former Boise National Forest employee pointed out that “the dogs have limitations” on allotments that are “topologically challenged... There's plenty of crooks and crannies and patches of vegetation... that sheep get lost in, or the dog just simply can't have the influence that you do in a broader, wider, open landscape.” Even new technological tools can be limited in the backcountry. As one former Idaho Department of Fish and Game (IDFG) researcher noted, “We have cameras that can send you an alert every time it gets a photo [of a wolf], but we don't have cell coverage in lots of parts.”

These landscape qualities also created challenges for lethal control. In Idaho, WS helicopters ran into difficulties in heavily timbered areas, making timely and effective wolf removal difficult (see box 9.1). One IDFG agent noted,

It's just been a real frustration for the livestock producers and Wildlife Services that [have] this control authorization. They're out flying, they're up trying to trap on the ground, but... you'll have a depredation here, and a week later there'll be one 20 miles away, and a week later there'll be another one...; the same producer will get hit every couple of weeks or every couple of months and... occasionally, you'll be able to pick one or two off. Then you can't find the rest.

Added to this, a common perception among producers was that wolf predation on livestock on national forests occurred

Box 9.1

Conflict Hotspots

Lethal removal is most often used to remove “problem wolves” to prevent recurrent depredations; it may also be used to reduce overall wolf population numbers to reduce impacts on livestock or to affect the behavior of surviving wolves (Anderson et al. 2023). However, many interviewees described some areas as “conflict hotspots”—places where livestock predation was a recurring chronic problem, sometimes even following full pack removal. Some of this was linked to ideas of “good wolf habitat” at different scales; hotspots could be a den or pack rendezvous site, or a valley with wolf-conducive conditions.

The exact reasons for, and mechanisms of, these dynamics remains unclear. It may be the result of sheer wolf numbers and “saturation” of habitat (i.e., relative wolf density in the region). As one Idaho Department of Fish and Game manager noted, once wolves are established in an area, “You can take a wolf pack out this year... and you can take it out again next year, but you'll have certain habitats that will always backfill.” Indeed, early arguments for wolf reintroduction from proponents of rewilding pointed to the central role of habitat “cores” where wolf populations could become established and from where they could disperse (Soulé and Noss 1998); yet when such core habitat areas are also

grazing allotments, this may lead to recurrent conflict. Prey availability may also play a role in the geography of conflict. Wolf packs may follow elk herds, which in turn seek the same forage as livestock. Alternatively, the absence of wild ungulates in an area may lead packs to prey on livestock. Competition from other carnivores, such as grizzly bears in Montana, might also affect wolf behavior and make it difficult to separate the impacts of different predators on livestock.

Conflict hotspots may also be related to the geography of allotments and grazing practices, with unattended livestock particularly vulnerable to attack in more rugged or remote locations. Some landscapes might be more prone to conflict because it is simply too difficult to defend livestock against predators there—what one manager on the Colville National Forest described as “indefensible landscapes.” Some point to these dynamics as motivation for closing certain areas to grazing entirely. However, livestock producers generally oppose such moves, particularly given a longer history of reductions in livestock numbers on federal allotments resulting from environmental regulations and in the absence of alternative available allotments or private range (e.g., Swette and Lambin 2021).

more frequently than was officially reported. Many interviewees suggested that a significant number of wolf-related livestock mortalities go uncounted because they are difficult to find in a timely manner given the large spatial scales of federal grazing allotments. Cattle may not have a human rider present with them for extended periods of time while on the federal range (in contrast with sheep, which require a herder), so herds are harder to protect, and losses harder to detect. Carcasses were not always found in time to confirm predation by wolves, if they were found at all. These gaps make accurately assessing wolf impacts on livestock impossible (cf. Martin 2021a and Kroepsch and Clifford 2022 on questions of uncertainty). They also pose problems for producers who would like to participate in state compensation programs (see below), which generally require locating a livestock carcass and showing evidence to verify that wolves were responsible. Moreover, different actors may have differing interests in improving these data; for example, dead livestock may be a source of shame for some producers, while others may see them as evidence to be tallied and mobilized in campaigns against state and federal wolf recovery programs.

The physical geography of national forest allotments also challenges the ability of permittees to mitigate conflict using livestock husbandry practices. Over the 20th century, range science developed norms of spreading cattle out over the landscape to avoid overutilization (Sayre 2017). However, predators create pressures to bunch cattle up to reduce vulnerability. As one Lassen National Forest manager noted, “You’re keeping them closer together... You’re having to ... graze them quicker than you normally would.” This practice in turn reduces weight gain and hence economic returns to producers. Forest Service grazing regulations, such as restrictions on bedding and night penning, may prevent the use of stock management strategies employed on other landscapes. Reducing stocking numbers and taking nonuse (temporarily not grazing an area) may also present problems; some of our interviewees expressed concerns that national forest requirements may lead to revocation of permits. Some of these tensions—including many of the challenges of large, rugged, and remote landscapes—might be resolved synergistically through more active and intensive grazing practices (Barnes 2015). However, the additional labor associated with such practices represents a significant cost for producers operating at low margins. Moreover, adaptations to livestock husbandry approaches often rely on a degree of regulatory flexibility (e.g., in adaptively adjusting allotment on/off dates

and pasture use to avoid areas of high wolf activity), which interviewees reported as a management challenge (Moir and Block 2001, Stankey et al. 2005, USDA FS 2002).

In sum, our findings indicate that management interventions must account for the material challenges and specificities of grazing on Forest Service allotments, and that further research and experimentation are needed to better adapt extant mitigation approaches to federal lands. Although perspectives on the efficacy of tools and techniques among our interviewees varied, anecdotal success stories point toward the need for approaches that are mobile, rather than fixed in place, and that aim to modify or affect wolf or livestock behavior in a more systematic way, rather than relying on disrupting individual attacks (Anderson et al. 2023, Wilkinson et al. 2020).

Wolf-Livestock Conflict Embedded in Broader Social and Political Dynamics

Another key finding concerns the broader social context in which wolf-livestock conflict takes place in different regions and states. The American West has long been a site of tension over natural resource management and use (Hays 1959, Wolters and Steel 2020). Over the latter half of the 20th century, profound socioeconomic transformations have also occurred, often described in terms of the emergence of a “New West” (Riebsame and Robb 1997, Robbins et al. 2009, Winkler et al. 2007). These transformations include the growth of western cities, shifting demographics toward a younger and more educated urban population, exurban development and migration focused around rural amenities, and the declining centrality of extractive industries, including livestock grazing. Such social and demographic changes are unevenly experienced, however, with some places changing more rapidly than others. For example, population and income levels around the Colville National Forest in Washington have grown much more rapidly than around the Wallowa-Whitman National Forest in Oregon as a result of amenity migration.

The West has witnessed multiple and divergent development paths as communities move away from resource-based economies, with implications for land and resource governance (Coughlan et al. 2022, Epstein 2020, Hines 2012). In this context, rural residents and especially ranchers often feel that not only their livelihood but their way of life is being threatened by economic and demographic

transformation, a dynamic that contributes to social conflict over the economic implications of environmental decisions. Amid ongoing economic shifts across the region and the perceived threat these pose to livestock-based livelihoods, wolves can be perceived as an additional cost, and become a terrain over which broader social conflicts are waged (Anderson 2022, Martin 2020, Skogen et al. 2019).

Wolves' history with people and their deep symbolic resonance have made them both an emblem of wilderness preservation and a scapegoat for regional economic anxieties (Donalson 2006, Lorimer 2015, Pluskowski 2006, Wise 2016). As one California wildlife manager put it, wolves come with significant "sociological baggage" and "stand for a lot more than themselves" (see also Marvin 2012, Nie 2003). Many ranchers and rural residents routinely describe the wolf as an intruder and threat, pointing to the historic role of ranching in the region (and often in their own family histories) as the baseline against which appropriate land use should be measured. In contrast, many environmental advocates point to a longer historical arc, noting that wolves are native to the region and were eradicated in the context of settler-colonial expansion to pave the way for (ongoing) resource extraction. In this way, the wolf question becomes one of belonging and nonbelonging—which species (as well as human activities) belong in which places, and which do not (Buller 2008, Philo and Wilbert 2000). As McInturff et al. (2021a) have argued, these competing narratives can perhaps best be understood through the application of an **environmental justice** lens, unpacking appeals to human and nonhuman belonging (and victimhood) in the context of power dynamics and histories of injustice and oppression, in which wildlife conservation is entangled (see also Margulies and Karanth 2018, Martin et al. 2019).

At the risk of oversimplifying these complex historical and political dynamics, contemporary social conflict over wolves in the American West often plays out along the familiar lines of a common urban-rural divide on issues of natural resource management. A particular arena of tensions concerns the relative authority of federal, state, and local governments to make resource management decisions, with rural resistance to wolf return often reflecting longstanding antifederal sentiments (and political movements) across the American West (Bryson and Wyckoff 2010, Charnley et al. 2014, Farrell 2015, McCarthy 2002, Swette et al. 2023). One Idaho environmental director explained, it's the federal versus state issue:

"These are the federal government's wolves. We Idahoans... never wanted your wolves." That kinda thing is going on. It's rural versus urban. "You enviro tree-hugging terrorists [chuckling], we don't want your wolves... This is the Canadian super mega wolf, so it's just going to really mess things up around here."

In this way, the perception of wolves as nonbelonging is deeply tied to distrust, often of government in general, but also specifically for wildlife management agencies, which are sometimes perceived as agents of political agendas. A California Department of Fish and Wildlife wolf specialist similarly recalled some "rough public meetings," when folks would show up for "their chance to kick Goliath." One IDFG manager jokingly said while laughing, "You feel you've had a great day when everybody's pissed off at you an equal amount... because now you can go home feeling good that you found that definition of compromise." Some producers may refuse to cooperate with public agencies in deploying nonlethal tools or even reject compensation funds for lost livestock on the grounds that doing so would amount to acceptance of wolf return or the government's authority to intervene in rural issues. In the context of ongoing economic shifts across the region and the perceived threat these pose to livestock-based livelihoods, one producer on the Colville National Forest described a mentality in which cooperating with wolf-livestock coexistence efforts is seen as "break[ing] ranks" with the other producers working in the area. In this context, producers who might otherwise be interested in experimenting with more wolf-friendly practices may not do so because of social dynamics or pressure exerted from within the livestock production community; significantly, the common adversary that the producers came together to oppose was not so much the wolf as it was the Washington Department of Fish and Wildlife.

These social and political dynamics can thus undermine efforts at coexistence between wolves and livestock, and more broadly between conservation and rural livelihoods. They can also undermine collaborative efforts to reduce conflict (Martin 2021b, Swette et al. 2023). Such coexistence collaborations are fragile; as one California environmental director noted, having "the right people" involved, with a "solutions-based orientation," is critical (see also Charnley et al. 2014). In sum, our interviews demonstrated how challenging it can be to separate the wolf from broader social issues. This means that antiwolf sentiments cannot

always be countered with better information or examples of successful coexistence. As noted by one manager on the Lassen National Forest, some people are “against wolves as a concept... they’re not going to change their mind because [new] information is just not useful to them.” Such attitudes can limit the effectiveness of conflict mitigation efforts.

Economic Factors May Constrain Adaptation Among Producers

Economic processes can also undermine producers’ ability to adapt to the presence of wolves on national forest allotments. New West transformations can increase pressure on private land use via exurban development and amenity migration to rural areas. This increases land prices and tax rates and decreases access to private pasture, all of which coincide with fluctuating livestock prices and rising production costs (Muhly and Musiani 2009; Sheridan 2001, 2007). Producers already operating on low margins may then face pressure to maximize outputs and minimize losses (e.g., predation), while low economic returns undercut their adaptive capacity and ability to experiment with new methods (Martin 2024).

Economic pressures are particularly constraining for producers operating with limited family labor resources, given a short supply and rising cost of agricultural laborers in many areas (Simnitt and Martin 2022, Zahniser et al. 2018). For western cattle production, the latter half of the 20th century saw movement toward a low-labor model of production to cut costs, a model that went hand in hand with predator removal (Sayre 2017). With fewer people out with the animals at any given time, there is much lower capacity to deploy proactive tools or respond promptly to deter wolf predations on livestock. Interviewees frequently noted that nonlethal tools needed to be rotated to maintain wolves’ caution and avoid habituation, and that they were most effective when used in combination. As the Idaho Governor’s Office of Species Conservation put it, “Some methods will be better suited for certain operations than others and, in some cases, a combination of techniques and methods may be needed to achieve success” (IGOSC 2021). Such combinations of multiple tools are expensive to obtain and deploy and require labor to maintain, adding to the existing challenge of insufficient labor for range riding on large allotments. These factors combine to make nonlethal conflict mitigation potentially cost intensive, and incongruent with the low labor model of contemporary cattle production.

