



Research

Collaborative research to mitigate conflict with bears and wolves in the American West

Photo: Erika Nunlist

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Introduction

After decades of campaigns to exterminate large carnivores in the USA, by the 1970s public opinion had shifted, leading to the listing of the grey wolf (*Canis lupus*) and grizzly bear (*Ursus arctos*) under the Endangered Species Act. Through recolonisation and translocations from Canada in the 1990s, grey wolves rebounded and reestablished in seven of the western United States: California, Colorado, Idaho, Montana, Oregon, Washington and Wyoming (Fig. 1). Additionally, there are now over 286 Mexican wolves (*C. lupus baileyi*) in Arizona and New Mexico

as a result of reintroduction efforts that began in 1998. Successful conservation programmes also led to the expansion of grizzly bear populations from strongholds in Yellowstone and Glacier National Parks into Montana, Wyoming and Idaho.

As wolf and grizzly bear populations continue to expand, they increasingly occupy public and privately owned rangelands. Ensuring habitat connectivity is a central goal for conservation of large carnivores and their native ungulate prey. Rangelands, which provide grazing for livestock as well as habitat and movement corridors for wildlife, are a central piece of the landscape mosaic. However,

large carnivores can threaten the viability of livestock operations through direct impacts (i.e. depredation) and indirect effects (e.g. reduced pregnancy rates in breeding livestock, reduced weaning weights in calves, increased labour for monitoring and management). The twin goals of reducing losses to agriculture while sustaining large carnivore populations have led to an increasing emphasis on the development of nonlethal approaches to conflict mitigation. This calls for rigorous evaluation of potential practices and the help and knowledge of livestock producers to find sustainable and effective solutions.

In 2021, we formed a consortium to evaluate the effectiveness of nonlethal techniques to reduce direct and indirect losses and to provide producer-led feedback to agencies and organisations providing conflict reduction programmes to improve their practicality, utility and accessibility. The Conflict on Working Lands Conservation Innovation Grant (CoW-CIG) brought together representatives of non-profits, federal and state agencies, universities, private livestock producers and landowners from across the western USA. We worked together to evaluate three nonlethal techniques that were commonly used on extensive cattle and sheep ranches in the region but would benefit from a scientific basis for implementation where livestock typically graze on lower elevation private land in winter months and on higher elevation public, multi-use lands in summer months (Fig. 1). We also created a platform for shared learning and knowledge exchange. Our research and outreach were paired with an effort to develop more durable funding opportunities for landowner-implemented nonlethal techniques. In this article, we describe the collaborative approach that our consortium used to co-produce, evaluate, implement and share knowledge about range riding, carcass management and fencing (Fig. 2). We share our experience implementing this project and lessons learned to inform future initiatives to reduce conflict on rangelands.

Nonlethal techniques

Range riding

Range riding is a long-used nonlethal technique where human presence is used to manage livestock, deter carnivores and monitor the activity of both [1,2]. It can provide a myriad of operational benefits, such as detecting livestock carcasses, rotational grazing, deploying other nonle-

