

6-1-2015

Participant Perceptions of Range Rider Programs Used to Mitigate Wolf-Livestock Conflicts in the Western United States

Molly Parks
Utah State University

Follow this and additional works at: <http://digitalcommons.usu.edu/etd>

 Part of the [Biology Commons](#)

Recommended Citation

Parks, Molly, "Participant Perceptions of Range Rider Programs Used to Mitigate Wolf-Livestock Conflicts in the Western United States" (2015). *All Graduate Theses and Dissertations*. Paper 4444.

This Thesis is brought to you for free and open access by the Graduate Studies at DigitalCommons@USU. It has been accepted for inclusion in All Graduate Theses and Dissertations by an authorized administrator of DigitalCommons@USU. For more information, please contact dylan.burns@usu.edu.



PARTICIPANT PERCEPTIONS OF RANGE RIDER PROGRAMS USED TO
MITIGATE WOLF-LIVESTOCK CONFLICTS IN THE
WESTERN UNITED STATES

by

Molly Parks

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Wildlife Biology

Approved:

Terry A. Messmer
Major Professor

Mark Brunson
Committee Member

Julie Young
Committee Member

Mark R. McLellan
Vice President for Research and
Dean of the School of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2015

Copyright © Molly Parks 2015

All Rights Reserved

ABSTRACT

Participant Perceptions of Range Rider Programs Used to Mitigate Wolf-Livestock
Conflicts in the Western United States

by

Molly Parks, Master of Science

Utah State University, 2015

Major Professor: Dr. Terry A. Messmer
Department: Wildland Resources

Range Rider Programs (RRPs) are one example of a proactive non-lethal tool that has been implemented in the western United States to mitigate wolf-livestock conflicts. I surveyed 51 participants from 17 RRP in Montana, Washington, and Oregon to develop a typology of operational programs and assess perceptions of effectiveness. I conducted interviews with RRP coordinators (n=20), ranchers (n=25), and range riders (n=6) to obtain information regarding program structure and perceived effectiveness. Programs shared similar organizational components and operational structures, but the typology identified 3 RRP versions based on program focus: 1) livestock monitoring, 2) wolf surveillance, and 3) livestock herding. Although the RRP were diverse, they shared traits exemplified in contemporary community-based conservation programs including use of an adaptive, democratic approach for decision making, and rider implementation that provided benefits to multiple and diverse stakeholders.

The coordinator, rancher, and rider interviews identified four common themes yielding diverse perceptions: 1) establishing human presence around livestock herds, 2)

use of radio-collars to monitor wolves, 3) building trust/relationships, and 4) seeking stable funding sources. While most RRP's primary objective was to proactively reduce wolf-livestock conflicts, quantifying this impact was perceived to be difficult. Interview responses suggested a RRP's primary contribution may not be a direct reduction in livestock depredations, but instead may be the collection of other benefits this tool provides.

Livestock management benefits identified by participants included depredation mitigation, increased information on livestock, and rapid carcass identification, while social benefits included program influence on public perception, empowerment, reduced stress, and trust building. Challenges identified included: too much area for range riders to cover, appropriate application of radio-telemetry technology, distrust, use of lethal control by riders, and funding.

To improve current RRP's and develop future efforts, programs should be realistic in expectations and work with rancher participants to develop an adaptive RRP that meets participant needs, maintains transparent communication, and provides a forum for feedback. Program coordinators, ranchers, and riders could benefit from discussion at the start of each field season to address how to handle potential complex situations and get all collaborators on the same page.

(157 pages)

PUBLIC ABSTRACT

Participant Perceptions of Range Rider Programs Used to Mitigate Wolf-Livestock Conflicts in the Western United States

Molly Parks

Range Rider Programs (RRPs) are one example of a proactive non-lethal tool that has been implemented in western United States to mitigate gray wolf (*Canis lupus*) and livestock conflicts. Because RRP are an emerging non-lethal tool that little is known about, I selected a qualitative research approach to examine participant perceptions to further contemporary understanding of how these efforts are implemented and potential benefits. I surveyed 51 participants from 17 Range Rider Programs (RRPs) in Montana, Washington, and Oregon to determine participant perceptions regarding effectiveness of RRP as a non-lethal approach to mitigate wolf-conflicts.

I developed a RRP typology based on information provided by the participants interviewed. The typology identified 3 versions of RRP programs that revolved around the role of the range rider. These roles included: 1) livestock monitoring, 2) wolf surveillance, and 3) livestock herding. The RRP, although diverse in operations, shared traits exemplified by community-based conservation programs.

Interview responses suggested a RRP's primary contribution may not be a direct reduction in livestock depredation by wolves, but instead a collection of indirect technical and socio-political benefits. To improve current RRP and develop future efforts, programs should be realistic in expectations and the sponsors must work closely with rancher participants to develop an adaptive program that meets their needs, maintains transparent and frequent communication, and provides a forum for feedback.

ACKNOWLEDGMENTS

Throughout the last two years, I have received immense guidance and support from multiple individuals. I could not have completed this study without their assistance. Thus, I would like to acknowledge these people. Terry Messmer, my committee chair, accepted me and my idea for a study without hesitation. He helped fund, develop, and implement this project and has been a great source of support, feedback, and advice throughout the entire process. I am truly grateful for such an ambitious and driven mentor. Mark Brunson and Julie Young also brought extensive expertise to this study, driving me to identify a valid and meaningful project.

Seth Wilson and Liz Bradley were also instrumental in the development and implementation of this research. Both gave me opportunities in Montana to gain field experience in the world of wolf monitoring and range riding. Based on this experience and several lengthy discussions, Seth and Liz not only helped develop this study, but also provided assistance for contacting other Range Rider Programs for interviews. They were also a huge source of technical expertise, provided thought-provoking feedback and advice, and were a huge support throughout the last few years. I have learned a great deal from Seth and Liz, two hard-working and dedicated individuals who are truly changing the face of wolf-livestock conflict, and I couldn't have conducted this study without them.

Another individual that has given me support and encouragement is Lorien Belton. She has provided useful insight and even a bit of sanity in times of great frustration. I am grateful to have had her wisdom and reassurance.

I would also like to thank Tyler Parks, my husband, best friend, and steady companion throughout this entire process. Tyler has given me more support, encouragement, insight, and comedic relief than anyone. (In fact, he may deserve an M.S. at the end of this as well!) So thanks to Tyler for sticking with me.

I also need to thank my parents, Jim and Marilyn Brown. They were always my biggest supporters and encouraged me to chase my dreams. I would not be where I am today without their love, support, and encouragement.

I would further like to thank my dog Luke and my horse Espresso – both helped me in my field work tracking wolves and range riding, as well as providing me a bit of a mental reprieve throughout this endeavor. They both helped me learn on the job what the world of wolf-livestock conflict is all about, and were the best co-workers a range rider could ask for.

Finally, I would like to thank all of the Range Rider Program coordinators, ranchers, and range riders that agreed to take time out of their busy schedules to talk with me. I enjoyed meeting and talking with these individuals and I learned a great deal from them. The world of wolf-livestock conflict is even more complex than I understood, and I hope my findings can improve some aspect of RRP's to reduce the burden of these conflicts in some way.

Molly Parks

CONTENTS

	Page
ABSTRACT	iii
PUBLIC ABSTRACT	v
ACKNOWLEDGMENTS	vi
LIST OF TABLES AND FIGURES	xii
LIST OF FIGURES	xiii
 CHAPTER	
1. INTRODUCTION AND LITERATURE REVIEW	1
WOLF-LIVESTOCK CONFLICTS	1
Northern Rocky Mountain Wolf Status: A Dynamic Environment	3
Wolf Management Controversy and the Importance of Public Attitudes	4
Wolf Depredation Management Techniques	6
Non-Lethal Predation Management Options	7
Range Riders	12
Participant Perceptions of RRP's	16
Research Approach	17
Protecting Participant Identities	18
Role of the Researcher	19
Expected Benefits	19
Format	20
LITERATURE CITED	20
2. A TYPOLOGY OF RANGE RIDER PROGRAMS OPERATING IN THE WESTERN UNITED STATES TO MITIGATE WOLF-LIVESTOCK CONFLICTS	29
ABSTRACT	29
INTRODUCTION	30
METHODS	33
Study Area and Sampling Frame	33
Coordinator Interviews	35
Rancher Interviews	36

Range Rider Interviews	36
RRP Coordinators, Ranchers, and Riders:	
Groups not Mutually Exclusive	37
Data Analysis	37
RESULTS	38
Program Overview: Status and Purpose	38
Terminology Matters: What is a Range Rider	40
Three Versions of Range Rider Programs	41
Livestock Monitoring	42
Wolf Surveillance	43
Livestock Herding	43
Shared Goals	45
Organizational Components of the RRP	46
Coordinating Organizations	46
Funding	46
Operational Structure: The Coordinators	47
The Ranchers	48
The Range Riders	48
Technical Components of the RRP	49
Human Presence	49
Radio-Collars	50
Rider Transportation	50
Range Rider Expectations	50
DISCUSSION	51
No Analysis of RRP's to Date	52
Reasons RRP's were Implemented	53
RRP Coordination Influences Scale	53
Program Scale and Rider Duties	54
Federal Wolf Status	54
Radio-Collars	55
RRP's: Community Based Conservation	56
CONCLUSIONS	57
LITERATURE CITED	58
3. PARTICIPANT PERCEPTIONS OF RANGE RIDER PROGRAMS USED TO MITIGATE WOLF-LIVESTOCK CONFLICTS IN THE WESTERN UNITED STATES	62