Livestock producers are unevenly positioned to cover the costs of increased labor, new equipment, and shifting

practices. One Forest Service manager on the Colville National Forest pointed out that permittees with small operations find it less feasible to take on big changes to their practices (including hiring range riders, adopting low-stress livestock handling methods, and paying for nonlethal tools). They suggested that this may be one reason that such practices have been less prevalent on the Colville National Forest than on other national forests, even as both the Washington Department of Fish and Wildlife and nongovernmental organizations work to promote them. At the same time, economic factors may also be deployed as justification for inaction by producers who “just don’t want to adapt,” as one conservation advocate in the Colville area put it. Smaller-scale producers may also be particularly affected by pressure from within the livestock community not to “break ranks” with their neighbors, as noted above; this dynamic was observed by some interviewees on the Colville National Forest, where one of the larger operators working in the region has become a focal point of resistance to wolf return amid the ongoing and highly polarized social conflict (see chapter 7).

When the promotion of nonlethal tools and techniques comes with capacity-building or some form of subsidy or alternative funding mechanism, as in Idaho’s Wood River Valley through the initial support of the nonprofit group, Defenders of Wildlife (Martin 2021b), it can have greater acceptance and success (see also Hoag et al. 2023, van Eeden et al. 2021a). In the absence of such support, however, adoption of new tools and practices—and thus adaptation to wolf return—will be more feasible for producers with more resources (Martin 2024). This situation creates the potential for wolf return to reinforce trends toward a decline of small operators and greater economies of scale and consolidation within the industry, to the detriment of smaller producers (Sheridan 2007).

As noted across our cases, nonlethal tools and techniques and the labor to implement them represent added costs for producers already operating at the margins or for capacity-strapped public agencies. As one WS state supervisor pithily put it, “At the end of the day, it all takes money” (see also Martin 2021b). Further cross-case comparison, with research into the number and size of operators on a given national forest, the role of operation size in shifting existing grazing practices to adapt to wolf return, and the relationship between social and economic factors (e.g., compensation; see box 9.2) in driving producers’ willingness and ability to adopt new approaches, could help clarify these dynamics.

Box 9.2**Compensation and its Limits**

Financial compensation for livestock lost to wolves is often presented as a key pillar of conflict reduction in the American West (e.g., Western Landowners Alliance 2022). Following wolf reintroduction to Yellowstone National Park and central Idaho in the mid-1990s, compensation was carried out through the environmental nonprofit Defenders of Wildlife. This changed in 2010, when federal legislation established a U.S. Fish and Wildlife Service funding stream for compensation and nonlethal deterrence programs in Arizona, Idaho, Michigan, Minnesota, Montana, New Mexico, Oregon, Washington, Wisconsin, and Wyoming (Defenders of Wildlife 2010a, 2010b). While California has struggled with the absence of compensation (see chapter 8), even states with such programs have seen critiques levied at their forms and outcomes.

The predominant mode of compensation for livestock losses in the West is one of *ex post* compensation, in which producers receive payments for confirmed livestock losses to wolves. For public lands grazing, a postmortem examination of the animal is carried out—typically by the U.S. Department of Agriculture, Animal and Plant Health Inspection Services, Wildlife Services, although sometimes by state agencies—across an extensive and often remote range. These agencies typically have limited staff and resources, and by the time producers note losses, it can be difficult or impossible to confirm the cause of death, leading to discussions and debate over probable losses to wolves. Indeed, one motivation for range riding includes finding and confirming losses in a timely manner. However, some have pointed to the perverse incentives created when programs are set up to reward “dead cows” rather than co-adaptation (see chapter 6; also Carter and Linnell 2016).

Even when confirmation is successful, payments often fail to account for the full extent of losses given prorating, purported sublethal effects (e.g., weight and stress impacts), loss of breeding potential (and thus future earnings), and the emotional impacts of livestock death on producers (Epstein and Haggerty 2022, Steele et al. 2013). State compensation programs also

vary in their requirements and payments. Wyoming, in contrast with other state programs, reimburses producers an amount seven times the value of each animal lost, with an underlying assumption that other livestock kills have occurred that were not documented as well as to acknowledge the lost reproductive potential of a cow.

Globally, alternative forms of “payments to encourage coexistence” have been proposed (Dickman et al. 2011), including moves toward *ex ante*, or “pay for presence,” models that emphasize upfront assistance and sustaining predator presence on the landscape (Macon 2020; see also Fletcher and Büscher 2020, Martin 2024). Staff from the Idaho Department of Fish and Game (IDFG) emphasized the need to “think outside the box” and mentioned potential inspirations from Europe. As one IDFG regional supervisor explained,

Based on your history of depredations and financial losses, we [could] reach an agreement... every year you have losses that range between \$10,000 and \$30,000.... What would you say if we gave you \$20,000 a year for the next 5 years, and you can use that money however you want...? [O]bviously now it's in your financial best interest.... If I can use this \$20,000 to save some of my livestock, that's my profit.

Such moves might provide an alternative income stream for landowners grounded in ecosystem services akin to the use of conservation easements already common in much of the West (Anella and Wright 2004, Rissman and Sayre 2012; see also Gilbert et al. 2021). They might also better promote the adoption of nonlethal preventative measures, while addressing some of the environmental justice aspects of the wolf question (McInturff et al. 2021a)—or, as one former IDFG researcher put it,

If society wants wolves around, it shouldn't be shouldered by individual people... we're going to [need to] put our money where our mouth is and just pay you for your inconvenience.

State Policy Matters

Another central finding that emerged from our research concerns the uneven state policy landscape of wolf management (table 9.2, see also fig. 1.6). Different states have experienced different timelines of wolf return—some through federal reintroduction in the mid-1990s and others only within the past decade or two through natural dispersal. States also have notably different demographics and political dynamics. West coast states (Washington, Oregon, and California) have large urban populations and strong environmental constituencies that pressure state legislatures and wildlife agencies toward wolf protection. Such protections can lead to social conflicts in rural areas of these states, where local perspectives and values among rural producers are often misaligned with state policy goals. In contrast, in the states of the Northern Rocky Mountains (Idaho, Montana, and Wyoming), where state policies are more aligned with livestock industry and rural producers' values, management of wolves can be “a little easier.” As one former IDFG researcher noted hyperbolically, “Because everybody hates wolves.” In this way, the objectives of protecting and conserving the wolf population and of reducing social conflict over wolves can be at odds with one another.

Currently, Washington, Oregon, and California all prohibit public hunting of wolves; Washington and California have state-level endangered species listing, while Oregon has delisted wolves but has not opened a hunting season. California has no lethal removal, and Oregon and Washington limit the use of lethal removal in favor of emphasizing and encouraging the use of nonlethal tools. This stands in sharp contrast to Idaho, Montana, and Wyoming, where lethal management and public hunting have become more routine (see fig. 1.6). The coastal states have fewer wolves, as well, which may also play a role in the lower tolerance for wolf killing there. As one Colville National Forest manager put it, “The wolf population is not at risk of becoming extinct, but... a lot of people [feel that] one wolf being killed is too many.”

The human-wildlife conflict and coexistence literature often frames these differences in terms of competing **social values** toward wildlife, or **wildlife value orientations**. It notes an ongoing shift within American society toward coexistence with, care for, and compassion toward wildlife (**mutualism**), in contrast to the historical view of wildlife as a resource (or, in the case of wolves, as a threat

to valuable resources) and primarily for human extraction and use (**domination**) (Manfredo et al. 2016, 2017, 2020). Alternatively, human-wildlife conflict and coexistence have been understood in terms of **cultural carrying capacity**, conceptualized as the level of human tolerance or acceptance for the presence of a given species, independent of biological carrying capacity (Bruskotter and Wilson 2013, Decker and Purdy 1988). As Edelblutte et al. (2023) note, however, these concepts tend to represent generalizations about attitudes and values across diverse and heterogeneous human populations (see also Bonnie et al. 2020). They thus disregard the complex power dynamics and political processes by which human attitudes toward wildlife are translated into policies for management—including hunting and other forms of lethal control—across scales.

Given the importance of state-level policy differences in our findings, we conceptualize these distinctions instead as competing models of wolf management, characterized as follows:

Model 1: standard wildlife management

under the North American Model of Wildlife Conservation, in which regulated hunting is conceptualized as part of routine population management (Heffelfinger et al. 2013, Mahoney and Jackson 2013). This approach aims for a target number of wolves, typically framed as a biologically sustainable population, to be conserved in a given geography, and seeks tolerance through normalization both of the species and of hunting/killing as a management tool. Wyoming's hunting program within its designated trophy game management areas exemplifies this model, designed to maintain wolf populations at minimum recovery levels and prevent them from growing larger, and informed by a relatively robust wolf population monitoring program. Notably, this model has been critiqued for its roots in settler colonial violence and for privileging the values and objectives of a narrowly defined group of stakeholders, among other concerns (Eichler and Baumeister 2018, Peterson and Nelson 2017).

Model 2: predator control, emphasizing securing landscapes for human uses (e.g., livestock grazing, game hunting) through the reduction of the threat posed by predator species. This approach is rooted

Table 9.2—Wolf management policies and practices in six Western states

	Idaho	Montana	Wyoming	Oregon	Washington	California
Protection for wolves within the state under state and/or federal law	None, managed as a game species	None, managed as a game species	None, managed as a game species in some portions of the state, “predator” status with no protection elsewhere	Federal ESA listing in the western portion of the state, “special status game animal” under state policy	Federal ESA listing in the western portion of the state, state-listed endangered species statewide	Federal ESA listing and state-listed endangered species statewide
Policy/practices related to lethal wolf removal to address wolf-livestock conflict	Lethal removal widely used, typically conducted by USDA APHIS Wildlife Services	Lethal removal widely used, typically conducted by USDA APHIS Wildlife Services	Lethal removal widely used, typically conducted by USDA APHIS Wildlife Services	Lethal removal used only in the eastern portion of the state and only after nonlethal efforts have been implemented, per state policy, managed by Oregon Department of Fish and Wildlife	Lethal removal used only in the eastern portion of the state and only after nonlethal efforts have been implemented, per state policy, managed by Washington Department of Fish and Wildlife	No lethal removal permitted
Policy/practices related to hunting of wolves by the public	Hunting and trapping of wolves permitted following regulations of Idaho Department of Fish and Game	Hunting and trapping of wolves permitted following regulations of Montana Fish, Wildlife and Parks	Hunting and trapping of wolves permitted following regulations of Wyoming Game and Fish Department	Hunting prohibited in the western portion of the state under the ESA, hunting could be legally implemented under the state management plan in the eastern portion of the state at the discretion of the state Fish and Wildlife Commission but has never been authorized	Hunting prohibited in the western portion of the state under the ESA and statewide by state-level endangered species listing	Hunting prohibited statewide by both federal ESA and state-level endangered species listing

ESA = Endangered Species Act (1973), USDA APHIS = U.S. Department of Agriculture, Animal and Plant Health Inspection Service.

in a rejection of wolf legitimacy on the landscape and often informed by an “Old West” mentality of control and domination of predators. It aims to reduce the wolf population as much as possible, while still avoiding triggering a relisting under the U.S. Endangered Species Act (1973) that would transfer wolf management authority back to the federal government. This model may include classifying wolves as shoot-on-sight predators as well as the expanded use of lethal control by government agencies alongside recreational hunting as tools for population reduction. This model is exemplified by recent proposals in both Idaho and Montana, which set significantly reduced target thresholds for wolf populations in those states (see chapters 3 and 4).