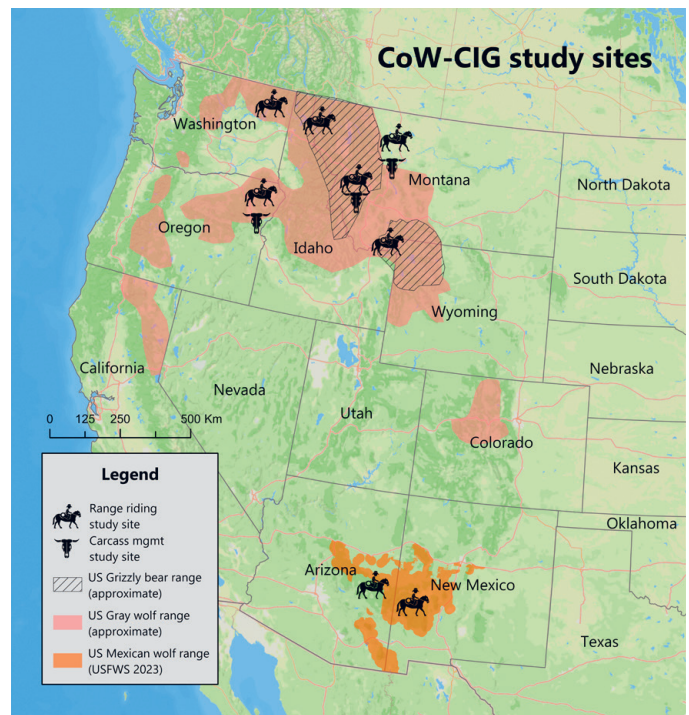


Fig. 1. Map of the western USA showing approximate wolf and grizzly bear ranges as of 2025 and CoW-CIG consortium range riding and carcass management research areas (Sources: Mapbox, USFWS, icons from Gan Khoon Lay and Jems Mayor).

thal techniques and adaptive management. Range riding is flexible and varies according to operational contexts and goals, as the rider makes decisions in real-time based on the landscape, livestock behaviour and predator activity [2].

Carcass management

In the western US, deadstock (i.e. livestock carcasses) are often left in place or put in a single location that is referred to as a bone pile. Carcasses and bone piles attract carnivores, influencing their diet and behaviour as they scavenge the remains and spend more time in the area [3]. Carcass management, popularised in the western US by the Blackfoot Challenge in the early 2000s [1,4], is the practice of removing deadstock to prevent it becoming an attractant that lures carnivores into areas near livestock or human infrastructure. It involves secure enclosures, typically off ranches or away from ranch infrastructure, where carcasses can be composted or buried. Carcasses are removed by producers to off-site locations or collected by personnel from the local organisation coordinating the programme. In addition to reducing carnivore–livestock interactions, carcass management can reduce risk of grizzly bear–human interactions, prevent pathogen transmission, protect water quality and prevent attracting other



Fig. 2. Nonlethal tools evaluated by the Conflict on Working Lands – Conservation Innovation Grant consortium. From top left clockwise: An electric fence installed on a livestock operation in Montana (Photo: Russell Talmo); dead cattle picked up as part of the Madison Valley Ranchlands Group's carcass management programme in Montana (Photo: Linda Owens); a range rider herding cattle in northeastern Washington state (Photo: Jay Shepherd); range riders checking livestock and looking for predator sign in New Mexico (Photo: Lori McCurdy); domestic compost pile for livestock carcass removal run by the Blackfoot Challenge in collaboration with local partners (Photo: Matt Collins); installation of fladry to deter predators in Montana (Photo: Louise Johns).

scavengers like ravens (*Corvus corax*) which can affect livestock and other wildlife such as sage grouse (*Centrocercus urophasianus*), a ground-dwelling bird of conservation concern impacted by nest predation by ravens.

Fencing

Fencing is among the most common strategies to reduce depredation by excluding predators or containing livestock. In the western US, 4- and 5-wire electric fences, turbo-fladry, temporary electric night pens and electrified drive-over mats are promising designs to reduce the impacts of grizzlies and wolves. Temporary electric night pens are typically used for sheep herds on western rangelands. Electric fences are typically used to secure calving and lambing pastures and other attractants (e.g. chicken coops) on home ranches and electrified drive-over mats are used around infrastructure in areas where vehicles transit.

Co-production of methods

The CoW-CIG consortium committed to research based on the concept of co-production [5] to help ensure that our findings were relevant and practical, and that our education and outreach efforts contributed to the use of nonlethal techniques, policy and collaboration across agriculture and wildlife management [6]. We recognised that conflict prevention strategies designed and implemented without agricultural expertise would have limited local relevance and may be detrimental to the real and perceived efficacy of the techniques. We defined co-production as: processes that iteratively bring together diverse groups and their ways of knowing and acting to create new knowledge about reducing conflict and using practices to inform holistic, adaptive decision-making for working landscapes, habitat permeability and agricultur-

al production. We immediately began the co-production process by ensuring the entire team, including representatives of livestock owners, were involved in selecting two graduate students. The team helped to develop the advertisement, select applicants for interviews, participate in the interview process and vote to choose the successful candidates.