ABSTRACT	62
INTRODUCTION	63
Range Rider Programs: A Non-lethal Tool For Mitigating Wolf-Livestock Conflicts	66
METHODS	68
Study Area and Sampling Frame	68
Participant Interviews	69
RRP Coordinator Interviews	71
Rancher Interviews	71
Range Rider Interviews	72
RRP Coordinators, Ranchers, and Riders: Groups not Mutually Exclusive	72
Data Analysis	73
RESULTS	73
Interview Themes: Coordinators, Ranchers, and Range Riders	73
Human Presence	74
Coordinator Perceptions	74
Rancher Perceptions	77
Rider Perceptions	79
Range Rider Tools	80
Coordinator Perceptions	80
Rancher Perceptions	84
Range Rider Perceptions	85
Importance of Trust and Relationships	86
Coordinator Perceptions	86
Rancher Perceptions	90
Range Rider Perceptions	93
Funding	95
Coordinator Perceptions	95
Rancher Perceptions	98
Rider Perceptions	99
Shared Perceptions Regarding Benefits of RRP's	100

Depredation Mitigation	100
Livestock Management Benefits: Herd Information	101
Wolf Information	102
Rapid Carcass Identification	102
Proactive Non-lethal	103
Social Benefits: Sleep at Night Factor	104
Empowerment	105
Building Trust	106
Herding	107
Current and Future Challenges for the RRP	108
Riders Spread Thin	108
Range Rider Tools	108
Social Challenges	109
Use of Lethal Control by Riders	109
DISCUSSION	110
No Standard Metrics for Measuring RRP Effectiveness	111
Human Presence and RRP Effectiveness	112
RRP Benefits Differs by Sponsor and Participant	112
Funding Considerations: Costs vs Benefits	113
RRPs: Broader Implications for Wolf-Livestock Conflict	116
CONCLUSIONS	119
LITERATURE CITED	122
4. CONCLUSIONS	129
LITERATURE CITED	132
APPENDIX	133
Coordinator Interview Guide	134
Range Rider Interview Guide	140
Rancher Interview Guide	143

LIST OF TABLES

Table	Page
2-1 Typology of Range Rider Programs (RRPs) operating in the Montana, Washington, and Oregon that were evaluated as part of the 2014-2015 RRP research program, Utah State University, Logan	39
3-1 Maturity of RRP (years) by state and associated federal wolf status in Montana, Oregon, and Washington	91
3-2 Perceived benefits and challenges of Range Rider Programs (RRPs) in Montana, Oregon, and Washington	107

LIST OF FIGURES

Figure	Page
2-1 Variation in Range Rider Programs (RRP) operating in the Montana, Washington, and Oregon as identified in participant interviews 2014-2015	41

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

WOLF-LIVESTOCK CONFLICTS

Although human-wildlife conflicts may encompass a range of wildlife species, large carnivores present a unique challenge for wildlife managers because of perceived and real economic, social, and political ramifications (Messmer 2000, Messmer 2009). In the western United States, gray wolf (*Canis lupus*) interactions with livestock are a continual concern and source of controversy for producers, state wildlife managers, and wolf conservation stakeholders (Fritts et al. 2003). Though the natural prey species of gray wolves primarily include large ungulates (Mech 1970, Chavez and Gese 2006) to include elk (*Elaphus cervus*), deer (*Odocoileus spp.*), moose (*Alces alces*), and bison (*Bison bison*), wolves are considered opportunistic hunters (Mech 1970). Therefore, domestic livestock may constitute an anthropogenic food source when cattle abundance increases on the landscape during the grazing season (Oakleaf et al. 2003, Morehouse and Boyce 2011). Because wolf-livestock conflicts such as depredations decrease human acceptance for wolf conservation, these conflicts present formidable economic and political challenges for management agencies (Naughton-Treves et al. 2003, Meadow et al. 2005, Heberlein and Ericsson 2008).

In response to reports of wolf depredation on livestock, state and federal agencies, notably livestock protection specialists employed by the U.S. Department of Agriculture Animal Plant Health Inspection Service – Wildlife Services (WS) are assigned to investigate the incident. If the report is substantiated, the specialist may be authorized to

use lethal control to mitigate the potential for future depredation. However, rancher or livestock producer concerns may not end with cessation of depredations.

In cattle, stress from increased wolf presence has been correlated with higher calf susceptibility to disease and increased mortality (Sommers et al. 2010), along with decreased weight gain and reduced reproductive output (Fanatico et al. 1999, Lehmkuhler et al. 2007). Ramler et al. (2014) further found ranches with depredations in western Montana had an average 22 pound reduction in weight gain for calves, yielding a significant negative impact. These indirect costs associated with wolf-livestock interactions, along with the direct losses through depredation, illustrate the need for proactive methods to reduce wolf-livestock encounters to decrease losses, enable optimal foraging, and reduce stress for cattle in livestock grazing areas.

Lethal and non-lethal wolf management strategies have been employed to reduce the impacts of wolves on livestock, though conflicts still remain (Sime et al. 2007, Harper et al. 2008). Because lethal wolf management methods following depredation events have not proved a singularly effective management tool (Sime et al. 2007), and lethal control may conflict with wolf conservation goals (Shivk et al. 2003), further research on non-lethal wolf management is warranted (Shivik 2004). Additionally, non-lethal methods, utilized to proactively reduce wolf-livestock interactions, may increase stakeholder tolerance for wolves to benefit wolf conservation efforts, especially when proactive measures are subsidized (Nyhus et al. 2005, Treves et al. 2006, Karlsson and Sjostrom 2011).

Northern Rocky Mountain Wolf Status: A Dynamic Environment

Since the gray wolf re-introduction into Yellowstone National Park and Central Idaho by the U.S. Fish and Wildlife Service (USFWS) in 1995-1996, a dynamic environment has surrounded the Endangered Species Act (ESA) federal status of wolves. Following rapid population growth in the Northern Rocky Mountain Region (NRM), the wolf population in Idaho, Montana, and Wyoming reached biological criteria identified in the recovery plan by 2002 (USFWS 2003). In 2009, Montana and Idaho segments of the NRM wolf population were removed from the federal threatened and endangered (T & E) species list.

However, an assemblage of environmental groups challenged the delisting decision. In response to this legal challenges, the U.S. Federal District Court ruled in 2010 that Wyoming must be included in the delisting decision, thus reversing the delisting rule for Montana and Idaho. Nevertheless, 2011 marked the tenth consecutive year that the NRM population surpassed the minimum 30 breeding pairs and 300 wolves in the tri-state, with 103 breeding pairs and 1774 wolves (USFWS 2014).

Upon revisions to the T & E species list, USFWS published a final rule delisting Idaho, Montana, and parts of Oregon, Washington, and Utah, with a requirement of continued wolf population monitoring for a minimum of 5 years. The following year, Wyoming met federal criteria, and the USFWS removed the Wyoming wolf population from the T & E species list in 2012. However, in 2014, a coalition of environmental groups challenged the new delisting decision for wolves in Wyoming on the grounds of inadequate protections for wolves under the state management plan, and federal protections were re-established for the Wyoming wolf population (USFWS 2014).

Aside from Wyoming's recent reinstatement of federal protections for wolves, the populations in Oregon and Washington also maintain federally endangered status in central and western portions of each state. Only wolves in the eastern third of Oregon and Washington are federally delisted, while wolves in the western two-thirds of both states maintain a federally endangered status. This mixed listing classification creates a problematic mosaic of management criterion for wildlife managers. Wolves throughout Oregon and Washington remain endangered statewide under state law, despite variation in federal classification (Wiles et al. 2011, Oregon Department of Fish and Wildlife [ODFW] 2014).

Wolf Management Controversy and the Importance of Public Attitudes

As the NRM wolf population has grown, conflicts with humans have continued, contributing to polarized opinions regarding wolves and their management (Houston et al. 2010, USDA APHIS WS 2012). Views of wolves and wolf management range from an intense dislike for wolves and any government agency associated with the species, to a deep affection for wolves combined with the belief that ranchers are the problem in conflict situations and wolves must be protected (Mech 1995, USDA APHIS WS 2012). These polarized opinions are exacerbated by frequent litigation against wildlife management agencies by pro-wolf groups (Treves and Bruskotter 2011). In several cases, litigation has resulted in re-establishment of federal protections for wolves. Thus, state wolf management activities such as hunting and trapping have halted (USFWS 2014), yielding both ecological and social ramifications. Hunting and trapping can be tools that reinforce wolves' fear of humans; which, in turn, can improve effectiveness of non-lethal management strategies (Conover 2001).

The prohibition of activities may be perceived as limiting certain stakeholders ability to participate in active management of this controversial species. Because hunting and trapping can be tools that build tolerance for wildlife and wildlife damage (Conover 2001), human tolerance for wolves may be impacted, further polarizing opinions of wolves. Additionally, rural residents may feel a sense of powerlessness when opportunities for participation in management are removed (Heberlein and Ericsson 2008), instead of experiencing an increased sense of control over wolf related risks when wolves are delisted (Houston et al. 2010). In summary, the dynamic status of wolves increasingly polarizes opinions of wolves and affects public attitudes that can ultimately impact wolf conservation.

Understanding the wide spectrum of attitudes about wolves and developing human tolerance for these carnivores remains vital to wolf conservation. Houston et al. (2010) stated:

To the extent that carnivore policy is driven by the policy preferences of relevant publics, the success of large carnivores, and the extent of their recovery in the United States could ultimately depend on human tolerance. (p. 403)

By identifying public attitudes toward wolves and factors influencing those perspectives, wildlife managers may adapt management policies and strategies to appease the public and affected rural residents. In a content analysis of attitudes toward wolves in the US and Canada, Houston et al. (2010) found that in areas where wolf populations are newly re-established, attitudes about wolves became increasingly negative as experience with these carnivores increased. However, their study further indicated that attitudes should become less negative over time, as residents gain familiarity with the species, particularly if conflicts remain low. These findings suggest that heightened protections for wolves in new recovery areas will be important for species conservation until familiarity is

established, and illustrate how attitudes of the relevant public should play a key role in making appropriate wolf management decisions.

Wolf Depredation Management Techniques

The Montana Wolf Damage Management Environmental Assessment (USDA APHIS WS 2012) suggests that an effective wolf damage and livestock conflict reduction program is comprised of 4 key components. These include: 1) proactive non-lethal options, 2) sport hunting to reduce wolf populations in conflict areas, 3) field specialists to target and remove depredating individuals, and 4) compensating ranchers for livestock losses. However, the ESA status of the species influences the use of several of these components. Because Montana and Idaho wolves are federally delisted, state wolf management includes hunting and trapping seasons to manage their populations. In contrast, sport hunting to reduce local wolf populations in high conflict areas cannot be used in Oregon, Washington, or Wyoming, due to the endangered status of wolves (WGFD 2013, ODFW 2010, Wiles et al. 2011).