Model 3: mutualism, emphasizing coexistence between people and wolves and the intrinsic, ecological, and/or economic value of wolf conservation (e.g., via tourism). This approach is often aligned with ecocentrism, encompassing themes of connection and kinship (e.g., through indigenous worldviews) between humans and wildlife, as well as justice and morality in human-animal relations (Celermajer et al. 2021, Larsen and Johnson 2017). For some, this approach correlates with a rejection of the legitimacy of private livestock on public lands, especially if wolf-livestock conflict there leads to lethal removal of wolves. This model is perhaps best illustrated by wolf management policy in California (which confers strict protections on wolves and precludes both lethal control and hunting), although it is also reflected in Washington state policy (see chapters 7 and 8).

Social conflicts over wolf management at both the state and local levels often reflect the tensions between these models. As discussed above, Montana, Idaho, and Wyoming tend to favor more aggressive lethal management approaches. In these states, the debate over state-level wolf policy is usually enacted in the space between the poles of models 1 and 2, with a key question being just how many wolves should be protected, and conversely, how many to kill (either directly or through authorized public hunting). In contrast, the coastal states have aimed to minimize or prevent wolf killing; in these states, the policy debate plays

out in the space between models 1 and 3, with a key question being whether to allow wolf killing at all.

Although such policies are generally enacted at the state level, these competing models also shape local conflicts over wolf management amid tensions between federal, state, and local authority. For example, local sheriff departments in rural counties often see themselves as holding independent authority, rather than being subject to state or federal regulations. In several cases, local authorities in rural communities within states with strong urban-rural divides (e.g., Washington) have thus sought to implement local policies more aligned with aggressive predator control or refused to enforce state policies in ways that challenge the norms of the policy debate in their state (e.g., see fig. 9.1).

In this context, many managers see model 1 as a desirable compromise between the more extreme positions; many of our interviewees expressed an aim of “treating [wolves] like any other animal” or “just another predator” to de-escalate political conflict (see also Martin 2021a). Such an approach would normalize some level of lethal removal, hunting, or both, similar to that used with other game animals and predators, effectively the North American Model of Wildlife Conservation. Many managers suggested that this normalization (of both wolves and wolf killing) is part of the long-term process of coexistence and leads to the gradual reduction of social conflict over time (cf. Anderson 2021), pointing toward what they see as a trajectory toward long-term conflict reduction in states with longer histories of coexistence. This trajectory is debatable, however, given patterns of conflict in states like Idaho and Montana, and disregards significant sociopolitical differences between states. In any case, even as managers may try to normalize wolf presence and management, other efforts are at play—by anti- and pro-wolf actors, including legislators, resource users, and environmentalists—to make wolves **exceptional**, either requiring aggressive removal or strict protections.

Our point here is not to take a position regarding these ongoing wolf management debates, but rather to highlight how such dynamics have resulted in a fragmented and uneven state policy landscape. Because much of wolf management in the West is conducted through state wildlife management agencies—which in turn are subject to pressures from state legislatures, diverse publics with divergent values, and differing state management policies—the character of wolf-livestock conflict and management on national forests also varies widely. Indeed, policy



Figure 9.1—A billboard truck near Chewelah, Washington, encourages residents to report predator incidents to their local sheriff's department, not Washington Department of Fish and Wildlife. Photo by Robert Anderson.

volatility was frequently cited as a source of insecurity among producers. As noted in chapter 7, one permittee on the Colville National Forest explained, “the thing that everybody misses [is that] the wolf is not the problem. It’s the laws and policies around the wolf.” Notably, although wolves are largely managed at the state level, wolves themselves regularly cross state and jurisdictional boundaries. This makes their monitoring and management a regional challenge (see box 9.3) and is another source of political controversy. Recovery and long-term sustainability of the metapopulation is, indeed, predicated on this movement and connectivity between subpopulations. Hence state-level management decisions can either help or hinder the recovery process.

Interventions to Mitigate Conflict Have Significant Social Impacts

As previously observed by our research team, coexistence between people and wildlife is complex and multidimensional (Martin et al. 2021). We draw a distinction between the **technical** aspects of coexistence (referring to the use of deterrence tools and other efforts to mitigate wolf-livestock

conflict) (see table 1.1) and the **social** dimensions of coexistence (referring to efforts to shift human attitudes toward increasing acceptance or otherwise to address social conflict over wolves). Importantly, these are not distinct but often overlapping and intertwined. As noted in chapter 2, our research did not empirically evaluate the various tools and techniques in terms of their **technical** efficacy for reducing wolf-livestock conflict (i.e., affecting predation rates) on national forests in the West. Rather, our focus has been on interviewees’ experiences with these approaches and **perceptions** of their effectiveness.

Although this approach limits the conclusions that can be drawn about technical efficacy, it highlights the fact that many such approaches are more than just technical tools with environmental outcomes. Their use may also play a significant role in mitigating social conflict related to wolf return on shared landscapes. Our social science approach thus brings to light insights grounded in the experiences of practitioners, which can inform policy for, and practices of, conflict mitigation. For example, exploring perceptions of effectiveness tells us which practices might be more socially acceptable to producers, which they might be more willing

Box 9.3**Monitoring Unevenness**

Wolf management policy differences across states result in a wide range of practices used in the measurement and monitoring of wolf populations and their impacts. Wolves are elusive and mobile and reproduce rapidly under the right circumstances, making population numbers and distribution both highly dynamic (see Boyd et al. 2023, Martin 2021a). Population measurement can take place through different techniques. While many wildlife agencies have long relied on trapping and collaring individual wolves as key methods for monitoring the population, they are increasingly turning toward genetic technologies for modeling population dynamics or patch occupancy models that assess habitat availability to estimate wolf populations, yet these techniques are not always comparable. Different state agencies also use a range of different metrics, such as total number of animals, number of packs, or breeding pairs. These in turn can be defined somewhat differently; for example, the Oregon Department of Fish and Wildlife defines a pack as “at least four wolves traveling together in winter” (ODFW 2019), while other state wildlife agencies count two wolves traveling together as a pack.

As population sizes increase, greater effort is required to confirm overall numbers: “the old ‘collar and foller,’” as one California Department of Fish and Wildlife specialist put it (referring to radio collaring wolves

and tracking [following] their locations using radio signals the collars emit), is less and less feasible. Other techniques relying on new technologies of detection and monitoring may provide more economical alternatives to radio collaring, but reliability can be undermined as agencies have “ramped up harvest,” to quote one Idaho wolf researcher (see also Ausband et al. 2023, Horne et al. 2019). Uncertainty over wolf numbers can also be overplayed, even verging on conspiracy—the idea that there are “more wolves out there than you’re telling us,” as one California wolf biologist put it (cf. Skogen et al. 2008).

Questions of wolf numbers, distribution, and density have ramifications for rates of encounter and experience—and thus, potentially, levels of comfort or hostility with the species—yet are difficult to separate from questions of measurement and data availability. In some locations, interviewees reported that conflicts were worse than elsewhere, but it is difficult or impossible to compare such reports in the absence of more reliable and comparable datasets (see Selva et al. 2023). We simply do not have the number of wolves relative to number of livestock present across national forests, nor can we easily compare predation rates from place to place given the question of confirming predation on remote ranges discussed above.

to adopt, and under which circumstances. Such insights can also indicate divergences between local “common sense” and the best available science surrounding conflict mitigation tools and techniques.

Our interviews with managers and producers highlighted the limits of technological interventions and a technocentric view. Many producers expressed desires for “some sort of magic bullet,” as one permittee on the Boise National Forest put it, “that we could utilize and the wolves would stay at bay, stay away from us—but that’s not the nature of the beast.” The experience of diverse practitioners using nonlethal tools across our study area confirms that there is no such

single tool. Rather, as noted previously, nonlethal tools and techniques must be used in combination and often rotated to prevent habituation and are thus incompatible with a “set it and forget it” approach. In this way, producers must be continually engaged—physically, financially, and emotionally—with practices of conflict reduction. While rapidly evolving technologies might help, for now they remain a challenge for those with limited capacities (discussed above).

Another key theme of our interviews was uncertainty, on the part of both producers and managers, around the efficacy of nonlethal techniques. Many voiced skepticism about adopting expensive or labor-intensive new approaches

that they did not expect to succeed. This factor of social acceptability for a given tool (based on perceptions of its effectiveness held by individual producers or shared anecdotally within a given community) may outweigh studies of technical effectiveness as a determining factor for adoption across the landscape (Volski et al 2021). Moreover, preexisting values and perceptions among producers and managers appear to influence the adoption (or lack thereof) of nonlethal interventions. Those who frame wolves as an unwanted imposition by the federal government or as foreign invaders—e.g., the discourse of “Canadian wolves” common in many northern rural areas—view them as illegitimate (see Martin 2020, 2024). Such individuals may be less inclined to cooperate; adopt tools; or even, as noted above, accept compensation for livestock losses.

The tendency toward skepticism of nonlethals stands in contrast to a widespread perception among producers, observed across many of our interviews, that lethal control of wolves does have a meaningful effect on wolf-livestock conflict dynamics. Many respondents linked the desire for wolf control with the idea that lethal interventions, or their threat, made wolves more cautious—and thus might even make nonlethal tools more effective (Anderson et al. 2023). This idea that lethal control was therefore a necessary “tool in the toolbox”—and the sense of complementarity between lethal and nonlethal approaches—was common both in states with long traditions of lethal control and in states without it, notwithstanding ongoing debates in the scientific literature over the effectiveness of wolf removal for reducing livestock predation (Bradley et al. 2015, DeCesare et al. 2018, Lorand et al. 2022). As one permittee in California noted,

Sometimes as far as a management option, it [lethal control] really is the only one.... We understand there's going to be wildlife out there [but] sometimes... the lethal option would probably be necessary and helpful.

Many interviewees argued that increasing the use of lethal control, public hunting, or both, would assuage social anxieties surrounding the return of predators. Some land managers and environmental advocates, otherwise skeptical of the efficacy of lethal action for reducing livestock predation or stress, suggested that it could nonetheless function to increase social tolerance for wolves, mirroring discourse and policy evolution in states that have had wolves longer (Anderson 2021). As one former IDFG researcher noted,

Giving them a hunting season, even if it in the end doesn't reduce depredations... it's probably beneficial to you to getting public acceptance of having wolves around, because they [the public] have some power now.”

However, this viewpoint is contested by environmental advocates, who suggest that allowing hunting normalizes wolf killing and reinforces an antagonistic, rather than co-adaptive, relationship. They point out that states where such hunting has been in place for some time, including Idaho and Montana, have not seen a clear drop in wolf-related conflict and opposition (see Chapron and Treves 2016).

Although these social aspects complicate any easy answer to the question of coexistence, they collectively point toward the importance of thinking about coexistence as a more-than-technical question (Martin et al. 2021) and emphasize the role of social values and the psychological dimensions of human-wildlife conflict (Carter et al. 2012; Manfredo et al. 2017, 2020; Redpath et al. 2015; Thondhlana et al. 2020). Whether or not interventions (lethal or nonlethal) were effective at reducing predation, it seemed, was often secondary to their perceived psychological and affective value—in giving people on the ground a sense of control, of being heard, or of something being done. In considering wolf conflict within its broader social context, one key role for managers on the ground hoping to reduce conflict could be simply being seen as engaged and taking action. In the experiences of our interviewees, coexistence was often as much about managing people and their feelings as it was about managing wolves and livestock. Many of our interviewees—both managers and permittees—commented on the value of having someone **show up** and be **willing to listen**. This, in turn, was tied to another often-noted role for managers in building trust and relationships with collaborators. As one former Boise National Forest manager put it, “[A]s a district ranger, relationships are everything.” Another former employee explained,

Long-term sustainability of wol[ves] on the landscape and our ability to manage livestock... has a lot more to do with our social values... how we interact with each other and the choices we make about [our] priorities... than it has about the critters themselves.

“Stay in Your Lane”—Limited Consensus Over the Role of the Forest Service

The return of wolves presents a cross-jurisdictional challenge, necessitating multiagency coordination, institutional learning, and adaptive management—“chang[ing] on a dime,” as one California Department of Fish and Wildlife manager put it. This is something that has been historically difficult for government agencies to achieve (Moir and Block 2001, USDA FS 2002). While Forest Service lands serve as a key nexus of encounter between wolves and livestock, Forest Service land managers we spoke with were often unsure of their role amid the division of labor with other state and federal agencies. Although debated (e.g., Nie et al. 2017), state wildlife management agencies and other federal agencies (the U.S. Fish and Wildlife Service, WS) are typically understood to be responsible for managing wolf populations, while the Forest Service is responsible for managing wolf habitat and livestock grazing on National Forest System lands. Some managers voiced concerns over legal or regulatory limitations on their ability to manage conflict, often pointing to National Environmental Policy Act (NEPA 1969) requirements, threats of litigation, and political pressures as constraints on actions they were able to take.