To inform the metrics of effectiveness for each nonlethal technique and the methods needed to measure those metrics, the consortium developed technical advisory committees (TACs) for each technique. TAC participants included consortium members, wildlife management professionals and agricultural practitioners who met weekly or bi-weekly to ensure the practicality and relevance of metrics and methods in order to meet both the interests of livestock production and the needs of carnivore ecology. Graduate students and university researchers within the consortium served as facilitators [7]. After defining research questions, facilitators proposed methods and received feedback from TAC members. Pilot projects were conducted on livestock operations with TAC members to receive feedback, test different approaches and bring findings back to the TACs for method adjustment. Research plans were then implemented by the graduate students in collaboration with TAC members and other project partners, such as livestock producers participating in research and state wildlife agencies. After a full year of deliberation with TACs, we piloted research methods with input from relevant parties and then finalised the study design and began data collection.

Researchers and practitioners in the human–carnivore conflict field sometimes lack understanding of the complexity of livestock operations’ resource management [7]. Regular TAC meetings helped to ensure research addressed the concerns and experiences of livestock producers and practitioners. TACs created awareness for priorities that would have not been detected by a singular group, created dialogue on the logistical considerations for the deployment of each method and promoted transparency and credibility in how research was being conducted. Consortium members gained critical understanding of how nonlethal techniques fit into the changing needs of rangeland and livestock management, land management policies and resource concerns.

Collaborative research

The range riding TAC identified a need to understand the diversity of approaches to riding and how different approaches may impact overall effectiveness under varied operational contexts. This TAC also identified a need to measure the impact of range riding on depredations as well as physiological indicators of predator-induced stress (e.g. pregnancy rates, calf weaning weights, cow body condition, chemical indicators of stress such as cortisol and thyroid levels) and behavioural indicators of stress (e.g. increased vigilance). Due to the diverse nature of range riding approaches, the TAC also decided to conduct extensive interviews with livestock producers and range riders to understand how decisions are made in the field and the limitations to rider deployment. In partnership with state and federal wildlife agencies from Montana, Oregon, Washington, New Mexico and Arizona, the Blackfoot Challenge, Northeast Washington Wolf Cattle Collaborative, the Centennial Valley Association as well as range riders and livestock producers across the western USA, data on predator activity, cattle behaviour and rider decision-making were collected for three years across 13 ranches. Once analyses are complete and findings available, the range riding TAC will meet to deliberate the interpretation of results to ensure they are accessible and meaningful to individuals and agencies deploying riders.

The carcass management TAC proposed a study focused on whether the practice of carcass management shaped the home ranges, habitat selection and movements of grizzly bears and wolves. Thanks to extensive GPS-collaring efforts by partners from two state agencies (Oregon Department of Fish & Wildlife and Montana Fish, Wildlife & Parks) we obtained collar data from dozens of individual wolves and grizzly bears in areas with and without carcass management. We are working to combine these data with depredation events, bone pile locations and metrics of the human footprint to determine the degree of influence of carcass management.

The fencing TAC took a unique approach to understanding how fencing was being used across the American West as a nonlethal technique. The TAC designed a survey for livestock producers about their operation, fence designs they have used, their effectiveness and from whom

they received information. The survey was then distributed to livestock producers via our consortium's network. The group also partnered with a wildlife conservation non-profit that implements nonlethal techniques, to survey its programme participants about the effectiveness of electric fences that they have installed to deter grizzly bears in Montana.

Knowledge exchange

Overcoming barriers

There is an important body of research on conflict mitigation in the western US, but there are still three primary hurdles to the adoption of nonlethal approaches: 1) they are often designed outside the ranching community, resulting in techniques and programmes that do not account for the diverse, complex and sometimes limiting relationships between an operation's environmental, economic and social dynamics, therefore techniques are sometimes not feasible, are cost prohibitive or simply ineffective; 2) often the most promising and innovative techniques are unknown to producers and managers alike because they are the least researched and communicated; and 3) producers who try new innovative techniques are often geographically separated from other producers confronted with the same challenges, limiting a key mechanism of information transfer. TACs addressed the first hurdle, while our field-based research took additional measures to address the second and third. While the research was underway, together with the TACS we co-created documents for practitioner use, held various webinars and in-person workshops to provide peer-to-peer learning and opportunities for producers and wildlife agencies to work through challenges to collaboration surrounding nonlethal techniques and created technical reports that would serve to inform the public and policy-makers about carnivore–livestock conflict mitigation.

