

A call for a national collaborative predator coexistence programme

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Abstract

1. Negative interactions between large terrestrial predators and livestock are a global phenomenon. The resultant conflicts can threaten the livelihoods and cultural traditions of those living closest to predator populations and jeopardize the conservation of predator species. These challenges are pronounced in the United States, where predator conservation is at a defining moment.
2. Focusing on the United States, we advocate for policy initiatives at the national scale to incentivize coexistence on multi-use public lands. We discuss how such policies can bolster the efforts of local institutions, facilitate bottom-up collaborations and support science-based programmes. Modelled after other successful collaborative programmes, our proposed programme could facilitate adoption of effective coexistence strategies across large regions that better match the spatial extent of the interface between predators and livestock.
3. A carefully structured, national coexistence programme could harness the already-growing support for living alongside healthy predator populations and fundamentally alter how we approach predator management so that political conflicts are avoided. Moreover, elements of the programme can be transferred to other regions around the world where community engagement is essential to sustaining and coexisting with predators.

KEYWORDS

coexistence, conflict, grazing, large predators, livestock, policy

1 | INTRODUCTION

Globally, large predator species are among those at most risk from extinction (Ripple et al., 2014). Human killing of terrestrial, vertebrate predators in response to livestock loss is a major threat to predator conservation (Ripple et al., 2014; Woodroffe, 2000). This threat is pervasive, as areas where livestock and predators are likely

to encounter one another, that is, rangelands, constitute almost 40 million km², which amounts to over 30% of Earth's ice-free lands (Ellis & Ramankutty, 2008). Finding opportunities for people and predators to coexist is therefore important for both human livelihoods and predator populations (Killion et al., 2020). We define coexistence according to Carter and Linnell (2016) as a 'dynamic but sustainable state in which humans and large predators co-adapt to

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living in shared landscapes where human interactions with predators are governed by effective institutions that ensure long-term predator population persistence, social legitimacy, and tolerable levels of risk'. Given the central role of institutions in this definition, we propose and outline below a new policy initiative to promote coexistence with predators in the United States, where predator conservation is at a defining moment (Carter et al., 2020).

Following a long history of extermination efforts in the United States, there are increasing signs that the public is willing to coexist with large terrestrial predators, such as wolves, bears and felids (Bergstrom, 2017; Bruskotter et al., 2017). For instance, protective policies enacted over the last several decades have enabled some predator populations to stabilize or recover (Gompper et al., 2015; Figure 1). Public attitudes towards some predator species are becoming more favourable (George et al., 2016). The scientific community is increasingly focusing on the myriad socioeconomic and ecological benefits that predators provide to human societies, rather than only their risks to human safety or depredations of livestock (Expósito-Granados et al., 2019). People with different interests and priorities are collaborating to manage predators using non-lethal techniques instead of resorting to lethal removal (Young et al., 2019).

Although progress is being made, coexisting with predators faces significant hurdles in the United States. A key challenge is the management of predators on federal public lands managed for multiple uses, including livestock grazing. These lands are vast in the United States with 247 million acres managed by the Bureau of Land Management and US Forest Service available for livestock in 2017 (Congressional Research Service, 2019). These multi-use, public lands are a nexus for interactions between the millions of livestock that graze on them and expanding predator populations that rely on them for habitat. From the late 1990s to the late 2000s, for example, the average annual number of confirmed depredations by grey wolves *Canis lupus* in the northern Rocky Mountains increased from 70 livestock to over 500. In the same time period, the average annual

number of wolves legally shot by livestock owners or killed in government control efforts increased an order of magnitude from 15 to 170 (US Fish and Wildlife Service et al., 2016). Livestock depredation by predators and the killing of predators to reduce livestock losses on public lands continue to fuel highly polarizing debates and policy conflicts about predator conservation. Because of such controversial issues, predator management decisions are being pushed through ballot boxes, courtrooms, commissions and legislative chambers in piecemeal fashion that are unlikely to facilitate long-term resolution of the underlying human–human conflict (Bruskotter et al., 2011; Carter et al., 2019; Lute & Carter, 2020; Nie, 2003).