Lethal removal of depredating individuals also becomes increasingly challenging when dealing with an ESA listed species. Though lethal control is a controversial management technique, it plays a critical role in mitigating conflict in ranching communities (Mech 1995, Bangs et al. 2005). While Montana and Idaho, for example, can authorize lethal wolf control following a depredation confirmed by WS, Washington and Oregon differ in their investigating agency and criteria required to consider lethal options.

In Washington and Oregon, the state wildlife agencies (Washington Department of Fish and Wildlife and ODFW) complete investigations of potential depredation cases, and must determine the cause of death. To pursue lethal removal in Washington,

livestock must be clearly killed by wolves; non-lethal methods must be used according to state guidelines, documented, and prove unsuccessful; continued depredations must be likely; and no baiting or attracting of wolves by the rancher can be identified (Wiles et al. 2011).

Similarly, Oregon has stringent criteria that must be met in order to lethally remove depredating wolves. There must be: 4 qualifying depredation events by the same wolf or wolves, documented use of non-lethal measures based on ODWF guidelines, likelihood of a chronic depredation situation despite non-lethal efforts, and lethal take of only the offending wolves (ODFW 2010). Furthermore, if lethal control is desired in federally endangered regions of these states, USFWS must be consulted prior to implementation. Consequently, state management options are limited for federally endangered populations, so effective non-lethal conflict mitigation tools become crucial.

Non-lethal Predation Management Options

Non-lethal management strategies to reduce wolf depredation generally encompass three categories: 1) increasing human tolerance for predators, 2) altering human behavior or activities, and 3) managing predator behavior (Wagner et al. 1997, Shivik 2004). The following is a brief summary of commonly used non-lethal strategies (for more detail, see Shivik 2004 and Bangs et al. 2006).

Compensation programs are one technique that attempts to build tolerance for wolves in the ranching community. By compensating ranchers for confirmed or probable livestock depredations by wolves, the goal of these programs is to offset the economic burden placed on ranchers that experience depredations while conserving wolf populations (Naughton-Treves et al. 2003). Both governmental and non-governmental organizations implement compensation programs for livestock producers, but

effectiveness of these programs is still debated (Wagner et al. 1997). To receive compensation, an investigation must be completed by the appropriate agency (i.e., WS or the state wildlife agency), and any confirmed or probable cases can be submitted for compensation. In many cases, however, there is a lack of sufficient evidence to determine cause of death. Furthermore, ranchers may have missing cattle at the end of the grazing season where a carcass is never identified and cause of death is unknown (Bangs et al. 1998, Oakleaf et al. 2003). Thus, producers rarely receive payment equivalent to the total costs associated with their losses (Wagner et al. 1997). Ultimately, compensation programs do not address the cause of livestock losses to wolves, do not reduce the risk of further depredation events, and can become expensive (Wagner et al. 1997, Shivik 2004).

Aside from changing the perception of conflicts, human activities can be altered for non-lethal predator management. One non-lethal option proposes zoning lands for specific use by predators or livestock to create a spatial separation of these species to reduce conflicts (Shivik 2004). This would require altering the use of large expanses of land, where select zones would be managed predator free for livestock, while others would be managed for predator conservation (Linell et al. 1996). The political complexity associated with changing historical land use designation presents formidable challenges, and may detract from the goal of building tolerance for predators in the ranching community.

One non-lethal alternative that appears to be gaining momentum is modifying livestock management practices to proactively manage predator-wildlife conflicts (Bangs et al. 2006). Information on local wolf activity may help producers amend rotational grazing plans to reduce risk of wolf encounters with livestock in high risk time periods or

in high risk locations (Oakleaf et al. 2003, Shivik 2004). Fencing can also be used to reduce predator damage. By implementing a variety of fencing methods, a physical barrier between predators and livestock can be created. But due to costs and labor intensity, the scale on which fences can be effectively applied is often limited to small areas, such as calving pastures or night pens (Shivik 2004).

Use of enclosures during calving or lambing and use of night penning can also help mitigate losses when livestock are vulnerable (Robel et al. 1981). By penning livestock, the herd provides protection for individuals, though increased disease transmission and animal stress, as well as increased labor requirements are costs associated with these methods. Furthermore, many ranchers in rural communities rely on federal land grazing (U.S. Forest Service [USFS] 2013), where federal permits or leases frequently cover thousands of acres. Therefore, the large size of pastures combined with the broad dispersal of livestock may inhibit use of many husbandry based non-lethal techniques.

Carcass removal is another animal husbandry practice that has become increasing popular (Wilson et al. 2014). Carcasses and bone piles can become an attractant and anthropogenic food source for predators, often drawing predators into close contact with livestock. In a 2011 wolf diet study conducted in southwestern Alberta, Morehouse and Boyce found that 85% of scavenging events by wolves in the non-grazing season took place at rancher bone yards, which wolves repeatedly visited. By removing carcasses from livestock operations and grazing areas, the attractant food source is removed from the environment, in turn reducing predator-livestock encounter rates. Though this strategy can be effective for ranches with easily accessible pastures, it presents challenges

when facing the large scale and rugged terrain observed in many federal grazing allotments.

Predator behavior management or modification is the third category of non-lethal options. Predator behavior can be influenced through use of primary repellents (disruptive stimuli) and secondary repellents (aversive stimuli) in areas where predators and livestock overlap. Disruptive stimuli are used to frighten predators and disrupt any predatory behavior, though they risk rapid habituation (Shivik and Martin 2001, Shivik 2006). In contrast, aversive stimuli are used to condition predators to modify a predatory behavior.

Because predators are neophobic, simple visual and auditory stimuli can be used in livestock pastures to temporarily frighten predators (Bangs et al. 2006). But due to predator ability to rapidly habituate, these tools are only effective for a short period of time. To slow the habituation process, flashing lights and electronic guards are more sophisticated options for disrupting predators. Electronic guards use a combination of sirens and strobe lights for this purpose, but also risk habituation (Shivik 2004). Their use however is limited by the size of a pasture: one unit is needed for approximately 4 hectares (ten acres). Additionally, this tool can become a nuisance to people. To enhance effectiveness of electronic guards, radio activated guards (RAG boxes) were developed. For a more precise response to wolf presence, RAG boxes are triggered when a signal from a radio-collared wolf is detected. Though this can slow habituation, effectiveness is again limited because not all wolves are radio collared, wolf dispersal and mortality limits the lifespan of radio-collars, large pastures may be difficult to properly equip with this tool, and use of multiple units may be cost prohibitive: one RAG box costs \$3800 (Breck et al. 2002).

Fladry is another option for preventing wolves from entering livestock pastures. This tool is an adaptation of strategy used for centuries by wolf hunters in Eastern Europe. A barrier made of colored flags hung from a rope or wire is strung around the perimeter of a livestock pasture. Due to wolves' fear of novel stimuli, fladry has been successfully utilized to keep these canine predators from entering protected enclosures (Musiani et al. 2003), though estimates of effectiveness are roughly 60 days (Shivik 2006). To slow habituation by wolves, the flagging can also be electrified to deter predators bold enough to test the barrier. However, fladry must be actively maintained due to disturbance from varying environmental conditions or damage from livestock (Bangs et al. 2006). Again, this tool is only effective for small pastures or enclosures, while use on large scale grazing allotments is impractical.

Guard dogs are another non-lethal option that is currently being studied for excluding predators from areas with livestock (J. Young personal commun. 2014). Livestock Guard Dogs (LGDs) have been used for centuries in Europe and Asia (Bangs et al. 2006, Gehring et al. 2010), and have benefitted livestock producers around the world. LGDs are implemented to protect livestock against a wide variety of predator species, and function to deter predators, actively chase and attack predators, and serve as a warning system to human herders. While LGDs are effective in many situations, they too face limitations. Factors of scale (i.e. size of pasture, size of wolf pack, number of LGDs used) and livestock species contribute to the overall effectiveness of LGDs. Sheep, for example, stay grouped, allowing dogs to protect the flock. But cattle typically disperse across a large landscape, making guarding more difficult. Moreover, LGDs are expensive, require time to adequately bond to the livestock they will guard, and are often attacked by wolves (Bangs et al. 2006).

Finally, aversive stimuli can be used to condition predators against predatory behavior involving livestock. These non-lethal options include aversive harassment, conditioned taste aversion, and electronic training collars. The object of this suite of tools is to utilize operant conditioning to reduce likelihood of future depredations through pairing negative stimuli with behaviors leading to predation on livestock. Logistical difficulties have been identified for each of these tools, however, and the majority of these options are impractical in field situations (Shivik 2004).

Despite the limitations of scale, cost, and practicality in the field, there is continued need for proactive non-lethal tools. To address both wolf conservation and damage to livestock, wildlife managers must continue to implement both non-lethal and lethal management for mitigating wolf-livestock conflicts (Bangs et al. 2006).

Understanding the application and effectiveness of each option, as well as having a variety of proactive alternatives available will continue to benefit wildlife managers. Because every situation is unique, it is important to tailor management strategies to individual situations (Bradley and Pletscher 2005). Therefore, information on new techniques, particularly those that apply to large scale grazing regimes, will be valuable based on the limitations of current options.

Range Riders

One emerging proactive non-lethal management tool that has received little attention regarding effectiveness and optimal utilization is the use of range riders to monitor cattle and deter wolf activity in pastures and grazing allotments. Range Rider Programs (RRP) have been implemented throughout western North America, and are a method of herd supervision (Bangs et al. 2006, S. Wilson personal commu. 2012) – an animal husbandry technique that has been utilized for thousands of years around the

world (LaRocque 2014). Pastoralism is a traditional method of herd supervision, where livestock herds are tended, provided care, and moved in response to varying resource availability (Bollig et al. 2013). Pastoralist herding practices are often associated with a nomadic lifestyle and range from daily excursions to seasonal movements across large areas, all while providing constant herd surveillance (Wendrich and Barnard 2008). Because pastoralist expectations for livestock do not include self-defense or self-control, constant supervision allows pastoral herders to move livestock to optimal forage patches, mitigate livestock damage on crops, and prevent depredation by local predators (LaRocque 2014).