Guides and toolkits

We wanted to provide a comprehensive overview of risk assessment and the three nonlethal techniques based on livestock producers' and practitioners' experience to

inform others interested in using these practices. First, we created a guide for landowners, conservation planners and other partners to support designing and deploying site-specific nonlethal techniques to reduce conflicts while managing landscapes for multiple production and conservation values. The technical paper *“Reducing risk on the range: Non-lethal practices for managing carnivore–livestock conflicts”*¹ provides information on evaluating depredation risk over space and time, offers background information on the form and functions of range riding, carcass management and electric fencing/fladry and out-lines principles to guide practice implementation and adaptive management [8].

With the TACs, we also co-produced 'tool kits': documents conveying the context-specific application of each of the three nonlethal techniques, including case studies highlighting different settings throughout the West. The range riding tool kit² provides a concise definition of the practice (Fig. 3) as well as best practices for implementation [9]. The carcass management tool kit³ categorises and describes the four considerations of carcass management: 1) finding and securing a carcass; 2) temporary or permanent ranch facility; 3) transportation; and 4) community carcass management facility [10]. The fencing



Fig. 3. Range riding schematic from the tool kit.

¹ https://westernlandowners.org/wp-content/uploads/2024/11/Tech_Note_Non-Lethal-Risk-Management-Practices_Final.docx-2.pdf.

² <https://westernlandowners.org/wp-content/uploads/2024/08/Range-Riding-Tool-Kit-FINAL.pdf>.

³ https://westernlandowners.org/wp-content/uploads/2024/08/Carcass-Management-Tool-Kit_-FINAL.pdf.

tool kit⁴ offers an overview of four widely used types of fencing including turbo-fladry, electric night pens, 4- or 5-wire fences and electric drive-over ‘unwelcome mats’, as well as information to guide their context-specific implementation [11].

Webinars and workshops

In order to disseminate information and highlight the producers whose knowledge led the way for forming the toolkits, the project team hosted four webinars attended by over 500 individuals from all seven states within the project area. We also held a series of knowledge exchange workshops on range riding in different areas. The format varied by participant interest, but general themes included:

- 1) Peer-to-peer knowledge sharing opportunity for livestock producers, range riders, agency staff and NGO employees to discuss varied approaches to range riding (Fig. 4).
- 2) Free wildlife track and sign certification opportunity for range riders, producers and state and federal wildlife agency staff, requested by rider and producer project partners (Fig. 5).
- 3) Space for producers and wildlife management agencies to deliberate solutions to inter-group conflicts limiting effective range rider deployment.

The CoW-CIG consortium identified producers and practitioners from across the western US with experience in conflict mitigation. Panellists were invited to share their experiences with range riding, working with state and federal wildlife and agricultural agencies, and with predator conflict in general. Attendees could ask questions, and conversations were facilitated at both the full group and smaller break-out group scales. A few transversal topics from the workshops were: defining good range riding; improving its effectiveness and what training riders need; and what metrics to use to best deploy range riders across the landscape under limited resources. Importantly, participants agreed that being an “effective rider” is context-specific due to the unique goals of each producer, local wildlife policy, changing conflict risk and the many tasks assigned to a rider, including monitoring and/or managing livestock, locating depredations, recognising potential early patterns of conflict, etc.

We distributed surveys at two of these workshops. All respondents (n = 53) agreed that the workshop and training improved their awareness of the topics covered. Ninety-six percent agreed that the workshop provided new knowledge and was current, up to date and relevant, while 70% said that it provided new skills. Overall, 81% of respondents rated the workshop as excellent and the other 19% as good. Most respondents (n = 29) agreed that they were likely to use some aspect of the project in the next year: a) “to adopt one or more of the practices mentioned” (76%); b) “to increase networking with other producers” (79%); and c) “to add value to some aspect of my operation” (63%) (Fig. 6).

Forty-eight respondents (91%) reported that they planned to share what they learned from the workshops with their neighbours and community. Aspects of the workshops particularly appreciated by participants included: 1) getting to know the different organisations and stakeholders in person, especially hearing their diverse experience, knowledge and ideas; 2) the culture of respect, honesty and teamwork maintained at the workshop through hard conversations and different perspectives/points of view; 3) having all agencies with a stake in the game present; 4) community development; 5) the panel discussions and break-out discussions; 6) hope and optimism that there can be effective solutions to the current conflict; 7) learning about new Natural Resources Conservation Service (NRCS)⁵ and other funding options for range riding and wildlife conflict; 8) networking with fellow producers and/or range riders; and 9) the collaboration and relationship building.