There are encouraging signs that in some places grazing and conservation stakeholders are voluntarily collaborating to use non-lethal methods for resolving conflicts over predators (Boronyak et al., 2020; Wilson et al., 2017; Young et al., 2019). Such initiatives promote diverse practices including reducing attractants by disposing of livestock carcasses; increasing human presence using range riders to monitor predator movements; erecting barriers to separate livestock from predators in risky places and times; using visual, chemical and auditory deterrents such as strobe lights and loud speakers; working with guard animals such as dogs that are trained to protect herds from predators; and altering grazing practices such as rekindling herd instincts and rotational grazing. Evidence indicates that place-based collaborations can be effective in reducing impacts from predators, increasing human tolerance to these animals and reducing human-caused mortality of predators (Morehouse et al., 2020; Stone et al., 2017). These positive outcomes are attributed not only to the tools, but perhaps more importantly to robust, collaborative processes that create respectful forums and norms for addressing competing values (Wilson et al., 2017).

The benefits of these collaborations, however, are not being realized for the vast majority of communities and predator populations. Non-lethal strategies are used only by a small minority of livestock producers (Macon, 2020) and are applied to small portions

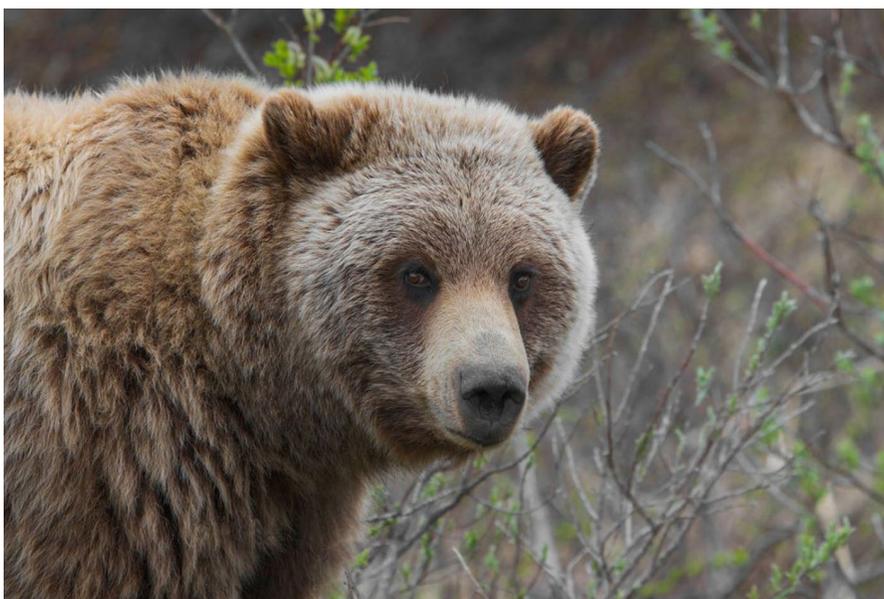


FIGURE 1 As grizzly bear *Ursus arctos* populations recover and expand their ranges in the continental US, livestock depredations and subsequent lethal removals of grizzlies on federal public lands may increase. A national coexistence programme will incentivize collaborations between grazing and conservation stakeholders to use non-lethal methods for resolving conflicts over grizzlies and other predators

of predators' current and potential ranges. Although bright spots of local-level governance, these collaborations are underutilized and do not match the large spatial extents that both predators and livestock roam. Yet, implementing and sustaining coexistence strategies across large regions must overcome substantial monetary and opportunity costs, deficits in training and materials, and social norms that might be resistant to their use.

2 | ENABLING COEXISTENCE AT REGIONAL SCALES

We argue that a national coexistence programme in the United States is needed to overcome these barriers. The federal programme should fund and support place-based (e.g. watershed level) coexistence strategies on federal public lands while facilitating adoption of effective strategies across large regions that better match the spatial extent of the interface between predators and livestock. The programme should be designed to foster the creation and growth of a network of communities that take it upon themselves to share landscapes sustainably with predators (Schneider et al., 2003). Insights, lessons and resources from those individual communities can link across the network to facilitate adaptive learning and enable effective collaborative coexistence at regional scales (Schultz et al., 2019). In addition to local collaboration, the programme should incentivize the use of best available practices, science and innovations for reducing predator-grazing conflict (van Eeden, Eklund, et al., 2018).