In North America, early American settlers faced limitations in labor availability. Consequently, livestock were turned out to range freely, and herd supervision was minimal (Stewart 1991). Hostility toward predators also ran rampant, so as open-range ranching developed, the gradual extirpation of predators to reduce livestock losses followed closely (Laliberte and Ripple 2004, LaRocque 2014). In light of recent efforts to recover wolf populations in the United States (e.g. the reintroduction of the gray wolf into Yellowstone National Park) the ranching community is again faced with grazing livestock alongside a top predator, and the concept of increasing herd supervision becomes pertinent. RRP's apply herd supervision techniques to mitigate conflicts that may arise due to the overlapping ranges of wolves and livestock. Not only can range riders supervise livestock to minimize risk of predation, but also herd livestock away from high risk locations and influence grazing distribution to provide additional benefits in rangeland health (LaRocque 2014).

The basic tenet of the RRP is the premise that wolves avoid areas of high human activity (Chavez and Gese 2006 Harper et al. 2008, Hebblewhite et al. 2005, Muhly et al.

2011). By providing a human presence with cattle, wolves may be less likely to remain in the area or attack livestock. Hebblewhite et al. (2005) and Muhly et al. (2011) found the spatial distributions of both predator and prey species varied in relation to human activity levels. Predator species avoided the high human use areas, whereas prey species persisted in areas with high human activity, suggesting a spatial refuge from predation. But research has yet to assess whether increased human presence in livestock grazing areas through RRP activity reduce incidences of livestock depredations (Bangs et al. 2006).

Temporal avoidance of high human-use areas by wolves may influence effectiveness of range riders. Muhly et al. (2011) suggested that wolves refrain from using high human use areas during the day, but travel those same areas at night when there is little to no human presence. Furthermore, Chavez and Gese (2006) hypothesized that because of the nocturnal habits of wolves, livestock depredation will most likely occur at night. Therefore, additional research is needed to identify the variation in RRP characteristics, such as time of day monitoring occurs, to investigate which components of a RRP (e.g. time of day monitoring occurs) create the most effective protocol to reduce wolf-livestock conflict.

Another factor influencing RRP effectiveness is the implementation of risk reduction actions by range riders. A risk reduction action is the identification and reduction of potential wolf attractants that could increase risk of livestock depredation (Wilson 2012). Potential attractants can include carcasses, sick or injured livestock, damaged fences resulting in separation of cow-calf pairs, and presence of ungulate prey species in livestock grazing areas. Bradley and Pletscher (2005) found that livestock pastures with depredations were more likely to have elk presence than pastures without

depredations, suggesting elk may function as a wolf attractant in livestock grazing areas. Carcasses have also been identified as an attractant and food source for wolves, acclimating them to feeding on livestock and bringing the predators into close proximity of other livestock in the area (Morehouse and Boyce 2011). Therefore, attractants in active grazing areas are critical to address because they increase the chance of wolf-livestock encounters, thus increasing the risk of conflict scenarios.

Range riders can employ risk reduction actions to reduce attractants through a variety of methods including but not limited to: notifying producers of livestock carcass detection for purposes of investigation/removal, notifying producers of sick or injured livestock for treatment/removal, notifying producers of damaged fencing or cattle that have escaped their enclosure, and increased monitoring or herding cattle to new livestock grazing areas when wolf activity is observed (Bangs et al. 2006). Thus, evaluation of range rider risk reduction actions to reduce livestock depredations could further our understanding of this non-lethal tool.

There are several facets of RRP in need of research for evaluating overall effectiveness. Three preliminary analyses would include: experimental testing to quantify changes in confirmed depredation levels associated with range riders and their impacts on wolf activity, a cost-benefit analysis to address economic aspects of the program, and sociological analysis to measure perceptions of range rider effectiveness and tolerance for wolves. Though experimental testing of RRP has not been published to date, the importance of economic considerations has been documented. LaRocque (2014) describes efforts by the Community Oriented Wolf Study (COWS) in Alberta, Canada to increase herd supervision for cattle within wolf territory. LaRocque (2014) explained that Alberta ranchers are less inclined to participate in this effort unless their

participation is subsidized, and suggests that the herding efforts may not continue, now that funding is dwindling. Similarly, Shivik (2006) noted that the adoption of a tool is proportional to its cost and complexity. Therefore, assessing multiple aspects of RRP would help develop a more complete view of range riders as a non-lethal wolf-livestock conflict management tool.

Participant Perceptions of RRP

The purpose of my research is to obtain a more complete understanding of RRP through participant perceptions. The collection of perceptions of coordinating agencies, range riders, and ranchers utilizing range rider programs is used to examine the human dimensions aspect of RRP effectiveness. Rancher perceptions are often just as important as any objective calculations of efficacy (Marker et al. 2005). Thus, assessment of rancher perceptions can serve as a proxy for direct measurements of program outcomes, such as confirmed livestock depredations or changes in herd weight gain. Ranchers have records of livestock lost each year, as well as perceptions about why they may have experienced unconfirmed livestock losses. Ranchers also have perceptions regarding the amount of wolf activity they have seen from year to year. Finally, ranchers interact not only with their range riders, but also state agencies, non-governmental organizations, and community based organizations when utilizing this tool. These interactions yield a social facet and complexity to RRP. Thus, interviews to retrieve in depth information about trends and the perceived impact of RRP give valuable insight into program efficiency, key program components, and areas of program weakness, as well as insight into adoption of this non-lethal tool by ranchers. This method of measurement does not account for external variables that could coincide with program success or failure, however. The numbers of livestock lost to predation and the net weight changes of cattle

herds are also potentially subjective when collected from ranchers and not from WS or other agricultural agencies. However, if ranchers lose more livestock than are confirmed, the additional losses can still influence the opinions and perceptions of ranchers toward wolves and the effectiveness of non-lethal management tools. In summary, rancher perceptions of wildlife damage influence their attitudes about wildlife, so those perceptions become an important consideration (Conover 1994).

Research Approach

A qualitative research approach utilizing semi-structured interviews was selected for examining perceptions of RRP. Because RRP is an emerging non-lethal tool with little evaluation to date, this qualitative study furthers our understanding of how these efforts are implemented and perceived. The social research approach of grounded theory (Glaser and Strauss 1967) facilitated development of methods for this study of RRP. In grounded theory, emergent themes are used to identify conceptual categories, which enhance existing theory. Thus, this study enhances our knowledge of this developing non-lethal tool via detailed accounts from participants regarding views of the RRP to include: program benefits, challenges, and motivations for adoption.

Qualitative research methods enable respondents to share information that would be unlikely to emerge in highly structured surveys. Surveys, though often useful in natural resource research, can limit the discovery of new information. Because researchers must predetermine questions and the list of appropriate responses, respondents are limited in discussion of unidentified, pertinent topics and related views (Bliss and Martin 1989, Didier and Brunson 2004). In contrast, qualitative research can provide a more flexible alternative to the rigid structure of surveys (Corbin and Strauss 2008). Throughout the interview process, questions can be adapted based on interview

responses, enabling new or unforeseen information to surface that may have otherwise gone undiscovered. By avoiding use of a rigid survey protocol, and by enabling discussion of topics important to participants, rather than strictly discussing topics dictated by researchers, these qualitative methods allowed a rich description of RRP to be generated (Glaser and Strauss 1967).

Despite the benefits of qualitative research, these methods often face scrutiny from the scientific community. Studies are often limited in generalizability due to a small sample size. Additionally, these studies are difficult to replicate (Bliss and Martin 1989, Babbie 1989). Thus, many quantitative researchers undervalue the significance of novel findings, and instead focus on concerns with study design including sampling, validity, and generalizability (Stebbins 2001).

Though probability sampling is preferred over non-probability sampling, it is not always practical or necessary (Singleton and Straits 2010). Non-probability sampling, or non-random sampling, can be useful in qualitative research when populations are small, and each case warrants inclusion in a study. Therefore, sampling may include all identifiable and cooperative individuals. Furthermore, random sampling may not be necessary when developing a preliminary understanding of a novel topic (Singleton and Straits 2010). Based on these considerations, this study utilized non-random snowball sampling to identify RRP coordinators, range riders, and participants.

Protecting Participant Identities

Because this study involves human participants, the Utah State University Institutional Review Board conducted a review of research ethics, and approval was provided (IRB protocol # 5491). The IRB process is used to protect individuals against

potential risks associated with research participation; enable studies that can provide benefits to participants and/or society; and comply with federal, state, and university regulations regarding human participants research (USU IRB 2015). In accordance with the approved IRB protocol, oral permission was received from participants prior to audio-recording of interviews, and pseudonyms were used instead of participant names when quotes were used in the text.

Relationship of the Researcher to RRP

It is important to identify my background and experience as both a researcher and range rider, for this influenced the development of interview questions for this study, my interpretation of interview responses, and my view of RRP. I have been a range rider in western Montana for the last three field seasons (2012-2014). I have also worked with Montana Fish, Wildlife, and Parks Department for those three field seasons, assisting with wolf trapping and radio-collaring efforts. Thus, I have experience working with ranchers, collaborative coordinating organizations, and a state wildlife agency – experience that provides a unique background that I incorporated in the development and implementation of this study. The relationships I established through this work also facilitated the identification and sampling of other RRP throughout the west. In this way, I learned about range riding first hand and then conducted this study to further my understanding of the breadth and depth of RRP across the west.

Expected Benefits

Ultimately, rancher perceptions are critical in RRP adoption and success, for ranchers must perceive the RRP as valuable and effective for the programs to ultimately be effective. Therefore, assessment of rancher perceptions is a critical starting point in

the assessment of this wolf-livestock conflict management tool. The primary objective of this study is to examine RRP in western United States through evaluation of rancher perceptions and RRP personnel perceptions of the programs. The secondary objective is to identify perceived program impacts and components that appear to be most related to high rancher satisfaction, a proxy for RRP success.