Podcast

To extend the reach of the project, partners developed Working Wild U, an award-winning podcast aimed at target audiences of ranchers, wildlife managers and urban wildlife enthusiasts. Hosted by team members Jared Beaver and Alex Few, episodes are centred at the intersection of cultural knowledge and science, exploring the challenges and successes of sharing and managing working landscapes that support both people and wildlife. Season 1: Wolves in the West⁶ featured partners and researchers involved in this effort. At the time of writing, the podcast

⁴ <https://westernlandowners.org/wp-content/uploads/2024/08/Electric-Fencing-Tool-Kit-FINAL.pdf>.

⁵ A federal agency that provides natural resource conservation solutions on private lands.

⁶ <https://workingwild.us/category/season-one>.



Fig. 4. A panel of livestock owners, range riders and government officials discuss range riding implementation during a knowledge exchange workshop (Photo: Matt Collins).

has achieved over 35,000 downloads across all 50 US states, topped by Colorado, Montana and California. It has proved highly effective as a mode of communication, with 91 % of surveyed listeners saying the show improved their awareness of the topics covered while 83 % of natural resource professionals and practitioners surveyed said they intend to use some aspect of this project as an educational resource and when advising others on this issue.

Lessons learned

Trust and partnerships

As one of our team members, Gary Burnett, emphasised, quoting Montana Public Radio host Brian Kahn⁷, “Trust is gained a teaspoon at a time and lost by the gallon.” The project relied on decades of trust that was built by project members with livestock producers, landowner collaboratives and wildlife managers. The success of this project would not have been possible without the pre-existing partnerships between these interest groups working for a common purpose.

Trust and relationship building continued to be prioritised throughout the project. New research partners were invited to attend and provide feedback during TAC meetings and webinars and were also invited to attend range rider workshops, often as panellists. Graduate students and their technicians spent at least six months of the year living and working with livestock producers and range riders while collecting data. This repeated face-to-face time and shared experience built real trust, promoted open conversation and improved collaboration, further improving research and education/outreach outcomes [5,6]. Members and partner organisations of the CoW-CIG consortium continue to work collaboratively with communities to evaluate and implement conflict mitigation tools.

Practical, relevant, accessible

Landowners and livestock producers maintain knowledge of the land and stewardship practices that are not often captured in scientific research or elevated for peer-to-peer learning. Incorporating this knowledge is impor-

⁷ <https://www.mtpr.org/show/home-ground>.

tant for both impactful applied science and the development and dissemination of conflict prevention techniques that are operationally relevant, accessible and practical [12]. Even the most effective nonlethal technique is not effective if producers cannot afford to use it, do not find its use practical or the technique does not fit into their operational context. Similarly, nonlethal techniques must be relevant to the economic and cultural contexts of livestock production. Producers' decisions and their perceptions of the effectiveness of nonlethal techniques are primarily based on their community, family and friends as well as personal experience [13,14]. For example, producers who believed more strongly that other producers were reporting wolf depredation or applying for depredation compensation were more likely to intend to report depredation and apply for compensation themselves [15].

Research, workshops and other products resulting from a co-produced process that involves the agricultural

community at all stages of development are often more trusted and valued by producers because they reflect their perspectives and account for the complexities and challenges they face as stewards of the land. Products are more likely to be shared among producers and workshops are more likely to be attended if they follow such an approach. Co-production is also essential for fostering a sense of shared ownership and agency over predator conflicts and mitigation measures [16,17], which has been found to improve outcomes and the adoption and sustained integration of potential solutions [6,12].

Flexible timelines

The co-production process illuminated the need for flexibility, both from the research perspective and for deliverables to project funders. Co-producing research with the TACs required an iterative process with multiple meetings, both remote and in-person [7,12]. The team



Fig. 5. Participants in a tracking event learn to estimate the age of large carnivore spoor in order to increase understanding of conflict patterns (Photo: Matt Collins).