Funding and administering a new collaborative coexistence programme in the United States would not be without its challenges, such as bridging divergent values of different parties, addressing a lack of trust in and between institutions, developing monitoring criteria that reflect the collective interests of participants and establishing a sustainable funding model. Insights on addressing these challenges can be gained from similar programmes in Europe, which are helping promote coexistence at scale from the bottom up (König et al., 2020; Silva et al., 2013). However, these insights can be extended only so far, since the sociopolitical and ecological contexts differ between the United States and Europe, for example the vast extent of US federal public lands that are managed for grazing and conservation uses. Existing natural resource management programmes in the United States, like the Collaborative Forest Landscape Restoration (CFLR) Programme, may serve as a more appropriate template to model a collaborative coexistence programme after. Over the course of the 2000s, community-based forestry evolved from a grassroots movement to an institutionalized component of US federal forest policy, culminating in the legislative establishment of the CFLR Programme in 2009, and the integration of collaborative governance principles throughout US Forest Service decision-making (Butler & Schultz, 2019). Authorized as an \$80 million programme and funded through an annual appropriation to the Forest Service, the CFLR Programme encourages collaborative forest restoration at the landscape scale through a competitive process

that rewards place-based collaborations with multi-year funding commitments (Cromley, 2005; Little, 2011; Schultz et al., 2019).

3 | THE FACETS OF A NEW COEXISTENCE PROGRAMME

We envision a national coexistence programme like the CFLR Programme, whereby collaborative groups representing diverse interests operating within federally managed landscapes with ongoing predator conflicts compete for funding (provided by federal appropriations) based on their ability to reduce conflict and meet and sustain coexistence criteria, as evaluated by an advisory committee. To be eligible for selection and funding, collaboratives would need to submit their track record and plan for achieving social and ecological coexistence objectives as well as describe issues of governance, including how decisions are made, how conflicts are resolved and whether the absence of key stakeholders in the process could impede the success of the project. Funds could be used for a range of activities that improve collaborative coexistence, including, among others: offsetting costs associated with the use of non-lethal deterrence tools; livestock husbandry practices that lower likelihood of predator-livestock encounters; developing novel coexistence technologies and solutions; professional facilitation and enhancing stakeholder participation, planning and collaborative decision-making processes; on-the-ground community outreach and education programmes; and monitoring and adaptive management. Funding should be long term to encourage sustained participation from federal land managers, local communities and stakeholders and to allow enough time for coexistence outcomes to emerge and succeed (Butler & Schultz, 2019).

Developing a core set of monitoring and evaluation criteria will be challenging but crucial to programme success. These criteria should build from common ground between stakeholder groups (Lecuyer et al., 2018) and include a range of sociopolitical and ecological dimensions and may include indicators related to predator behaviours, demographics and population status; livestock numbers, health and productivity; equity, efficiency and accountability in decision-making and conflict resolution; and attitudes, perceptions, values and behaviours towards predators (Ceaşu et al., 2019). To improve legitimacy, these coexistence indicators should be monitored by teams representing diverse interests, including members of the local collaborative group, natural resource management agencies, scientists from diverse disciplines, conservation advocates and livestock producers (Leibenath, 2008; Serenari & Taub, 2019). This would ensure that success is being defined and evaluated with consideration of all stakeholder's interests. Regular and timely reporting of monitoring results can foster adaptive management, enabling communities to adjust to emerging conflicts and maximize benefits of the programme (Aronsson & Persson, 2017).

A national, collaborative coexistence programme should emphasize capacity building at a community level. An example of a capacity building initiative is to provide leadership-building opportunities for

potential coexistence leaders from diverse interest groups in landscapes shared with large predators, particularly within rural communities impacted by conflicts over predators (Gutiérrez et al., 2011; Schultz et al., 2018; Sjölander-Lindqvist et al., 2015). The programme could also facilitate partnerships between local communities and researchers from conservation organizations or universities to test coexistence strategies and implement multi-party monitoring plans. Incentivizing collaboration can ensure broad consensus on effective coexistence strategies, while accounting for local contexts, and therefore make it easier for communities to adopt proven coexistence tools rather than have them mandated from the top-down (Linnell, 2015; Redpath et al., 2017; Schusler et al., 2003). Adopting proven coexistence tools through a network of collaboratives can also facilitate an economy of scale, helping reduce the financial, material and information burdens for those individual ranchers considering the use of coexistence strategies (Macon, 2020). Moreover, rather than relying on financial compensation for depredated livestock, incentivizing community collaboration for coexistence acknowledges the important role of ranchers as stewards of these landscapes (Lien et al., 2017).

The national coexistence programme could start as a limited pilot programme with sufficient funding to test and refine its effectiveness within high conflict landscapes with well-established and functional collaborative groups. Funds could be administered by a government organization with experience working with rural communities, such as the US Department of Agriculture's Natural Resources Conservation Service or Forest Service. Other federal agencies (e.g. US Fish and Wildlife Service) or organizations with domain expertise could have consulting roles within the collaborative governance structure. A requirement or incentive for matching funds or other value adding capacity could be employed to leverage investments. Like the CFLR programme, we would expect a well-constructed collaborative coexistence programme to expand over time as policymakers, stakeholders and other parties see the benefits of collaboration.