Format

The organization of chapters in this thesis follows the style guidelines of the Wildlife Society Bulletin (WSB). This peer-reviewed journal addresses wildlife management, conservation, and policy (WSB 2014). Articles in WSB include a wide range of topics, including articles that present or evaluate new management techniques and focus on “applied” science. Based on the content and target audience for this journal, it is both a practical format and outlet for publishing the results of this study to further our knowledge of RRP as an emerging non-lethal tool.

LITERATURE CITED

- Babbie, E. A. 1989. The practice of social research. Fifth edition. Wadsworth, Belmont, California, USA.
- Bangs, E. E., S. H. Fritts, J. A. Fontaine, D. W. Smith, K. M. Murphy, C. M. Mack, and C. C. Niemeyer. 1998. Status of gray wolf restoration in Montana, Idaho, and Wyoming. *Wildlife Society Bulletin* 26: 785-798.
- Bangs, E., J. A. Fontaine, M. D. Jimenez, T. J. Meier, E. H. Bradley, C. C. Niemeyer, D. W. Smith, C. M. Mack, V. Asher, and J. K. Oakleaf. 2005. Managing wolf/human conflict in the northwestern United States. Pages 340-356 *in* R. Woodroffe, S.

- Thirgood, and A. Rabinowitz, editors. People and wildlife: coexistence or conflict? Cambridge University Press, Cambridge, England.
- Bangs, E. E., Jiminez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krsichke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D. W. Smith, V. Asher, and S. Stone. 2006. Nonlethal and lethal tools to manage wolf-livestock conflict in the northwestern United States. Proceedings of the 22nd Vertebrate Pest Conference, Davis, California.
- Bliss, J. C., J. A. Martin. 1989. Identifying NIPF management motivations with qualitative methods. *Forest Science* 35: 601-622.
- Bollig, M., M. Schnegg, and H. P. Wotzka. 2013. Pastoralism in Africa: past, present and future. Berghahn Books, New York, New York, USA. E-book Library. Website @ <http://USU.ebib.com/patron/FullRecord.aspx?p=1390926>>. *Last visited 3/2/2015*.
- Bradley, E. H., and D. H. Pletscher. 2005. Assessing factors related to wolf depredation of cattle in fenced pastures in Montana and Idaho. *Wildlife Society Bulletin* 33:1256-1265.
- Breck, S. W., R. Williamson, C. Niemeyer, and J. Shivik. 2002. Non-lethal radio activated guard for deterring wolf depredation in Idaho: summary and call for research. Proceedings of the 20th Vertebrate Pest Conference, Reno, Nevada.
- Chavez, A. S., and E.M. Gese. 2006. Landscape Use and Movements of Wolves in Relation to Livestock in a Wildland-Agriculture Matrix. *Journal of Wildlife Management* 70:1079-1086.

- Conover, M. R. 1994. Perceptions of grass-roots leaders of the agricultural community about wildlife damage on their farms and ranches. *Wildlife Society Bulletin* 22: 94-100.
- Conover, M. 2001. Effect of hunting and trapping on wildlife damage. *Wildlife Society Bulletin* 29: 531-532
- Corbin, J., and A. Strauss. 2008. *Basics of qualitative research: techniques and procedures for developing grounded theory*. Third edition. Sage Publications, Thousand Oaks, California, USA.
- Didier, E. A., and M. W. Brunson. 2004. Adoption of range management innovations by Utah ranchers. *Journal of Range Management* 57: 330-336.
- Fanatico, A., R. Morrow, and A. Wells. 1999. Sustainable beef production. National Center for Appropriate Technology (NCAT) Agricultural Specialists, Appropriate Technology Transfer for Rural Areas (ATTRA) Publication #IPO18/18.
- Fritts, S. H., R.O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pages 289-316 *in* L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois, USA.
- Gehring, T. M., K. C. VerCauteren, and J. M. Landry. 2010. Livestock protection dogs in the 21st century: Is an ancient tool relevant to modern conservation challenges? *BioScience* 60: 299-308.
- Glaser, B. G., and A. L. Strauss. 1967. *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing, Chicago, Illinois, USA.
- Harper, E. K., W. J. Paul, L. D. Mech, and S. Weisberg. 2008. Effectiveness of lethal, directed wolf-depredation control in Minnesota. *Journal Wildlife Management* 72:778-784.

- Hebblewhite, M., C. A. White, C. G. Nietvelt, J. A. McKenzie, T. E. Hurd, J. M. Fryxell, S. E. Bayley, P. C. Paquet. 2005. Human activity mediates a trophic cascade caused by wolves. *Ecology* 86:2135-2144.
- Heberlein, T. A., and G. Ericsson. 2008. Public attitudes and the future of wolves *Canis lupus* in Sweden. *Wildlife Biology* 14:391-394.
- Houston, M. J., J. T. Bruskotter, and D. Fan. 2010. Attitudes toward wolves in the United States and Canada: a content analysis of the print news media, 1999-2008. *Human Dimensions of Wildlife* 15: 389-403.
- Karlsson, J., and M. Sjoström. 2011. Subsidized fencing of livestock as a means of increasing tolerance for wolves. *Ecology and Society* 16: 16. Website @ <http://www.ecologyandsociety.org/vol16/iss1/art16/>.
- Laliberte, A. S., and W. J. Ripple. 2004. Range contractions of North American carnivores and ungulates. *BioScience* 53: 123-138521-532.
- LaRocque, O. 2014. Revisiting distinctions between ranching and pastoralism: A matter of interspecies relations between livestock, people, and predators. *Critique of Anthropology* 34: 73-93.
- Lehmkuhler, J., G. Palmquist, D. Ruid, D. Willig, and A.P. Wydeven. 2007. Effects of wolves and other predators on farms in Wisconsin: beyond verified losses. Website @ http://dnr.wi.gov/org/land/er/publications/pdfs/wolf_impact.pdf Last visited 9/12/2013.
- Linnell, J. D. C., M. E. Smith, J. Odden, P. Kaczensky, and J. E. Swenson. 1996. Strategies for the reduction of carnivore-livestock conflicts: a review. *Carnivores and sheep farming and Norway* 4. Norwegian Institute for Nature Reserach Oppdragsmelding 443: 1-118.

- Marker, L. L., A. J. Dickman, and D. W. MacDonald. 2005. Perceived effectiveness of livestock-guarding dogs placed on Namibian farms. *Rangeland Ecology and Management* 58:329-36.
- Meadow, R., R. P. Reading, M. Phillips, M. Mehringer, and B. J. Miller. 2005. The influence of persuasive arguments on public attitudes toward a proposed wolf restoration in the Southern Rockies. *Wildlife Society Bulletin* 33:154-163.
- Mech, L. D. 1970. *The wolf: the ecology and behavior of an endangered species*. Natural History, Garden City, New York, USA.
- Mech, L. D. 1995. The challenge and opportunity of recovering wolf populations. *Conservation Biology* 9: 270-278.
- Messmer, T. A. 2009. Human-wildlife conflicts: emerging challenges and opportunities. *Human-Wildlife Conflicts* 3: 10-17.
- Morehouse, A., and M. S. Boyce. 2011. From venison to beef: seasonal changes in wolf diet composition in a livestock grazing landscape. *Frontiers in Ecology and the Environment*. 110324084539019 DOI: [10.1890/100172](https://doi.org/10.1890/100172)
- Muhly, T. B., C. Semeniuk, A. Massolo, L. Hickman, and M. Musiani. 2011. Human Activity Helps Prey Win the Predator-Prey Space Race. *PLoS ONE* 6(3): e17050. doi:10.1371/journal.pone.0017050.
- Musiani, M., C. Mamo, L. Boitani, C. Callaghan, C.C. Gates, L. Mattei, E. Visalberghi, S. Breck, and G. Volpi. 2003. Wolf depredation trends and the use of fladry barriers to protect livestock in western North America. *Conservation Biology* 17: 1538-1547.

- Naughton-Treves, L., R. Grossberg, A. Treves. 2003. Paying for tolerance: rural citizens' attitudes toward wolf depredation and compensation. *Conservation Biology* 17:1500-1511.
- Nyhus, P. J., S. A. Osofsky, P. Ferraro, H. Fischer, and Madden, F. 2005. Bearing the costs of human-wildlife conflict: The challenges of compensation schemes. Pages 107-121 *in* R. Woodroffe, S. Thirgood, A. Rabinowitz, editors. *People and wildlife: conflict or coexistence?* Cambridge University Press, Cambridge, England.
- Oakleaf, J. K., C. Mack, and D. L. Murray. 2003. Effects of wolves on livestock calf survival and movements in central Idaho. *Journal of Wildlife Management* 67: 299-306.
- Oregon Department of Fish and Wildlife. 2010. Oregon wolf conservation and management plan. Updated Aug. 18. Website @ http://www.dfw.state.or.us/Wolves/management_plan.asp *Last visited 2/3/2015.*
- Ramler, J. P., M. Hebblewhite, D. Kellenberg, and C.A. Sime. 2014. Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*. doi: 10.1093/ajae/aat100.
- Roebel, R. J., A. D. Dayton, F. R. Henderson, R. L. Meduna, and C. W. Spaeth. 1981. Relationships between husbandry methods and sheep losses to canine predators. *Journal of Wildlife Management* 45: 894-911.
- Shivik, J. A. 2004. Non-lethal alternatives for predation management. *Sheep & Goat Research Journal* 19: 64-71.
- Shivik, J. 2006. Tools for the edge: what's new for conserving carnivores. *BioScience* 56:253-259.