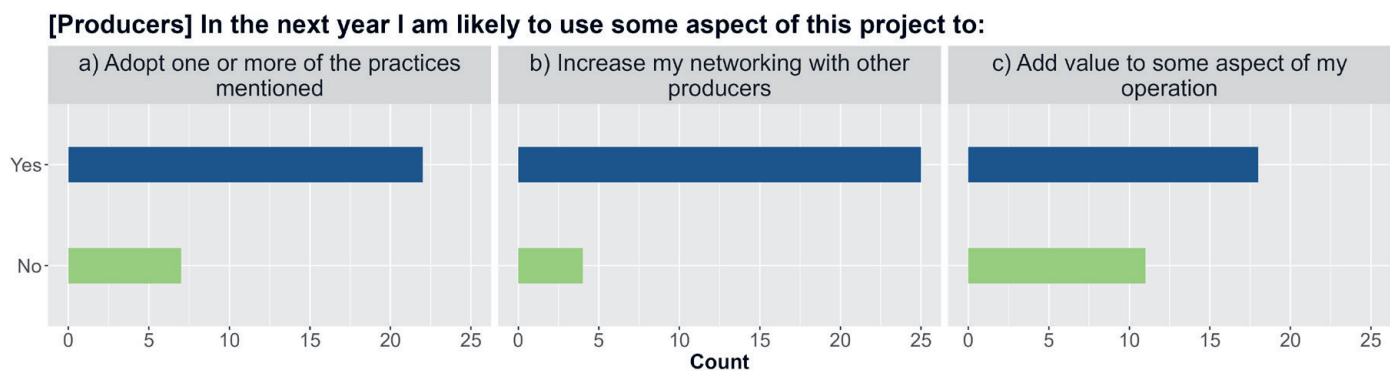


Fig. 6. Responses of participants at range riding workshops held in Oregon and Arizona to three post-workshop survey questions.

made a collective decision to delay research by a year to ensure a shared vision, build trust between members and develop a true understanding of operational and landscape complexity before collecting data. Therefore, some project deliverables took more time to develop than was originally planned. Fortunately, our funders recognised the importance of co-producing applied research and the time required to do it well. The co-production process also required frequent conversations with TAC members and numerous revisions to research plans, which changed the timing for graduate students to establish research questions, methods and begin data collection.

Neutral spaces

Much of the contention around human–carnivore interactions stems from different ways of thinking about carnivore management. As part of our range riding workshops, wildlife track and sign evaluations brought livestock producers, range riders and wildlife management agency employees together in a new and different environment. This was very beneficial because it created a space for individuals actively involved in interpersonal conflicts related to livestock depredation to work and learn together in a new setting. Research shows that contact with outgroup members (i.e. people outside the cultural group one identifies with), especially neutral contact not directly related to the active conflict, can help reduce stereotyping and increase capacity for building trust [18,19]. We think this practice could be useful in the future to create stronger relationships between groups who otherwise interact primarily during conflict-heavy and tense times, while also providing useful training that can improve range riding’s overall effectiveness.

Project outcomes

The CoW-CIG team set out with the goal of reducing the financial and social burdens of expanding predator populations to livestock producers through innovation and evaluation of nonlethal approaches, leading to more resilient ranches and connected landscapes with sustainable carnivore populations. Through numerous co-produced products, and by furthering research around conflict prevention practices, our efforts contributed to novel cost-sharing opportunities that will support livestock producers, reduce conflicts and increase landscape permeability for predators.

This project developed communities of practice among diverse stakeholders in conflict reduction, supporting information exchange and collective action to meet shared goals. Through TACs and consistent communication among partners, our project leveraged the diverse skill sets and knowledge of all project partners and participants to further durable policies and products. Determining questions and methods collaboratively was useful to create a mutual understanding of research priorities and context dependence of nonlethal techniques on rangelands in the western US. Networks developed through this project have led to conservation innovation and impact in conflict reduction while also serving as a venue to disseminate important information across stakeholder groups. Through a deliberate process of elevating livestock producer voices in guiding the direction of research and communications, our project developed products, including webinars, toolkits and guides representative of the needs and perspectives of those most affected by predator conflict. Additionally, our range rider workshops provided key opportunities for peer-to-peer learning, discussion and deliberation among local practitioners and

agency stakeholders collaborating to reduce carnivore–livestock conflict and meaningful new experiences to help build trust.