The return of wolves to the landscape introduces a new element to the ecosystem, and it follows that management practices will need to adapt to these new circumstances. On some national forests, this has meant new communication and adaptive management efforts, including adjustments to grazing routes and timing to avoid known wolf sites and thus reduce predation. Managers, permittees, and wolf advocates praised this sort of flexibility as effective and welcome, when and where possible given regulatory constraints. But as noted in chapter 6, one manager on the Wallowa-Whitman National Forest, in regard to the timing of allotment use, explained,

Flexibility would have to be written into the NEPA that the allotment management plan was analyzed under... [and] since we only renew the NEPA every 10 or 20 years, we don't have flexibility to change those dates... we don't usually have flexibility beyond 2 weeks in either direction.

The corollary to this sort of flexibility would be the imposition of new requirements for permittees grazing on Forest Service allotments. Of the national forests we surveyed, 33 percent noted the inclusion of language related to wolf-livestock conflict prevention in their allotment management plans, grazing permits, or annual operating instructions (see app. 1). Such language varied; most often it simply referred permittees to relevant contacts for wolf-related issues, although in a few instances permittees were required to coordinate with agencies when implementing nonlethal conflict mitigation efforts or to avoid grazing near active wolf rendezvous sites or dens. When Forest Service managers had data on wolf locations that they could share with permittees, this helped them avoid interactions that were bound to have negative consequences. However, as one Boise National Forest manager noted, it was ultimately “up to the permittee to figure out how to get [it] done.”

Imposing requirements on livestock producers (e.g., that they implement nonlethal deterrents in their operations) could be difficult even for state agencies. One IDFG supervisor drew a contrast between wolf and elk management:

It's great if you can require them [livestock producers] to do something, to manage and mitigate losses. We have that requirement to get compensation for elk in your hay field.... You have to contact us. You have to allow us to implement deterrence. You have to be a partner in that.... It's a shared responsibility by state law that you have to agree to, if you want to file a claim for your losses. We don't have that for wolves.

In Washington and Oregon, state wildlife agencies have used their authority over lethal removal as leverage to influence producers to take action, requiring affected producers to attempt nonlethal conflict mitigation before the agencies will conduct lethal removals. However, mandating such conflict reduction measures, such as the use of nonlethal tools, was generally seen by stakeholders as the role and responsibility of the state (as wildlife manager) rather than the Forest Service (as land manager).

At the level of the national forest, new requirements on permittees might trigger new environmental analysis—adding workloads to already struggling capacities—and evoke opposition. Even with the recommended livestock rerouting measures described above, some interviewees

sensed that Forest Service staff were unwilling or unable to enforce such changes. As one IDFG manager noted,

Part of the frustration on our end is, it seemed like... the biologist or the range con[servationist] or the ranger... was not comfortable or in a place to mandate this change and enforce it... we were never party to those discussions and can't really pretend to understand the social and political influences on that decision, [but] we can certainly understand the political influence of individual producers on their state legislators and their willingness to go to the [state] farm bureau and the governor and other influential lawmakers.

New requirements for permittees could also be in tension with other management aims. Wolf presence is but one of many challenges that land managers face. As one Forest Service range specialist on the Boise National Forest explained,

I can help route those sheep the way we'd want, but then I also... have to make sure I'm not then in turn routing the sheep on top of an occupied bull trout stream or into whitebark pine. We have all these things we have to try to mitigate around. That's where it can sometimes be complex to make sure we still have a manageable livestock allotment, [be]cause if you X off the whole allotment and say, 'You can't go here, here, or here,' you don't have a lot [of grazing land] left.

Because of these many constraints and concerns, in practice the tendency among many managers has been to step back from an active management role, and to let state agencies take the lead on wolf questions (or defer to the U.S. Fish and Wildlife Service where wolves are federally listed). As one Forest Service range conservationist in California put it, managers often feel pressure to "stay in your lane" and defer to other agencies' authority when faced with political pressure. As noted in our cases above, the Forest Service is thus often "a little bit on the sidelines" (Shoshone National Forest), with many Forest Service managers arguing that "depredation is not even a Forest Service issue. It's a state issue" (Lassen National Forest) and that adaptation to wolves falls outside of their

purview: "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" (Colville National Forest). "I can't come in and tell you as a rancher... you need to do this. Not my place, not my role" (Beaverhead-Deerlodge National Forest). The predominant perspective of Forest Service managers is that they are "not in the business of managing wolves" and should "not overstep their bounds" (Wallowa-Whitman National Forest).

Legal scholarship (e.g., Nie et al. 2017) has challenged this prevailing idea of "state supremacy" in wildlife management, arguing that land management agencies have greater administrative and decision-making powers than are widely perceived. From this perspective, Forest Service managers have significant legal authority to define and enforce grazing requirements on federal lands. However, a strictly legal lens ignores the broader history and social and political context in which managers act (see above, also Martin 2021a). Given political polarization surrounding wolf issues—and a history of similar regional conflicts around rural livelihoods and species of concern, such as the northern spotted owl (Gutiérrez 2020, Johnson et al. 2023, Watson and Muraoka 1992)—hesitation among managers to "rock the boat" should, perhaps, be unsurprising.

Yet the broadly hands-off attitude common among the Forest Service managers that we interviewed has also resulted in some staff being unfamiliar with wolf issues, at times even expressing assumptions of irreconcilable incompatibility between wolf conservation and livestock grazing. Such attitudes can stand in the way of an adaptive, multiple-use orientation. Some managers were aware of the disconnect between their role and the experiences of partners. As one former Boise National Forest employee put it,

From a public perspective, [wolves were] probably a high risk, high concern threshold for a variety of reasons... As an -ologist, it probably occupied less than 5 or 10 percent of my time.

By stepping back from wolf issues, however, Forest Service managers could find themselves behaving in a way that is "reactionary" instead of proactive, a position not necessarily benefitting the permittee over the long term. As another Boise biologist explained,

A problem shows up, and we react to the problem—and our reaction may not be anything that’s benefiting the permittee, to be honest. It’s just that we can tell the permittee something’s been done, right? A box was checked. That doesn’t necessarily mean the risk is less down the road.

Across our study area, there remains public pressure on Forest Service managers to address wolf-livestock conflict. As one environmental director in Idaho put it, “the Forest Service is one of the biggest pieces of this puzzle” of coexistence. As a permittee on the Wallowa-Whitman National Forest noted, range managers

find themselves in these boxes that they can’t really get out of... There are things that livestock producers could do to greatly reduce their livestock risk, but they can’t do it because the Forest Service says they can’t, even though it’s things that actually may help.

For livestock producers, the hope, as noted in chapter 6, is for “a range person that can look beyond the book...; don’t be a stickler for, ‘Well, the plan says we can only do this. NEPA says this is all we can do.’” Frustration could slide into full antagonism. On the Lassen National Forest, one permittee noted that they “don’t have any faith in the Forest Service,” and felt that the agency would use wolves or “the freakin’ three-legged frog, and whatever butterfly” to reduce grazing or “remove livestock from [Forest Service lands] permanently... in a heartbeat.”

In this context, as wolf populations—and their interactions with livestock and permittees—continue to grow, it is likely that without proactive engagement by the Forest Service, more challenges with both permittees and conservation interests will result. NEPA restrictions may require policy change to navigate, and capacity limitations create challenges for adaptive management. But in at least some cases, it appears both possible and beneficial for Forest Service managers to take on a more active role in wolf-livestock questions. At a minimum, by approaching these social conflicts collaboratively, Forest Service staff can play a critical role as mediators and liaisons, facilitating communication between agencies and partners and helping forge creative solutions.

Chapter 10: Management Implications

The return of gray wolves (*Canis lupus*) to the American West restores a megafauna predator and keystone species to landscapes where it has been absent for decades, and in some places more than a century. This return has reignited old fears and sparked concerns among livestock producers over the impacts of wolves on livestock production amid tensions between conservation and rural livelihoods. Ongoing expansion of wolf territories, along with recent delisting and relisting of wolves at the federal level (Kareiva et al. 2021), has brought renewed attention to questions of wolf management from both pro- and anti-wolf forces.

Some states have now contended with wolf-related conflicts for nearly three decades, while others are just starting to experience what it means to live with wolves. Stakeholders often characterize that process as a “learning curve,” suggesting that states with a shorter history of wolf presence (such as Washington, Oregon, and especially California) are experiencing challenges that will eventually lead toward lessons already learned in states with longer wolf experience (such as Idaho, Montana, and Wyoming). At the same time, variations in social and ecological conditions and wolf management policy across states mean that the process of adapting to wolf return should not be understood as a single or uniform trajectory leading to similar policies or practices. The difficulties of wolf-livestock conflict and coexistence, as we have explored in these case studies, have not necessarily lessened over time. The broader sociocultural, political, economic, and environmental contexts in which wolf-livestock interactions occur shape patterns of adaptation.

Conflict over wolf management is clearly about much more than wolves. It is entangled in broader Western U.S. dynamics (e.g., divergent rural versus urban concerns) and long-term shifts in regional economies. Thus, the wolf question can function as an arena in which other cultural and political divides may play out. These conflicts reach far beyond the control of any single agency or stakeholder, calling into question hopes for any simple or singular solution. However, the existence of conflict does not indicate the failure of human-wolf-livestock coexistence. On the contrary, some level of conflict is likely to continue as an ongoing element of coexistence in practice (Martin et al.

2021). Thus, the actions and decisions of managers navigating the challenges of shared space between livestock and wildlife on federal lands can play a key role in mitigating the processes by which everyday tensions grow into intractable polarization.

This report has synthesized findings from a social science research assessment of wolf-livestock conflict and management on national forests across six western states, conducted between 2020 and 2022. In it, we have sought to characterize these conflicts, to clarify the role of U.S. Department of Agriculture, Forest Service managers in mitigating them, and to communicate barriers, opportunities, and best practices from cases across the region. We have emphasized the perceptions and expertise of managers on the ground, a crucial gap in discussions of predator conflict and coexistence. While each of our case study national forests offers insights grounded in the particularities of place and history, we also encountered crosscutting themes and lessons learned, particularly from those managers who had contended with wolf issues for longer. Future research might build from this work toward more comprehensive assessments of federal lands grazing and the role of land managers in addressing human-wildlife conflict. However, emerging generalizations from our cases represent key transferable insights for Forest Service managers facing wolf-livestock conflict on other national forests across the West (box 10.1).

In the previous chapter, we observed that the physical geography of the public range matters. Large, rugged, and remote Forest Service allotments present challenges for intervening in wolf-livestock conflict. Tools and techniques adapted to the specifics of the federal lands context are likely to have the best results. Forest Service managers who are familiar with local conditions, have frequent interactions with involved stakeholders, and who can play a bridging role are uniquely positioned to support the efforts of other agencies, organizations, and permittees in adaptation by developing strategies that speak to the local context and local needs. These strategies could include developing more adaptive and flexible grazing approaches, as regulations allow, as well as sharing wolf monitoring data (when possible) among agencies and with producers to help them avoid negative encounters between wolves and livestock.

Box 10.1**Advice from Forest Service Managers**

The following represents a summary of insights provided by U.S. Department of Agriculture, Forest Service managers from our case study national forests when asked to provide advice for other national forest managers facing wolf-livestock conflicts (see interview guide, app. 3).

Accept wolf presence on the national forest and proactively manage conflicts.

- Don't wait to engage in the wolf issue until it becomes a crisis; be proactive and plan for it as soon as a wolf shows up on your national forest, or even before.
- Normalize the presence and management of wolves on the landscape—they are “here to stay” and should be understood by permittees as part of doing business on public lands.
- Some amount of wolf-livestock conflict is inevitable; make it a routine part of your job as a range manager to help mitigate conflict.

Build trust through collaborative working relationships.