- Shivik, J. A., and D. J. Martin. 2001. Aversive and disruptive stimulus applications for managing predation. *Wildlife Damage Management Conference 9*: 111-119.
- Shivik, J. A. Treves, P. Callahan. 2003. Nonlethal techniques for managing predation: primary and secondary repellents. *Conservation Biology 17*: 1531-1537.
- Sime, C., E. Bangs, E. Bradley, J. Steuber, K. Glazier, P. Hoover, V. Asher, K. Laudon, M. Ross, and J. Trapp. 2007. Gray wolves and livestock in Montana: a recent history of damage management. *Proceedings of the 12th Wildlife Damage Management Conference*, Corpus Christi, Texas.
- Singleton, R., and B. C. Straits. 2010. *Approaches to social research*. New York: Oxford University Press, USA.
- Sommers, A. P., C. C. Price, C. D. Urbigit, and E. M. Peterson. 2010. Quantifying economic impacts on large-carnivore depredation on bovine calves. *Journal of Wildlife Management 74*:1425-1434.
- Stebbins, R. A. 2001. *Qualitative research methods: Exploratory research in the social sciences*. Sage Publications, Thousand Oaks, CA.
- Stewart, M. A. 1991. "Whether wast, deodand, or stray": cattle, culture, and the environment in early Georgia. *Agricultural History 65*:1-28
- Treves, A., R. B. Wallace, L. Naughton-Treves, and A. Morales. 2006. Co-managing human wildlife conflicts: a review. *Human Dimensions of Wildlife 11*: 383-396.
- Treves, A., and J. T. Bruskotter. 2011. Gray wolf conservation at a crossroads. *BioScience 61*:584-585.
- United States Department of Agriculture Animal Plant Health Inspection Service: Wildlife Services (USDA APHIS WS). 2012. Environmental assessment: gray wolf damage management in Montana for the protection of livestock, other

domestic animals, human safety, and other resources. USDA APHIS WS with cooperating agencies: Montana Fish, Wildlife, and Parks, United States Fish and Wildlife Service, Bureau Land Management, United States Forest Service, Montana Department of Livestock, Confederated Salish & Kootenai Tribes, and Blackfeet Nation. Website @

http://www.aphis.usda.gov/regulations/pdfs/nepa/Montana%20Wolf%20EA%20October_2012.pdf. *Last visited 2/3/15.*

United States Forest Service. 2013. Rangelands. Website @

<http://www.fs.fed.us/rangelands/uses/allowgrazing.shtml>. *Last visited 2/3/15.*

United States Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final rule to reclassify and remove the gray wolf from the list of endangered and threatened wildlife in portions of the conterminous United States; establishment of two special regulations for threatened gray wolves; final and proposed rules. Federal Register 68: 15803-15875.

United States Fish and Wildlife Service. 2014. Gray wolves in the northern Rocky Mountains: news, information and recovery reports. USFWS with cooperating agencies on reports: Blackfeet Nation, Confederated Salish & Kootenai Tribes, Idaho Department of Fish and Game, Montana Fish, Wildlife, and Parks, National Park Service, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Utah Department of Natural Resources, Washington Department of Fish and Wildlife, Wildlife Services, and Wind River Tribes. Annual Reports for 1999 to 2013. Updated Sept. 23. Website @

<http://www.fws.gov/mountain-prairie/species/mammals/wolf>.> *Last visited 2/3/15.*

- Utah State University Institutional Review Board. 2015. Website @ <http://rgs.usu.edu/irb/>. *Last visited 3/23/2015.*
- Wagner, K. K., R. H. Schidt, and M.R. Conover. 1997. Compensation programs for wildlife damage in North America. *Wildlife Society Bulletin* 25: 312-319.
- Wendrich, W., and H. Barnard. 2008. The archeology of mobility: definitions and approaches. Pages 1-21 in H. Barnard and W. Wendrich, editors. *The archeology of mobility: old world and new world nomadism*. Los Angeles. Cotsen Institute of Archeology, University of California Los Angeles, USA.
- Wildlife Society Bulletin. 2014. Manuscript Submission Guidelines. Website @ [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1938-5463a/homepage/ForAuthors.html](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1938-5463a/homepage/ForAuthors.html). *Last visited 2/9/2015.*
- Wiles, G. J., H. L. Allen, and G. E. Hayes. 2011. Wolf conservation and management plan for Washington. Washington Department of Fish and Wildlife, Olympia, Washington, USA.
- Wilson, S. M., G. A. Neudecker, J. J. Jonkel. 2014. Human-grizzly bear coexistence in the Blackfoot River Watershed, Montana: getting ahead of the conflict curve. *In* S. G. Clark and M. B. Rutherford, editors. *Large carnivore conservation: integrating science and policy in the North American West*. University of Chicago Press, Chicago, Illinois, USA.
- Wyoming Game and Fish Department (WGFD). 2013. Wolves in Wyoming. Website @ <https://wgfd.wyo.gov/web2011/wildlife-1000380.aspx>. *Last visited 2/3/2015.*

CHAPTER 2

**A TYPOLOGY OF RANGE RIDER PROGRAMS OPERATING IN THE
WESTERN UNITED STATES TO MITIGATE WOLF-LIVESTOCK
CONFLICTS**

ABSTRACT

As grey wolf (*Canis lupus*) populations continue to expand in distribution in the western United States, wildlife managers are seeking tools to reduce the impacts of wolves on livestock. These tools have historically included lethal control and programs that compensate producers for economic losses. Range Rider Programs (RRPs) are one example of a proactive non-lethal effort that has emerged in several communities to mitigate wolf-livestock conflict. Although, the emphasis of RRPs a reduction of wolf-livestock conflicts through increased human presence, little else is known about program operations. I surveyed 51 participants from 17 Range Rider Programs (RRPs) in 3 states to develop a typology of RRPs operations. I conducted phone and face-to-face interviews to obtain the information that I used to describe the scope of individual RRPs programs to include their goals, breadth, and operational structure within the framework of conceptual community-based conservation programs. Programs shared similar organizational components that included a coordinating organization or sponsor, collaboration among several organizations, a funding mechanism, and an operational structure that included a supervisor, the landowner(s) who utilized RRP's service, someone in the field who did the work, and a mechanism that provided communication and periodic feedback. I identified three RRP versions based on the primary focus of the programs: 1) livestock monitoring, 2) wolf surveillance, and 3) livestock herding. While focus for each effort

varied, RRP shared common goals: 1) use human presence to reduce the negative impacts of wolves on livestock; 2) increase knowledge of wolves and livestock through increased monitoring; 3) increase communication of information to participants; 4) use a collaborative framework for addressing wolf-livestock conflict that includes agencies, ranchers, and conservation groups; 5) increase coexistence between people and wolves; and 7) in 3 programs, improve range health. Programs also shared key aspect of community-based conservation programs. The RRP collaborative approach in mitigating wolf-livestock conflicts, operated at the appropriate scale, used participant feedback to annually adjust their operations, and engaged and incorporated multiple and diverse stakeholders in coordinating and decision making role to enhance levels of trust and cooperation. The programs were incentive-based and incorporated both traditional and new ecological knowledge to develop the RRP uniquely tailored for each location to address the specific context, needs, and challenges for individual participants. This RRP operations were designed to empower the participants which is a central theme in successful community-based conservation programs. This typology provides the context for future evaluations of RRP to assess effectiveness of this proactive tool in mitigating wolf-livestock conflict.

INTRODUCTION

The reintroduction of gray wolves (*Canis lupus*; wolf) into the north Rocky Mountains (NRM) ecosystem has generated rancher concerns about depredations and sub-lethal effects on livestock. These concerns, both perceived and real, have generated continued controversy (Fritts et al. 2003). Though direct losses from wolf depredations on livestock are one concern for ranchers, indirect effects on livestock grazed alongside

wolves (e.g. decreased weight gain) have also been documented (Ramler et al. 2014). In addition to these rancher concerns, wolf-livestock conflicts can reduce tolerance for wolf conservation, presenting economic and political challenges for management agencies (Naughton-Treves et al. 2003, Meadow et al. 2005, Heberlein and Ericsson 2008).

Further exacerbating rancher concerns is the dynamic environment surrounding the legal status of the wolf under the Endangered Species Act (ESA) and thus, its management in the NRM. There have been several shifts in wolf management authority between federal protection and state management in response to litigation (USFWS 2014). This flux in policy has exacerbated the already polarized opinions of wolves (Treves and Bruskotter 2011), because the public may perceive it eliminates their participation in wolf management via hunting and trapping, and removes the feeling of control rural residents may experience when wolves are delisted (Houston et al. 2010). In short, the dynamic ESA status of the wolf affects policy which further complicates wolf management and conservation.

As the NRM wolf population continues to grow and expand, wildlife managers, ranchers, and stakeholders seek new tools to mitigate the potential effects of wolves on livestock. To address both wolf conservation and damage to livestock, wildlife managers continue to implement both lethal and non-lethal management strategies to mitigate wolf-livestock conflicts (Bangs et al. 2006). Although a wide variety of lethal and non-lethal tools have been implemented to reduce the impacts of wolves on livestock, conflicts still remain (Sime et al. 2007, Harper et al. 2008). Lethal control has not been singularly effective and faces scrutiny from both pro-wolf and anti-wolf stakeholders (Bangs et al. 2005). Non-lethal options are often limited by cost and the scale of landscape on which they are needed (Shivik 2004). Thus, synergistic new tools that minimize wolf-livestock

encounters, and can be applied on large landscapes, (i.e., federal grazing allotments) may be beneficial.

The RRP has been touted as an example of a non-lethal tool that can function on a large landscape and reduce wolf-livestock encounter rates by increasing herd supervision (Wilson 2012). Herd supervision is an ancient concept for increasing herd productivity and reducing risks from predators (Bollig et al. 2013, LaRocque 2014). This concept is now embraced by several RRP that are currently operating in the NRM. These programs are sponsored by a variety of organizations, and as such, may differ in goals and structure.

The range riders deployed under this concept work to create a human presence near livestock and deter wolves from frequenting active grazing areas (Bangs et al. 2005). Range riders may further improve their effectiveness and benefit ranchers by: 1) identifying carcasses for investigation or removal, 2) identifying sick or injured animals for treatment or removal, 3) identifying fencing concerns that lead to separated herds or herds in the wrong location (e.g. cattle on roads or in riparian areas, 4) and monitoring wolf activity to identify high risk time periods or locations (S. Wilson personal commun. 2012). Because little is known about the implementation, benefits, and challenges of this non-lethal option, a first step in gaining a better understanding of the scope and applications of RRP operating in the NRM is examination of participant perceptions of the program.