The crowning achievement of our work is the inclusion of the three targeted measures into funding opportunities (called ‘practice standards’) through the NRCS and Farm Bill⁸. Now, livestock producers in the western US can apply for federal funding to implement turbo-fladry and carcass management on their land. A practice standard for range riding has been established in five states and is currently under consideration for West-wide availability. This effort laid the groundwork for two successful Regional Conservation Partnership Program applications, a 22 million USD investment to support adoption of these nonlethal techniques in five western states. This reflects the team’s commitment to an intentional, high-investment co-production process resulting in what has been called, “actionable knowledge that can catalyse broader societal transformation of governance and knowledge production processes” [16]. Our project was thus successful in charting the course of research topics that will inform nonlethal approaches and ensuring federal funding for livestock producers who wish to implement them.

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References

- [1] Wilson SM et al. (2017) Learning to live with wolves: community-based conservation in the Blackfoot Valley of Montana. *Human–Wildlife Interactions* 11(3): 4.
- [2] Parks M & Messmer T (2016) Participant perceptions of Range Rider Programs operating to mitigate wolf–livestock conflicts in the western United States. *Wildlife Society Bulletin* 40(3): 514–524.
- [3] Petroelje TR et al. (2019) Subsidies from anthropogenic resources alter diet, activity, and ranging behavior of an apex predator (*Canis lupus*). *Scientific Reports* 9: 13438.
- [4] Wilson SM (2023) Living with predators: A 20-year case study in the Blackfoot River Watershed of Montana. In: McNew LB et al., eds. *Rangeland wildlife ecology and conservation*. Springer Cham, pp. 969–993.
- [5] Norström AV et al. (2020) Principles for knowledge co-production in sustainability research. *Nature Sustainability* 3: 182–190.
- [6] Naugle DE (2020) Coproducing science to inform working lands: The next frontier in nature conservation. *Bioscience* 70(1): 90–96.
- [7] Hyde M et al. (2022) Multidisciplinary engagement for fencing research informs efficacy and rancher-to-researcher knowledge exchange. *Frontiers in Conservation Science* 3: 938054.
- [8] Collins M et al. (2023) Reducing risk on the range: Non-lethal practices for managing carnivore–livestock conflicts. CoW-CIG consortium.
- [9] Nickerson R et al. (2024) Range riding producer tool kit. CoW-CIG consortium.
- [10] Gage E et al. (2024) Carcass management producer tool kit. CoW-CIG consortium.
- [11] Collins M et al. (2024) Electric fencing producer tool kit. CoW-CIG consortium.
- [12] Chambers JM et al. (2021) Six modes of co-production for sustainability. *Nature Sustainability* 4: 983–996.
- [13] Volski L et al. (2021) Social effectiveness and human–wildlife conflict: Linking the ecological effectiveness and social acceptability of livestock protection tools. *Frontiers in Conservation Science* 2: 682210.
- [14] Knapp CN & Fernandez-Gimenez ME (2009) Knowledge in practice: Documenting rancher local knowledge in northwest Colorado. *Rangeland Ecology and Management* 62(6): 500–509.
- [15] Nickerson R et al. (2026) Drivers of wolf depredation reporting and compensation use intentions by livestock producers. *PeerJ* 14: e20732.
- [16] Turnhout E et al. (2020) The politics of co-production: participation, power, and transformation. *Current Opinion in Environmental Sustainability* 42: 15–21.
- [17] du Toit JT et al. (2017) Managing the livestock–wildlife interface on rangelands. In: Briske DD, ed. *Rangeland systems: Processes, management and challenges*. Springer Cham, pp. 395–425.
- [18] Galinsky AD et al. (2015) Power: Past findings, present considerations, and future directions. In: Mikulincer M et al. eds. *APA handbook of personality and social psychology, Vol. 3. Interpersonal relations*. American Psychological Association, pp. 421–460.
- [19] FitzGerald C et al. (2019) Interventions designed to reduce implicit prejudices and implicit stereotypes in real world contexts: A systematic review. *BMC Psychology* 7: 29.

⁸ Federal funding that supports agriculture and food policy.