- Build and maintain strong relationships with permittees and other agencies involved in wolf management to facilitate communication and timely response to predation events. Participate in collaborative, community-based efforts around conflict mitigation, and make plans for what to do in advance of any potential conflict.
- Regardless of your personal opinions, it is important to listen to stakeholders and to understand and respect diverse views to develop credibility, trust, and rapport.
- Recognize that the human dimensions of conflict are as important as the ecological dimensions and take them seriously. Seek out training for yourself and your team related to conflict resolution and other public-facing aspects of your job.

Be a conduit for communication and information sharing.

- Forest Service managers are in a unique position to serve as an intermediary between parties. Keep up to date on actions taken by state wildlife agencies; U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services; and other groups involved with wolf conflict. Share information (when possible) on wolf presence, movements, and available tools and techniques among agencies and with permittees to help coordinate efforts and reduce conflicts, misinformation, and fear.
- Consider including representatives from multiple agencies involved in wolf management in annual operating instructions meetings to discuss management issues and conflict mitigation strategies.
- Don't hesitate to reach out for advice when you feel you need help dealing with wolf-livestock conflict; many others have been through what you are going through and may have valuable insights to offer.

Communicate your role while striving for management flexibility.

- Be clear on what your role in conflict management is as a Forest Service manager vis-à-vis other agencies and communicate this to stakeholders to manage expectations around what you can and cannot do to help (e.g., lethal control is managed by the state, not the Forest Service).
- Listen to permittees' concerns and do what you can to respond quickly and proactively to them. Tolerance for wolves improves when producers feel they are heard and can get help when needed (and producers may have valuable insights from working on the landscape).
- To the extent possible, incorporate flexibility into annual operating instructions and allotment management plans to help reduce encounters between wolves and livestock (e.g., flexible on-off dates, timing and location of pasture use and livestock movements, taking nonuse [temporarily not grazing an area]).

Although wolf issues are often polarizing, there are opportunities to collaboratively build pragmatic solutions. Toward these ends, communication is key. As stressed above, National Forest System lands are an important nexus of encounter between wolves and livestock, and Forest Service managers can serve as a nexus of collaboration between partners. Managers can help build relationships and facilitate productive collaborations among permittees, state agency personnel, and other stakeholders for sustaining both rural livelihoods and conservation, consistent with multiple-use commitments. This role points toward the value in having Forest Service managers make enduring connections in place, because learning the landscape and building trust and collaborative relationships with partners take time.

While physical geography clearly matters for the effectiveness of tools and techniques in conflict mitigation, the sociopolitical context of conflict is also key. Conflict is affected by multiple factors at different scales, including Western demographic and economic transformations as well as state-level wolf management policy. State wildlife agencies, often guided by priorities dictated by state legislatures, affect patterns of lethal control, public hunting, and funding for nonlethal alternatives, as does broader political discourse and legislation around wildlife management. Federal managers' power and responsibility may legally extend beyond that commonly perceived by those on the ground (Nie et al. 2017), but the concerns of Forest Service staff navigating legal and political pressures are understandable.

Our research suggests that federal lands—and, by extension, federal land managers—are central to debates and interventions related to wolf-livestock dynamics in the West. Wolves and livestock often share space on National Forest System lands, and Forest Service managers must balance a multiple-use mandate that includes both livestock grazing and maintaining wildlife habitat. Various publics often turn to Forest Service managers for answers and actions that address wolf conflict. However, many dimensions of wolf-related conflict are outside the control of the agency—there are many other agencies and actors that play an important role, particularly at the state level. Nevertheless, Forest Service managers exercising their responsibilities may have substantial influence on the nature of wolf-livestock interaction issues, such as those indicated in box 10.1.

Ultimately, the wolf issue highlights the embeddedness of federal land management within a larger sociopolitical context, underscoring the value of collaboration across agencies and with diverse publics. This also points to the key role of social science in informing adaptive management (Charnley et al. 2017), particularly around issues sensitive to local values and amid rapidly changing policy circumstances. The Forest Service has the potential to be an essential partner in collaborative approaches to mitigating conflict related to wolves, not only on the lands it manages, but across the matrix of public and private lands spanning the American West. Working across contexts to facilitate peer-to-peer learning between resource users, agencies, and managers from different national forests will be key to navigating the return of the wolf. Many Forest Service managers have insights and experiences from working with grazing permittees, county-level specialists, and other state and federal agencies across the West that could inform ongoing efforts to live with wolves.

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Metric Equivalents

When you know:	Multiply by:	To find:
Feet	0.3048	Meters
Miles	1.609	Kilometers
Acres	0.405	Hectares
Square miles	2.59	Square kilometers

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Appendix 1: Survey Instrument

We provided the following wolf-livestock interactions survey to U.S. Department of Agriculture, Forest Service managers. The survey was conducted via online form submission, December 2020–January 2021.

* Indicates response required.

Section 1: General overview

1. Email address
2. What is your name?
3. What Region are you in? *
4. What National Forest are you located in/answering on behalf of? *
5. To the best of your knowledge, in what year was the first wolf sighted on the forest (since wolves' return)? (If you don't know, please write "don't know.")
6. Which of the following best describes the wolf population on the forest?
 - Just a few wolves; occasional sightings or wolves temporarily passing through the area
 - Established pack territories occupy some of the suitable wolf habitat on the forest
 - Established pack territories occupy most or all of the suitable wolf habitat on the forest
7. Which of the following best describes the level of conflict between wolves and cattle on the forest?
 - None
 - Low: few or infrequent problems
 - Moderate: occasional depredations; moderate impact on cattle and producers in affected areas
 - High: frequent or regular depredations and stress; high impact on cattle and producers in affected areas
8. How many sheep/goat allotments does your forest have?
9. Which of the following best describes the level of conflict between wolves and sheep or goats (if applicable) on the forest? *
 - None
 - Low: few or infrequent problems
 - Moderate: occasional depredations; moderate impact on livestock and producers in affected areas

- High: frequent or regular depredations and stress; high impact on livestock and producers in affected areas

10. Is there any wolf-livestock conflict prevention language in your allotment management plans, permits, or annual operating instructions?
11. If yes, please describe what this language says:

Section 2: Established wolf packs on your forest

(note: this section was only requested from those forests that indicated "Established pack territories" on question 6)

12. In what year did wolves become established on the forest?
13. To the best of your knowledge, how many established wolf packs are there on your forest? (If you don't know, please write "don't know.")
14. Please list which districts on your forest have wolves currently, or in the past year.
15. Please estimate how many allotments on your forest have wolves currently, or in the past year.
16. Please estimate how many permittees are affected by wolves currently, or in the past year.
17. Have you used any range program funding to pay for materials or interventions designed to prevent or mitigate wolf-livestock conflict?
18. If yes, please describe:

Section 3: Wolf reconnaissance and monitoring tools and techniques

19. For each of the following tools/techniques, please choose the option that most accurately describes its use and effectiveness in your forest.
 - Radio collars on wolves with some data provided to permittees
 - Radio collars on wolves; permittees have telemetry scanners to detect wolf presence
 - Trail cameras
 - Howl surveys
 - Work with public to gather information about wolf sightings

- Other (please specify in comments below)

Response options:

- Never used on this forest
- Used; generally effective
- Used; generally ineffective
- Used; mixed results
- Don't know if used, or don't know the result

20. Please share any comments about monitoring/
reconnaissance approaches used in your forest

Section 4: Livestock husbandry tools and techniques

21. For each of the following tools/techniques, please choose the option that most accurately describes its use and effectiveness in your forest.

- Guarding of sheep herds by people
- Range riding: frequently patrolling pastures to monitor livestock and respond to wolf presence
- Prompt removal/disposal of livestock carcasses
- Prompt removal/treatment of sick or injured livestock
- Low-stress livestock handling techniques; such as to promote herding instincts in livestock
- Select different types or breeds of livestock
- Delay turnout of livestock onto allotment
- Change allotments to avoid wolves
- Take temporary nonuse of grazing allotment to avoid wolves
- Reduce livestock numbers in grazing allotments with possible wolf presence
- Change timing or order of pasture use to avoid wolf presence
- Protect calving area; calving outside of wolf territory
- Other (please specify in comments below)

Response options:

- Never used on this forest
- Used; generally effective
- Used; generally ineffective
- Used; mixed results
- Don't know if used, or don't know the result

22. Please share any comments about livestock husbandry tools and techniques used in your forest.

Section 5: Wolf management/deterrence tools and techniques

23. For each of the following tools/techniques, please choose the option that most accurately describes its use and effectiveness in your forest.

- Livestock guardian dogs
- Nonelectric fencing for night enclosures or small pastures
- Electric fencing
- Fladry (lines of flagging to deter wolves)
- Turbo-fladry (electrified fladry)
- Spotlights or other lights operated manually by people
- "Foxlights" or other automated light deterrent tools
- Human-operated noisemaking scare devices
- Radio activated guard (RAG) boxes
- Nonlethal munitions such as rubber bullets, cracker shells, etc.
- Supplemental feeding of wolves to reduce predation
- Other (please specify in comments below)

Response options:

- Never used on this forest
- Used; generally effective
- Used; generally ineffective
- Used; mixed results
- Don't know if used, or don't know the result

24. Please share any comments about wolf management/deterrence approaches used in your forest

Section 6: Wolf removal tools/techniques

25. For each of the following tools/techniques, please choose the option that most accurately describes its use and effectiveness in your forest.

- Lethal removal of one or a few wolves at a time
- Lethal removal of full pack
- Hunting
- Translocation (capture and relocate wolves)
- Other (please specify in comments below)

Response options:

- Never used on this forest
- Used; generally effective

- Used; generally ineffective
- Used; mixed results
- Don't know if used, or don't know the result

26. If lethal removal or hunting of wolves has occurred on your forest, please estimate how many wolves have been killed there since the practice(s) began.

27. Please share any further comments about wolf removal in your forest

Section 7: Final comments

28. The tools and techniques for wolf-livestock conflict deterrence are often best used in combination, not individually. Is there a particular suite or combination of tools that have been most effective in your forest? Please describe/discuss.

29. Have you had any litigation on your forest relating to wolf conflict?

30. If yes, please identify the relevant case(s):

31. Thank you very much for participating in this survey. Do you have any further comments to share?

Appendix 2: Survey Results

This appendix contains selected results from the wolf-livestock interactions survey for U.S. Department of Agriculture Forest Service managers, conducted via online form submission, December 2020–January 2021.

Our sample included all national forests and grasslands in six Forest Service regions—Northern (Region 1), Rocky Mountain (Region 2), Southwestern (Region 3), Intermountain (Region 4), Pacific Southwest (Region 5), and Pacific Northwest (Region 6)—with active grazing

programs and transitory or established wolves ($n = 42$). We requested a response from one forest-level rangeland or other natural resource program manager per forest. All data reflect the best estimates provided by these managers regarding conditions on their national forest and do not necessarily reflect the perspectives of permittees or other stakeholders.

We received responses representing 40 national forests across the six regions (95 percent response rate).

Status of Wolf Populations and Impacts

Table A2.1—National forest manager responses to the survey question, “Which of the following best describes the wolf population on the forest?”