The RRP may share traits found in community-based conservation programs (CBC) operating in the western U.S. to address species conservation concerns (www.utahcbcp.org). These CBC attempt to match the scale of the management to the scale of the problem. They are adaptive, in that they seek and use new information to

prioritize management emphasis. The community-based conservation programs are incentive-based, in that they provide mechanisms which are intended to provide voluntary participants with value or benefits tied to their participation. Lastly, these programs incorporate both traditional and new knowledge as mechanism for learning and an empowerment (Berkes 2004).

The purpose of this chapter is to use information collected from participant interviews to describe the breadth and depth of RRP that have been implemented in the NRM to mitigate wolf-livestock conflicts. This information will be used to develop RRP typology and identify CBC traits which may affect the success of RRP (Berkes 2004).

METHODS

Study Area and Sampling Frame

A list of known RRP in the western United States was developed through communications with a key informant. Key informants can provide important information to structure evaluation and help gain access to the research setting (Singleton and Straits 2010). In this case, the key informant was a RRP coordinator from the longest running program in Montana. This individual's insight facilitated development of the list of RRP that included efforts in Idaho, Montana, Oregon, and Washington. Because the RRP efforts in Idaho were limited to monitoring domestic sheep (*Ovis aries*), while the Montana, Oregon, and Washington RRP monitored domestic cattle (*Bos bos*), Idaho was not included in this study. This decision was made because the RRP the focus on cattle better reflect the landscapes scales inhabited by wolves (Berkes 2004), and the sheep

RRP have typically incorporated herders because of historic coyote (*C. latrans*) depredations (Shivik 2004).

At the time my study was initiated, I identified 13 cattle-based RRPs in the NRM for possible inclusion. This list include 9, 4, and 1 programs in Montana, Washington, and Oregon, respectively. I interviewed participants in each of these programs. However, as the study progressed, 4 new programs were identified and I added them to the study. Ultimately, ten programs were included from Montana, reflecting the larger wolf population and increased number of range rider efforts throughout the state. Five programs were included from Washington and 2 programs were included from Oregon, because Washington and Oregon had smaller wolf populations and the RRP efforts were more limited. Thus, the range of cattle RRPs selected for this typology reflected the contemporary operational NRM environment.

It is important to note that each of the Washington RRP efforts was funded and coordinated by the same two groups (a non-governmental organization (NGO) and the state agency), though all efforts were geographically distinct. Similarly, 2 efforts in Montana were run by the same NGO, but were geographically distinct. Furthermore, the coordination duties and leadership changed for one RRP in Oregon halfway through the program period, changing the program focus and creating 2 unique RRPs and two separate “efforts.” Thus, the 5 efforts in Washington, the 2 efforts in Montana, and the two efforts in Oregon were described as individual programs.

Range Rider Programs were compared using information collected through interviews with program coordinators (i.e., key informants from all partnering agencies), ranchers involved with the programs, and range riders. Non-random snowball sampling, beginning with known RRP coordinators, was used to select participants to be included in

this study. This sampling method was warranted because the primary objective was to develop an understanding of breadth and depth of current (and historic) NRM RRP efforts. This method was also appropriate because the number of identified RRP in the western US is small (< 20). Therefore, all identifiable and cooperative participants warranted inclusion in the study (Singleton and Straits 2010).

All recommended participants were contacted for interviews. For the few larger range rider programs (>20 rancher participants), interviews were conducted until interview data reached a point of saturation. In social research, saturation is a concept developed in the framework of grounded theory, and describes the point at which no new information can be obtained from further data collection (Glaser and Strauss 1967). Accordingly, when RRP participant interview responses became repetitive, interviewing for that individual program was terminated. While the combination of snowball sampling and sampling to a point of saturation could produce a bias where individuals recommend other like-minded individuals for additional sampling, the programs with >20 ranchers sampled the key individuals most involved with the RRP. Ultimately, the producers most affected by wolf activity and with the most range rider activity were interviewed, providing insight from those closest to the program. All survey instruments (Appendix) were pretested to address areas of concern prior to implementation in the field. The survey instruments used were reviewed and approved for use by the Utah State University Institutional Review Board (IRB) process. IRB Protocol #5491.

Coordinator Interviews

To develop the typology, key personnel from agencies partnering in each RRP effort (n = 20) were interviewed January 2014 – April 2014 using a semi-structured phone interview to define program structure and operations, and duration. The interviews

identified: 1) the time span of the program, 2) if the program has ended - what are the reasons, 3) how information is communicated in the program, 4) how many range riders are employed, 5) rider duties, time periods that riders actively monitor cattle, area that riders monitor, 6) what type of transportation each rider uses (horse, 4-wheeler, dirt-bike, truck), 7) information regarding risk reduction actions, and 8) levels of wolf activity. Interviews also identified any other non-lethal tools that were used in addition to the RRP (e.g. carcass removal programs, fladry) and trends in livestock losses prior to RRP implementation and during the course of the program.

Rancher Interviews

Through interviews with RRP coordinators, ranchers utilizing the programs were identified. The coordinators contacted the participating ranchers to determine interest in participation and to initiate interview scheduling. Participating rancher interviews (n = 25) were conducted October 2014-January 2015 using a semi-structured face-to-face interview protocol.

To further insight into the varying RRP efforts, rancher interviews were conducted to learn from participants utilizing the programs. Interviews asked respondents for a description of their ranching operation and their role on the ranch. Interviews also identified rider duties and rancher expectations for an optimal range rider. Because interviews were semi-structured, unidentified parameters were emergent. Thus, the structure of the interviews was flexible to accommodate these new findings.

Range Rider Interviews

Range riders employed by each program were also identified in RRP coordinator interviews, and contacted for participation in this study to gain an “on-the-ground”

perspective. Range rider interviews (n = 6) were conducted October 2014 – January 2015 using a subset of questions from the coordinator interview guide. These interviews collected information on rider background, rider duties and activities, levels of wolf activity, communications, perceived impacts, and areas for program improvement.

RRP Coordinators, Ranchers, and Range Riders: Groups Not Mutually Exclusive

It is also important to note that interview respondents in each group (i.e. coordinator, rancher, range rider) do not strictly fit in a single category: groups are not mutually exclusive. A coordinator for one program may also be a producer, a producer may be the range rider, or the coordinator may be the range rider. Or they may all be one in the same. Thus, more individuals in each group were contacted than the sample size suggests. For example, though 6 interviews were conducted with range riders, 3 additional range riders were previously interviewed as coordinators. Therefore, the overlapping roles of participants observed in several RRP's influenced the sample size by reducing the number of interviews conducted.

Data Analysis

Interviews were transcribed, printed, and initially read to gain an increased familiarity with interview responses. A second reading of transcripts enabled development of an outline of key points for each interview. Using these outlines, and third review of the interviews, transcripts were hand coded to identify common themes identified for each group (coordinators, ranchers, and range riders). These themes, along with data collected from responses to pertinent interview questions, were used to describe RRP efforts and illustrate similarities and differences for the programs. I subsequently

used this information to evaluate how well the programs approximated the CBC framework (Berkes 2004)

RESULTS

Program Overview - Status and Purpose

Range Rider Programs were implemented in Montana, Oregon, and Washington, with the earliest program beginning in 2003. Seven of the efforts (41%) have ended (six efforts in Montana and one effort in Oregon), while 10 of the RRP (59%) are currently running (Four in Montana, one in Oregon, and five in Washington). Interviews were conducted with 51 participants in 17 RRP in three states. Fifteen of the 17 programs (88%) were developed primarily as a non-lethal option for mitigating wolf-livestock conflict by increasing human presence in livestock (cattle) grazing areas where wolf territories overlap, while two of the RRP (12%) were implemented primarily to positively impact range health through intensive herding practices, and secondarily reduce wolf-livestock conflicts.

Every program engaged a person(s) to “ride-the-range” to provide some type of human presence. The roles and responsibilities of the range rider differed according to the context of each individual RRP situation (e.g. level of wolf activity, acreage and terrain, number of livestock, federal wolf status). Interviews were conducted with 20 RRP coordinators, 25 participating ranchers, and 6 range riders across this spectrum to determine how and why the programs differed and if these differences influenced participant perception regarding overall success (Table 2-1). This chapter focuses on defining a RRP typology. How the typology related to participant perceptions of success will be covered in Chapter 3.

Table 2-1. Typology of Range Rider Programs (RRP) operating in the Montana, Washington, and Oregon that were evaluated as part of the 2014-2015 RRP research program, Utah State University, Logan.