4 | A PIECE OF A BIGGER PUZZLE

The proposed collaborative coexistence programme will not resolve all of the challenges associated with managing predators on increasingly crowded landscapes. For example, this programme focuses on public lands in the United States; however, many impacts from predators and lethal control responses occur on private lands, which are numerous (Wilson et al., 2005). As the proposed collaborative coexistence programme is refined over time, the lessons learned can be integrated into the management of non-federal lands. As an example, the US Fish and Wildlife Service has a programme called Partners for Fish and Wildlife, which helps landowners restore wildlife habitat on their land to benefit federal trust species, including migratory birds, endangered, threatened and at-risk species. Our proposed collaborative coexistence programme also does not directly address other key threats to predators, such as human population growth in

predator habitats and urbanization and other drivers of habitat loss and fragmentation (Parsons et al., 2019). Rather, our proposed programme should be viewed as one of a suite of evolving policy tools for predator population and habitat conservation that account for changing social, political and ecological conditions.

Although focused on the United States, with its unique social and political landscapes, certain elements of the programme could likely be adopted elsewhere. For example, the set of monitoring and evaluation criteria, which help determine whether progress is being made towards collaborative coexistence, could largely be replicated to other regions around the world where community engagement is essential to sustaining and coexisting with predator populations. However, because of fundamentally different governance structures in other places (Baylis et al., 2008), some aspects of the programme, such as the funding mechanisms and interconnections to existing wildlife management policies would not transfer easily or at all. If this programme were to take shape in the United States, it will be highly useful to coordinate with international conservation organizations and national wildlife management agencies in other countries to determine how well this programme would fit elsewhere and benefit from their experiences as well.

5 | A RETURN ON INVESTMENT

A national coexistence programme that supports a network of coexistence collaboratives and reduces high-cost conflicts on federal public lands furthers the public interest and supports the conservation and management goals on those lands. In addition, the continued recovery of large predators generates multitudinous benefits. By consuming prey animals, predators can mitigate zoonotic disease transmission, decrease vehicle collisions with herbivores, reduce crop losses and increase carbon sequestration in certain ecosystems (Geger et al., 2020; O'Bryan et al., 2018). Inasmuch as predators are attributed with aesthetic, cultural, economic and educational values, their loss also diminishes humans' quality of life (Carter et al., 2019; Gilbert et al., 2021). However, rural communities living closer to predators disproportionately incur the costs of those animals. This proposed coexistence programme would help rectify this inequity by distributing financial incentives to communities sharing landscapes with predators now and in the future (Carter et al., 2019; van Eeden, Crowther, et al., 2018). Because the programme would focus on strengthening collaborative processes, local communities will also be better capable of sustainably living with predators regardless of the changing winds of national politics (Hartel et al., 2019).

We believe our proposed collaborative coexistence programme can help solve systemic problems on public rangelands in the United States more effectively and efficiently than the status quo, which in the case of coexistence includes some local success stories in areas otherwise predominated by conflict. Indeed, place-based coexistence collaboratives are limited and supported more by the individuals involved rather than formal institutions. Establishment of a new federally funded, national-scale coexistence programme

enables supporting institutions to emerge and grow, for example, through governmental and non-governmental funding streams and coordination with other organizations. The proposed coexistence funding and collaborative programme would also help fill a policy gap. Federal public lands have existing multiple use and conservation legal frameworks that imply a balancing of values; however, existing policies do not adequately tackle the challenge of sustaining predator populations in shared landscapes. Although the programme requires investment, it would also potentially save money in other areas, such as by reducing the costs of lethal removal and compensation for depredation, which combined reach millions of dollars every year (US Fish and Wildlife Service et al., 2016). A national, collaborative coexistence programme is increasingly important as the overlap between public rangelands and predator ranges grows in the future. Furthermore, boosted by science-based collaborative processes, the programme has the potential to mature into a structured force that could reshape how we live with predators across the United States.

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CONFLICT OF INTEREST

The authors do not have any conflicts of interest to declare.

AUTHORS' CONTRIBUTIONS

The idea for this manuscript was originally developed by N.H.C. and P.N.; N.H.C. led the writing of the manuscript; N.H.C., P.N. and T.E. significantly contributed to drafting and revising the manuscript and gave final approval for its publication.

DATA AVAILABILITY STATEMENT

There are no data associated with this article.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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