Response	National forests ($n = 40$)
	NUMBER (PERCENT)
Established pack territories occupy most or all of the suitable wolf habitat on the forest	10 (25%)
Established pack territories occupy some of the suitable wolf habitat on the forest	15 (37.5%)
Just a few wolves; occasional sightings or wolves temporarily passing through the area	15 (37.5%)

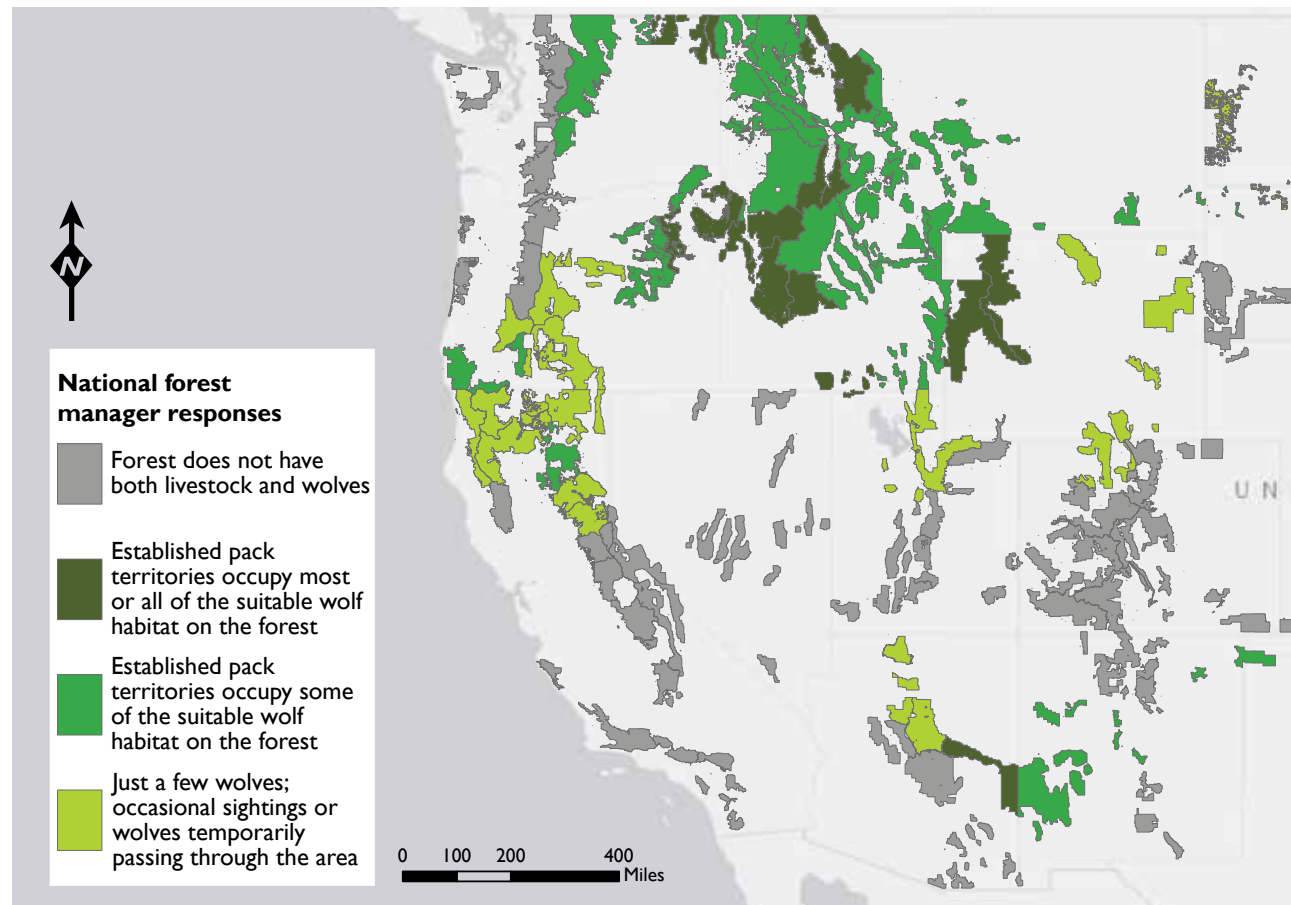


Figure A2.1—National forest manager responses to the survey question, “Which of the following best describes the wolf population on the forest?”

Table A2.2—National forest manager responses to the survey question, “To the best of your knowledge, how many established wolf packs are there on your forest?”

National forests responding	National forests indicating “I don’t know”	National forests offering an estimate	Established wolf packs on a single forest (estimate)	Established wolf packs on a single forest (average)
24	8	16	1 to 20	11

Note: This question was only asked of those participants who indicated that they have “established pack territories.”

Table A2.3—Number of allotments and permittees affected

Region	National forests responding	Allotments affected on a single forest	Allotments affected per forest (average)	Total reported allotments affected	Permittees affected on a single forest	Permittees affected per forest (average)	Total permittees affected (estimate)
1	9	5 to 100	35	315	3 to 80	15.5	124
2	1	80	80	80	70	70	70
3	2	12 to 45	28.5	57	11 to 50	30.5	61
4	6	10 to 340	92.5	555	3 to 300	68.2	409
5	1	10	10	10	4	4	4
6	5	5 to 140	51.4	257	1 to 85	31	155
All	24	5 to 340	53.1	1274	1 to 300	35.8	823

Note: Questions were only asked of those participants who indicated that they have “established pack territories.”

Timing of the Arrival and Establishment of Wolves

Across Regions 1–6, dates given for first sightings ranged from the 1970s to 2019. As one respondent in the Northern Region (1) commented, there “always were some wolves on the Rocky Mountain Front prior to Yellowstone reintroductions.” Several forests in three regions—Northern (Region 1), Southwestern (Region 3), and Intermountain (Region

4)—reported wolves beginning in the mid-1990s, consistent with the active reintroductions done in those areas. In the Pacific Northwest Region (6), the earliest date was 2009 (multiple forests), and in the Pacific Southwest Region (5) (California), the earliest date was 2016.

Level of Conflict on the Forest

Table A2.4—National forest manager responses to the survey question, “Which of the following best describes the level of conflict between wolves and cattle on the forest?”

Response	National forests (n = 40)
	NUMBER (PERCENT)
High: frequent or regular depredations and stress; high impact on cattle and producers in affected areas	5 (13%)
Moderate: occasional depredations; moderate impact on cattle and producers in affected areas	15 (38%)
Low: few or infrequent problems	12 (30%)
None	8 (20%)

Table A2.5—National forest manager responses to the survey question, “Which of the following best describes the level of conflict between wolves and sheep or goats (if applicable) on the forest?”

Response	National forests (n = 40)
	NUMBER (PERCENT)
High: frequent or regular depredations and stress; high impact on sheep/goats and producers in affected areas	3 (8%)
Moderate: occasional depredations; moderate impact on sheep/goats and producers in affected areas	4 (10%)
Low: few or infrequent problems	9 (23%)
None	6 (15%)
Not applicable	18 (45%)

Conflict Prevention/Mitigation Tools and Techniques

The following figures summarize responses from national forest managers to the survey question, “For each of the following tools/techniques, please choose the option that most accurately describes its use and effectiveness in your forest.”

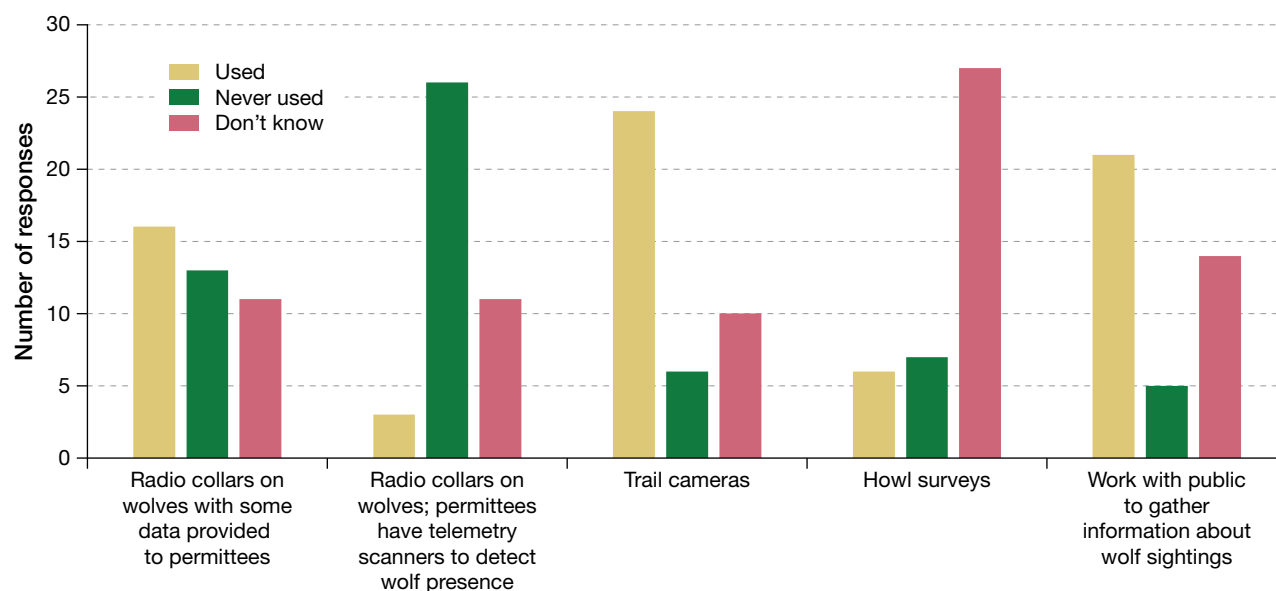


Figure A2.2—Use of reconnaissance/monitoring tools, Forest Service regions 1–6.

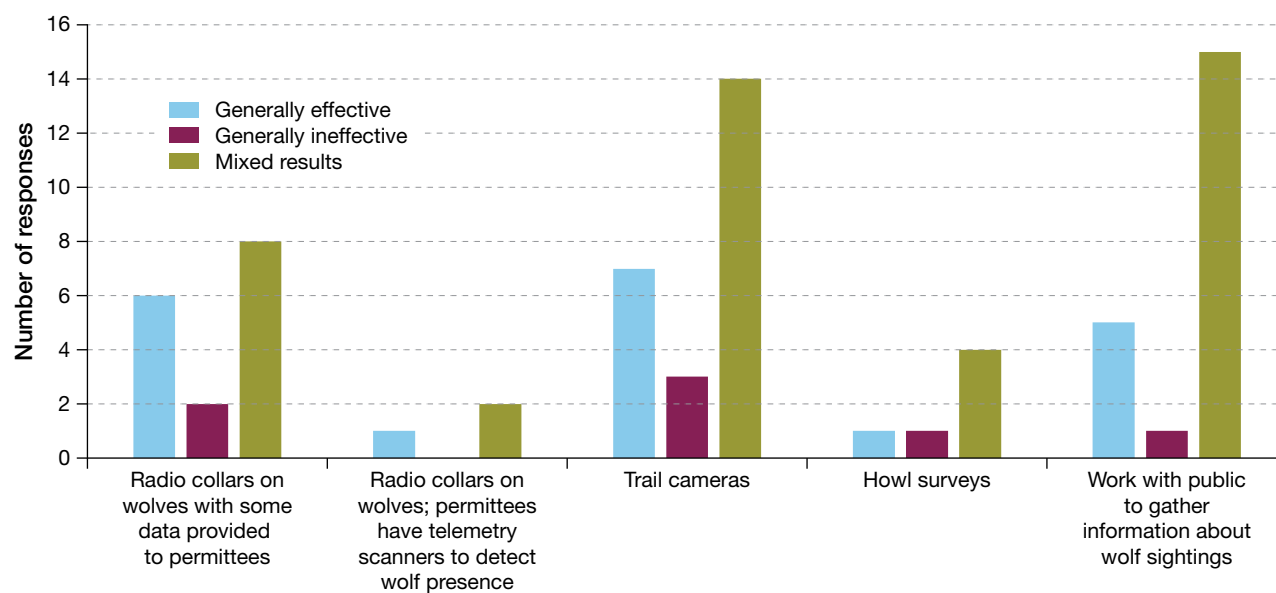


Figure A2.3—Perceived effectiveness of reconnaissance/monitoring tools, Forest Service regions 1–6.

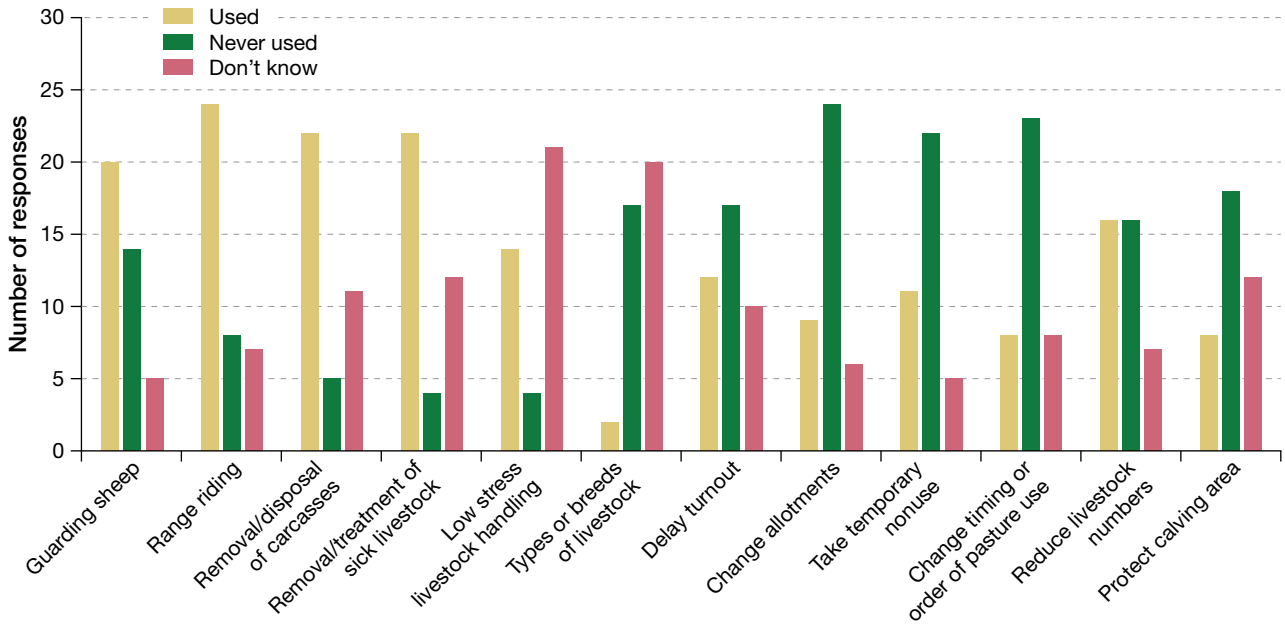


Figure A2.4—Use of husbandry tools, Forest Service regions 1–6.

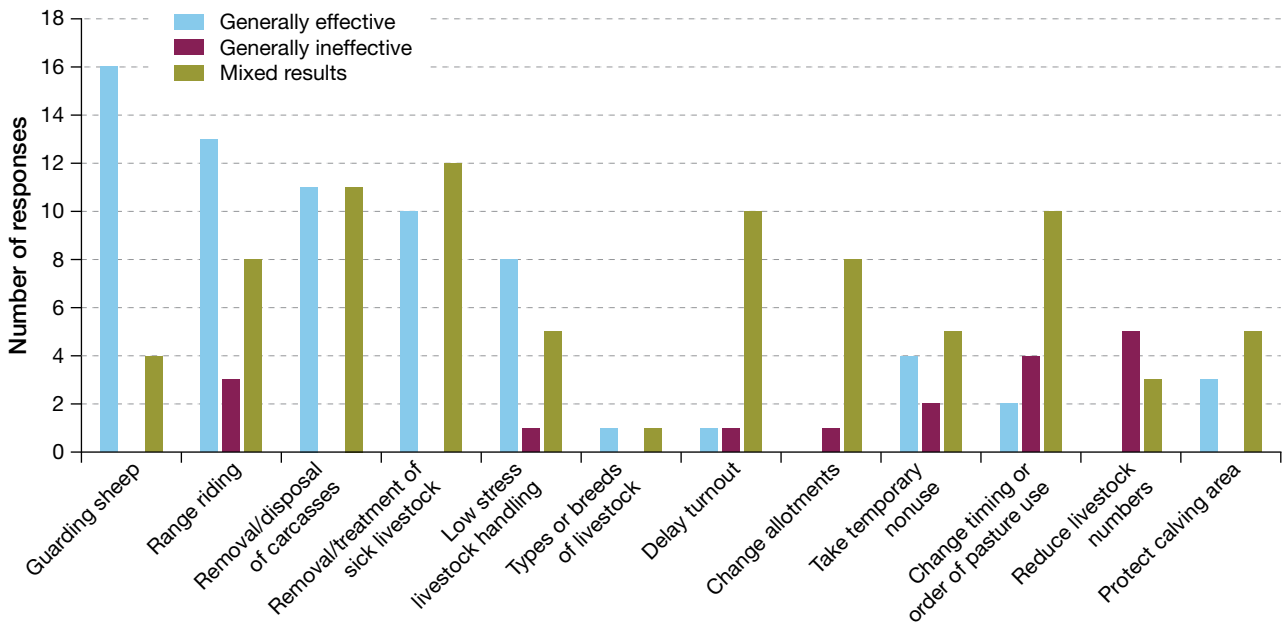


Figure A2.5—Perceived effectiveness of husbandry tools, Forest Service regions 1–6.

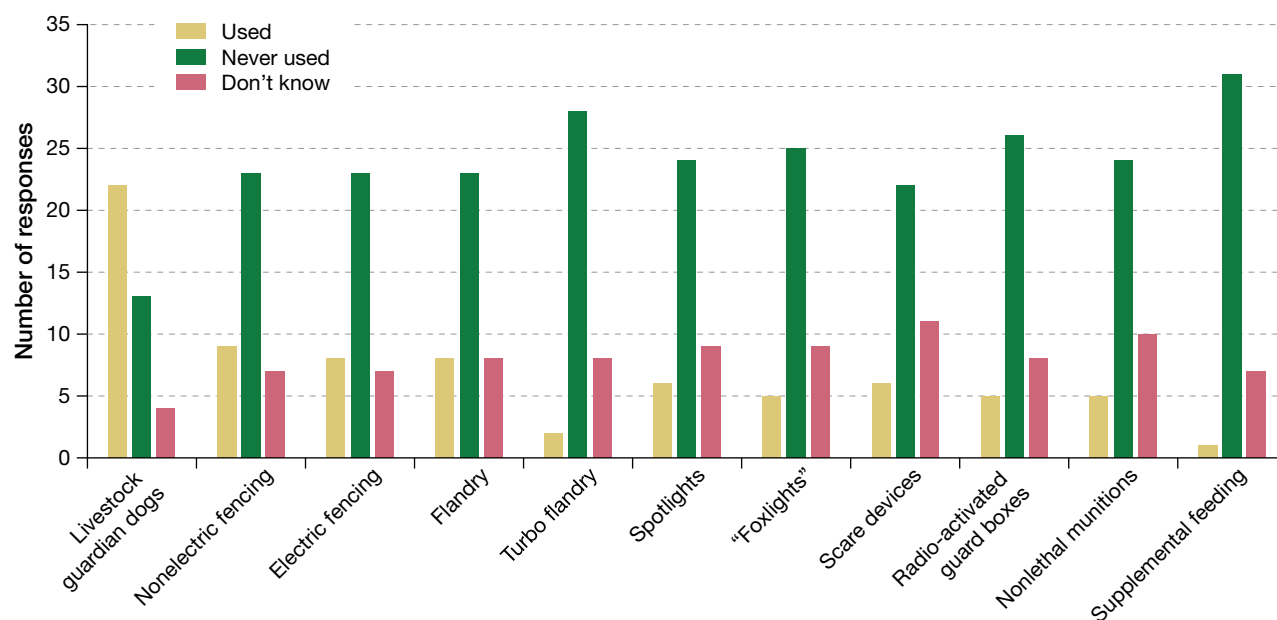


Figure A2.6—Use of deterrence tools, Forest Service regions 1–6.

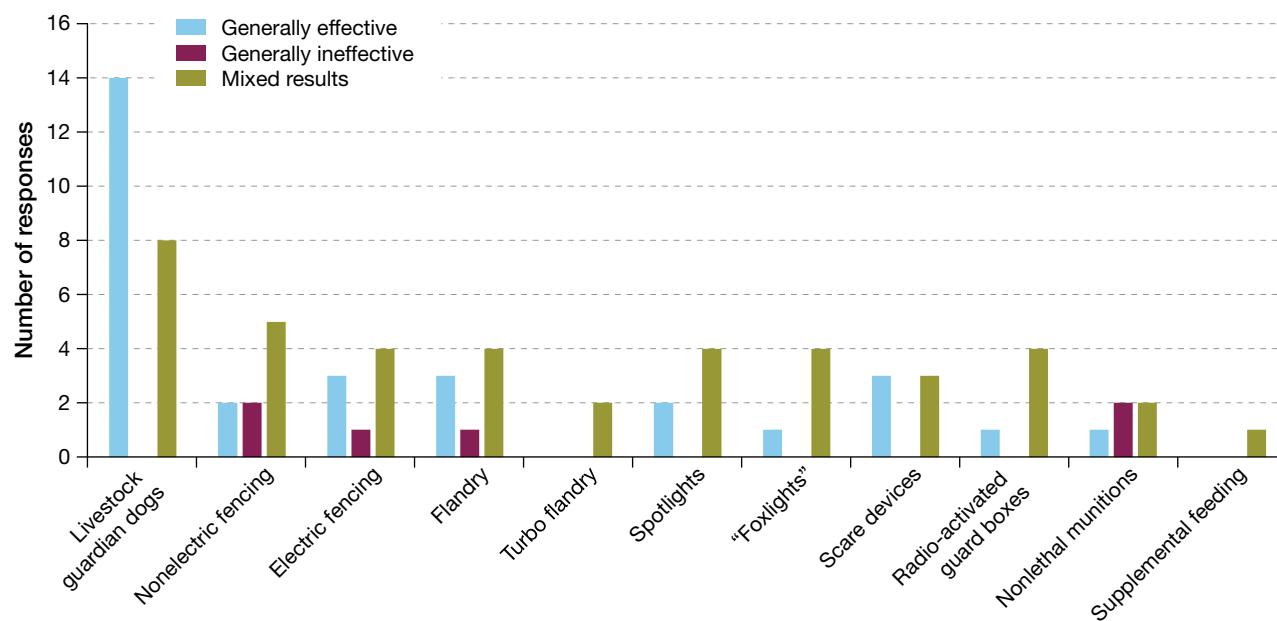


Figure A2.7—Perceived effectiveness of deterrence tools, Forest Service regions 1–6.

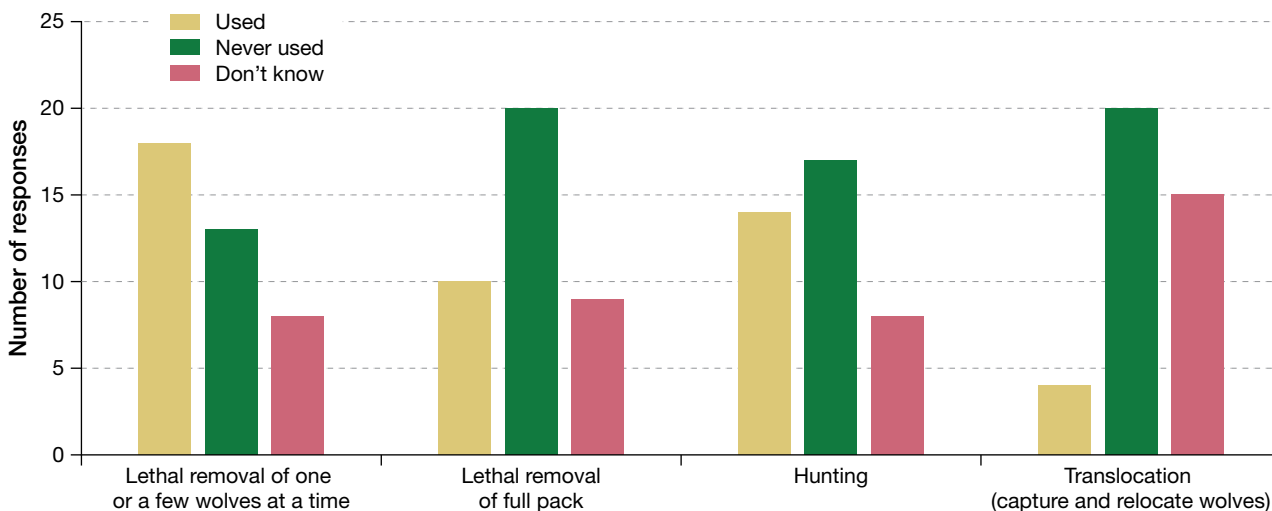


Figure A2.8—Use of removal, Forest Service regions 1–6.

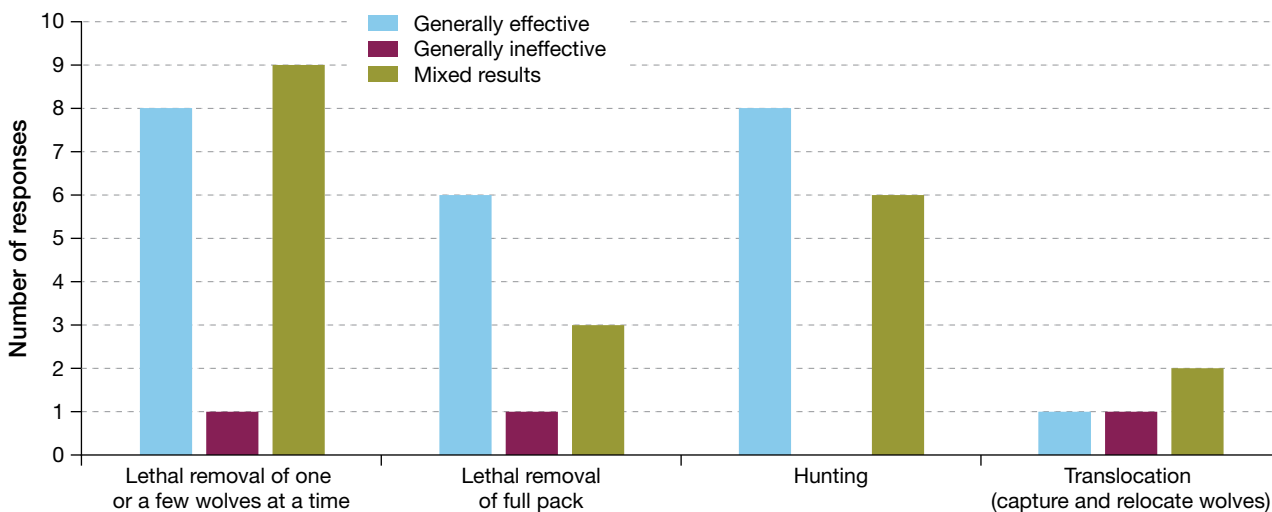


Figure A2.9—Perceived effectiveness of removal, Forest Service regions 1–6.

Appendix 3: Interview Guide

Note: We slightly modified interview guides to be appropriate for different interviewees, such as Forest Service managers, other government agencies, nongovernmental organizations, etc.

1. Introductions

Did you have the opportunity to read the “informed consent” document that I sent via email, and do you have any questions about it?

I’d like to emphasize that the purpose of the interview is to hear your honest opinions and perspectives, including on issues that may be considered controversial, so we take your privacy and confidentiality seriously. We’ll take what we learn from you and combine it with other interviews and synthesize, possibly use anonymous quotes, but we won’t attribute anything to you individually.

With your permission I’d like to record our interview.

This interview has several parts. In this first section, I’d like to start by collecting some background information about wolves in the region more generally. Then I’ll ask you about wolf conflict and your work in relation to wolf-live-stock dynamics, before moving on to your thoughts about the types of tools and strategies used to address the conflict.

To get us started, can I just confirm the following:

- Name
- Position / title
- Unit
- Time with organization (here and/or elsewhere)

2. Origins of the wolf story

Great! Okay, to officially begin, we have a few questions related to the general background and history of wolves in your forest.

1. To start off, we’ve already learned a little bit about your forest from our initial survey. There, folks noted that wolves arrived in [XX year from YY place/under ZZ circumstances]. Does that sound right to you?
 - A. Confirm the following:
 - I. When (what year) was the first sighting?
 - II. How did they arrive? From where? (*i.e.* natural recolonization or reintroduction)
 - B. When did the first pack get established in your forest?
2. How has wolf presence evolved since their arrival?
 - A. Has it varied over time? (*numbers/range expansion, contraction, etc.*)
3. How many documented packs does the Forest host today?
 - A. Do you track/monitor individual/overall numbers? How? (or if not, where does your information come from?) What is the estimated total population?

3. Current conflict context & conflict dynamics

So now I'd like to get into some more details about the current context of wolf conflict in your forest. In this section, we're really interested in understanding details about what types of conflicts you see in this forest and the "where, why, and how" of those conflicts. (We'll save questions related to the work you are doing to address these conflicts for a later section.)

1. In our survey, respondents noted that this forest sees [XX type of conflicts with YY number of allotments and ZZ # of grazing permittees affected] Does that sound right to you?
2. What kinds of impacts are there from wolves on producers and livestock? (Livestock movement, stress, behavior, predation, how this varies by cattle vs sheep vs other? Goats, horses? # of depredations over time on their NFs)
 - A. Are some producers/permittees affected more than others?
3. What do you see as the main factors or differences that have led to how producers/allotments experience conflict?
 - A. How does the level of conflict vary?
 - I. Across space/allotments
 - II. Across time/seasons
 - III. By other characteristics (e.g., size of operator, geography, ecological conditions, livestock type/breed, presence of other predators or prey...)
4. How do conflict dynamics compare at forest boundaries or on neighboring public and private lands?
 - A. How do wolf-livestock interactions on neighboring lands influence the nature of these interactions on national forest allotments, if at all?

5. How have conflict dynamics evolved over time? (e.g., more or fewer depredations? Have the wolves learned to attack livestock, etc.?)
 - A. If wolves and livestock co-exist relatively well, what accounts for this?
6. On a scale of 1 to 5, with 1 being low concern and 5 being high, how do wolf/livestock issues rank among other (rangeland management) concerns...
 - A. From your perspective (as a FS manager)?
(What's your #5?)
 - B. What about for your affected permittees?

4. Social & political context

Now, I'd like to switch gears slightly and ask you about how you see this conflict with respect to the broader social and political context. So for example...

1. What can you tell me about the social reactions (overall) when the wolves arrived?
 - A. How did those responses vary across groups? [stakeholders, community members]
 - B. How have these social reactions changed over time?
 - C. How would you describe the attitudes of stakeholders and community members with respect to wolf-livestock dynamics on the national forest? Currently?
 - D. What is your perception of how the livestock community perceives wolves?
2. So far I've heard you mention X and Y stakeholders, are there other stakeholders that play an important role?
 - A. And if so, what are their perspectives?
3. Are there other conflicts that wolf/livestock conflicts get brought into?

I'd like to shift gears here slightly to address some of the more policy-oriented aspects of wolf-livestock dynamics

4. What are the key federal or state policies or programs that influence conflict management, either directly or indirectly?

5. Who are the agencies involved in wolf/livestock management and related conflicts on this national forest? [Note could include USFW, state game agencies, Wildlife Services, BLM or other USFS, tribal or local governments]
 - A. What are their respective roles/responsibilities? (division of labor)
 - B. What are your relationships like with each of these other agencies?
 - C. What are relationships like between permittees and other agencies?
 - D. Do these dynamics look different elsewhere in the state/region?
6. What is the role of local or state-level working groups/collaboratives involved in this conflict/similar issues? What are they doing and how do you interact with them?
 - A. What practices have they adopted? What have been the outcomes?
7. Has this forest been subject to litigation? (Describe case(s), roots, outcomes, how this has influenced their current approach to management.)

Now, I'd like to ask you about Forest Service policies specifically.

8. Have you adapted USFS regulations or management policies at all in response to wolf/livestock issues, i.e. in order to reduce conflict?
 - A. *If yes:* How have you adapted management in order to provide the flexibility needed to address these issues/mitigate conflict? [Note, AOIs, permits, AMPS, Forest plans, etc.]
9. Do current USFS management policies enable you to respond to wolf-livestock conflict effectively?
 - A. Which policies have been especially helpful in this regard?
 - B. Which USFS policies hinder or constrain your ability to respond?

5. Management, problem-solving, lessons learned

In this section, I'd like to circle back to what's happening on the [X] Forest. More specifically, I'd like to ask about what types of strategies and/or management practices you and others at the [x] Forest have taken up in response to these conflicts. I learned something about these strategies from the survey we conducted, but would like to explore the responses from your forest more in depth.

Let's talk about your Forest's conflict mitigation programs/efforts/practices

1. Summarize survey results. Do these seem accurate to you? Is there anything you would add?
2. Can you tell me about the context in which those tools and techniques are being used - what tools are used where or how? (e.g., ...by season, geography/landscape conditions, livestock type, operator type, for how long)
3. How are decisions made about what tools to use?
 - A. What is the USFS (manager and agency) role in the roll out of different tools, practices, and/or strategies? Which of these tools are being used by the forest? [which ones are the USFS managers responsible for/taking on as part of agency duties]
 - B. What have individuals and/or the Forest as a whole been asked to do? How were you able to respond? Confirm whether forest specific requests or agency-wide]
 - C. Who or what provides the funding for these tools?
4. How do these tools vary in use/effectiveness? [Review answers on survey and dig in deeper, follow up questions]
 - A. By permittee type? [e.g., by scale, range management choices, animal/breed]
 - B. By landscape conditions / allotment? [e.g., topography, land cover, etc.]

5. Which group of the tools/practices/programs you've just mentioned appear to be most successful overall? In what context? Why?

- A. What does "success" look like in this context? (e.g., changing wolf behavior, reducing future depredations, reducing stakeholder conflict?)
- B. For those tools that are used, but seem less successful, why?

Now I'd like to talk a little about the role of lethal control / removal of wolves on (the forest / your state).

6. Could you say more about the role of lethal removal in your Forest? [nod to survey results]

- A. From our survey, it sounds like X amount of/ type of lethal control is taking place, does this sound correct to you?
- B. Confirm
 - I. Numbers
 - II. Form/how it takes place
 - III. Who decides/controls
 - IV. What other techniques have to be in place
 - V. Who pays/what funds
- C. (A tailored question on use, effectiveness, etc. of lethal control and/or hunting seasons)

Finally, I am curious about the changes that have occurred over time and any lessons learned.

7. Do you see wolf behavior changing in response to the set of tools you are using? [inducing fear, objective impacts/reducing depredation?]

- A. I'd also be curious about your own experiences with wolves: any encounters / stories you can share?

8. Do you see public/social response [permittees/ stakeholders] shifting because of the tools that you are using? *If people see hunting as an effective tool, circle back...*

- A. How/why do you think hunting is considered effective?
- B. I'd also be curious about your own experiences with the public, permittees, etc. — positive and negative; any stories you can share?

6. Snowball opportunities and next steps

- 1. In your own words, what would coexistence mean/ look like in your forest?
- 2. What have been some keys to success that have helped in mitigating wolf-livestock conflict on the [X] national forest?
- 3. What are the biggest barriers to preventing/ mitigating conflict on your national forest?
 - A. How could these be overcome?
- 4. What changes could be made in the USFS range management policy realm that would give USFS managers more flexibility to address wolf-livestock conflict, if any?
- 5. What advice or key messages do you have for other national forest managers facing wolf-livestock conflicts?
- 6. Do you have suggestions for other resources we should consider related to regional wolf dynamics?
 - A. E.g., we are aware of a study [X] that was conducted in relation to this issue; can you think of any other studies we should consult?
- 7. Who are other people/individuals you think we should talk with/interview?
- 8. Based on what you know about this project and from our conversation, are there products that could come out of this work that could be useful to you or your permittees?
- 9. Lastly, do you have anything you'd like to add?
 - A. Do you have any questions for me?

Appendix 4: List of Abbreviations

APHIS—USDA Animal and Plant Health Inspection Service

BDNF—Beaverhead-Deerlodge National Forest (Montana)

BNF—Boise National Forest (Idaho)

CDFW—California Department of Fish and Wildlife

CNF—Colville National Forest (Washington)

ESA—Endangered Species Act of 1973

HM—Head month

IDFG—Idaho Department of Fish and Game

LGD—Livestock Guardian Dog

LNF—Lassen National Forest (California)

MTFWP—Montana Department of Fish, Wildlife and Parks

NEPA—National Environmental Policy Act of 1969

ODFW—Oregon Department of Fish and Wildlife

OSC—Idaho Governor’s Office of Species Conservation

RAG—Radio-activated guard boxes

SNF—Shoshone National Forest (Wyoming)

WS—USDA APHIS Wildlife Services

USDA—United States Department of Agriculture

USFWS—United States Fish and Wildlife Service

WDFW—Washington Department of Fish and Wildlife

WGFD—Wyoming Game and Fish Department

WTGMA—Wolf Trophy Game Management Area

WWNF—Wallowa-Whitman National Forest (Oregon)

Pacific Northwest Research Station

Website	https://research.fs.usda.gov/pnw
Telephone	(503) 808-2100
Publication requests	(503) 808-2138
FAX	(503) 808-2130
E-mail	sm.fs.pnw_pnwpubs@usda.gov
Mailing address	Publications Distribution Pacific Northwest Research Station USDA Forest Service 1220 SW 3rd Avenue Portland, OR 97204



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