<u>RRP</u>	<u>Years Run</u>	<u>Years</u>	<u>Federal Wolf Status</u>	<u># Riders</u>	<u># Ranchers</u>	<u># Head</u>	<u># Acres</u>	<u>Grazing Land Type</u>	<u># Wolf Packs</u>	<u>Collars</u>	<u>Coordinators</u>
A	4	2011-present	Delisted	1	7	15,000	50,000-100,000	public, private	1-2	NO	2 NGO, State, CBO
B	7	2008-present	listed-delisted	2-3	10-12	15,000	20,000-50,000	public, private	12-13	VHF	NGO, State, CBO
C	3	2005-2007	Listed	1	8	1,500	50,000-100,000	public, private	2	VHF	2 NGO, State, CBO
D	1	2014-present	Delisted	1	2-5	>2500	10,000-20,000	public, private	0-1	NO	NGO, CBO
E	5	2004-2008	Listed	2	5	2750	10,000-20,000	Public	2	NO	2-3 NGO, State, CBO
F	5	2003-2007	Listed	1	1	2000	10,000-20,000	Private	1	VHF	NGO, State, CBO
G	2	2007-2008	Listed	1	1	2000	20,000-50,000	public, private	1	VHF	NGO, State
H	2	2013-2014	Delisted	2	1	380	<500	public, private	1	NO	NGO
I	2	2012-2013	Delisted	2	1	300	<500	Public	1	VHF	NGO, State
J	2	2013-present	Delisted	2-3	5	1500	10,000-20,000	public, private	1	NO	3 NGO, State
K	2	2010-2011	Listed	1	60	N/A	>100,000	public, private	1	GPS	NGO, State
L	3	2012-present	Listed	1	35	N/A	>100,000	public, private	2	GPS	State, CBO
M	3	2012-present	Listed	1	1	1500	50,000-100,000	Public	1	GPS*	NGO, State
N	2	2013-present	Listed	1	1	900	20,000-50,000	Public	1	GPS*	NGO, State
O	2	2013-present	Listed	1	1	300	500-5000	Private	1	GPS	NGO, State
P	1	2014-present	Listed	3 PT=1	1	200	20,000-50,000	public, tribal	1	GPS**	NGO, State
Q	1	2014-present	Listed	1	1	300	20,000-50,000	Public	1	GPS**	NGO, State

1 Non-Governmental Organization (NGO), Community Based Organization (CBO), Very High Frequency (VHF), Global Positioning Satellite (GPS)
 2 GPS* Collar lost during RRP, GPS**Collar on wolf pack but not utilized by RRP

Terminology Matters – What Is a Range Rider?

The RRP participants interviewed differed in their definitions of and terminology used to describe what constituted a RRP program and a range rider. Their definitions reflected coordinator role and perceptions, and influenced daily RRP operation as well as success metrics (see Chapter 3). These differences surfaced in the initial interviews with program coordinators. As interviews were completed with other RRP participants, the diversity in range rider definitions increased. As one coordinator explained: “you’ll see there are some dramatic differences in how the term range rider is being used” (Alfred). The definition of a “range rider” varied not only among coordinator groups (i.e., conservation group, state agency, community organization), but within each of those groups as well. For example:

“Range rider to me at least is almost a little cliché because it means so many different things” (Alfred).

One RRP coordinator from a conservation group stated:

“The best thing is incorporating active livestock management, including herding, into the concept of what a range rider should do. Now of course, that’s what range rider historically meant, but as its generally applied now in the conservation community, from what I can tell, most range riders are not doing that and I think that’s the real contribution” (George).

A state agency coordinating another RRP expressed a different sentiment:

“The primary duty of the range rider was to actively seek out wolves when they were near livestock, and if necessary haze them” (Alfred).

Another idea of how a range rider should function came from a community based organization partnering in another program:

“To the best of their knowledge, (riders) understand where wolves are and aren’t, understand where livestock are, increase herd supervision rates, and communicate what they are seeing and understanding to the community” (Peter).

“...(riders) use human presence to monitor wolf and livestock but ideally, discourage frequency of encounter rates between livestock and wolves by using human presence and regular monitoring” (Peter).

A conservation group that sponsored a different program offered another opinion on range riders:

“...the one major ranch project where the rider was more focused on examining the cattle looking for injuries, and there were very few attempts to do non-lethal - to me that was the least successful out of all of them” (Jane).

Three “Versions” of RRP

Several variations of the RRP concept emerged through the interview process. To date, there has been no effort to standardize the RRP on a range wide basis. Interviewee responses suggested the programs were specifically tailored to address sponsors and participants perceived needs. Although the programs differed, participants generally agreed each effort provided local benefits and value, despite variations in protocol.

Based on the range of definitions and program descriptions obtained through the interview process, three main categories were developed to describe contemporary RRP. However, these categories are not mutually exclusive. These categories were designated based on overall program focus and scope, and included: 1) livestock monitoring, 2) wolf surveillance and 3) livestock herding. Though some programs fit one category, overlap was observed for others (Figure 2-1).

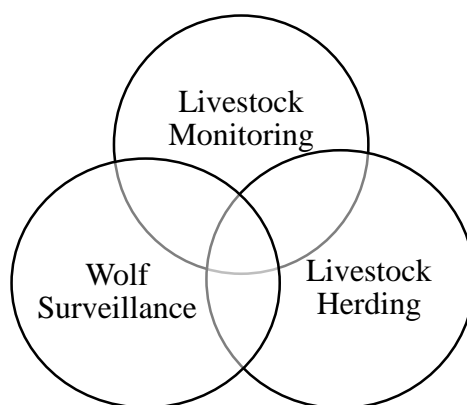


Figure 2-1. Variation in Range Rider Programs (RRP) operating in Montana, Oregon, and Washington as identified in participant interviews 2014-2015.

Livestock Monitoring

The first version of a RRP focused on livestock monitoring and primarily engaged range riders to increase herd supervision for cattle. These riders recorded herd behavior, detected herd health concerns, identified potential wolf depredation attractants in a grazing area (i.e, carrion and/or livestock carcasses), all while creating a human presence around livestock. “Day to day duties are to really try to focus efforts on helping livestock producers monitor cattle where we think they are at highest risk of wolf depredation” (Mary).

Another coordinator described a range rider’s job as: “more or less just being in and amongst the livestock, and eyes and ears, and reporting back if they are bunched...His job is not to be a cowboy in the cattle, it’s just report back so that they can deal with it that they are sick or injured. Report it back so the producer can hopefully remove them from the landscape, move or deal with those high-risk animals, report back activity to us on wolves” (Joe).

Upon making field observations, riders reported back to livestock producers if there were any concerns. Rapid detection of potential problems enabled ranchers to efficiently address concerns, reduced risks to the herd and gave peace of mind to the rancher. Because ranchers were often busy performing multiple tasks required for a livestock operation such as irrigating or haying, livestock monitoring by a range rider was described as providing an extra “set of eyes” to increase herd supervision and reduce the burden associated with raising livestock alongside wolves.

Wolf Surveillance

The second version of a RRP focused on wolf monitoring and engaged riders to provided increased information on wolf location and activity, or in some cases, the lack

of wolf activity in an area. “Primarily the person is using the collars and going after the collars to determine wherever they are” (Alfred). Riders tracked and located wolves using a variety of methods including ground tracking, howling surveys, trail cameras, and radio collars, either Global Positioning Satellite (GPS) or Very High Frequency (VHF). The riders used this information to detect areas of high wolf use such as rendezvous sites, commonly used travel routes, and areas with the greatest potential risk to livestock, where they targeted range riding efforts. Riders also used human presence to deter wolf activity around livestock and actively hazed wolves out of these locations. One coordinator explained:

“the primary duty was to put human presence into wolf presence in the presence of livestock. So it wasn’t just sort of be out there- looking around, driving around, checking things out – it was whenever wolves were known to be around livestock in areas where we have had some depredation, the range rider would actively go to those wolves wherever they were, and also haze them if appropriate” (Alfred).

According to another coordinator riders focusing on tracking wolves also located and investigated wolf scat to determine the diet of wolves by looking for evidence of natural prey or livestock in the scat. “I want to know where the wolves had been, look for any suspicious activity, bumped the cattle – but I want to know what they’re eating. I know they’re eating every day or at least every other day, and I would like to know if they’re eating deer or elk” (Mark). In short, riders actively monitored wolf activity, communicated information to potentially affected ranchers, helped inform livestock management decisions, and provided some peace of mind for ranchers.

Livestock Herding

The third version of a RRP focused on livestock herding. One coordinator described their RRP efforts:

“So unlike maybe other RRP’s –this program really focuses on knowing where the wolves are, learning about how the wolves are utilizing the landscape, travel routes, dens, that sort of thing, but we don’t put a lot of effort into going off and tracking the wolves to who knows where. But we put a lot of effort into handling the cattle and managing the ranch and the livestock on the ranch to work better for coexistence with wolves, and so the goal is to make changes on the ranch through the use of tools as well as the way that we handle livestock to make it work better for ranching in areas that have wolves” (Ruth).

Programs that focused on herding were highly livestock-centric and functioned to keep cows and calves paired, keep herds grouped, and influence grazing distribution.

When intensive herding was used, the riders routinely gathered cattle into groups, even drove cattle to water, drove the herd to a selected area for targeted grazing, and drove the herd to a location where the cattle were settled for the evening or night penned. One goal of intensive herding was to positively impact range health through actively managing grazing by the herd. Herding allowed riders to prevent overgrazing, prevent over-use of riparian areas, and facilitated weed management. Another coordinator noted:

“(riders) drove the herd to a selected area for targeted grazing, and drove the herd to a location where the cattle were settled for the evening or night penned. One goal of intensive herding was to riparian areas. Not have to spend resources and time mending a lot of perimeter fencing – we were using riders and temporary fencing. There were a lot of targets there” (Luke).

Additional benefits from herding livestock came from safety in numbers. Cattle on large allotments typically exhibit a wide dispersal pattern, but when riders actively herded cattle using low stress livestock handling techniques, they worked to rekindle herding instinct and trained cattle to group up to defend themselves from predators.

Additionally, riders used the low stress handling to train cows to “mother up” to help defend their calves. One coordinator described the program as

“using low stress livestock grazing techniques...the gist is that (the rider) does a lot of work to essentially train these cows to stick together as a group so that it rekindles their herd instinct so that the pairs are always paired up rather than spread out, which goes against traditional ranching practices of spreading them

out... and she has observed them using their herd instincts to fend off wolves” (Sarah).

Though the programs that utilize livestock herding techniques were particularly labor intensive, they provided increased accountability for livestock through frequent contact with the herds. If cattle became sick or injured, they were rapidly detected and concerns were efficiently addressed.

Shared Goals

Despite logistical differences in program set up and context in each program area, interviews identified common objectives for RRPs. Programs sought to accomplish the following, to varying degrees in each effort: use human presence to reduce the negative impacts of wolves on livestock; increase the level of information on wolves and livestock through increased human presence and monitoring; increase communication of information to participants; use a collaborative framework for addressing wolf-livestock conflict that includes agencies, ranchers, and conservation groups; increase coexistence between people and wolves by helping maintain ranch sustainability and reduce the number of conflicts that result in lethal wolf removal; and in 3 programs, improve range health. Thus, many programs looked to address the bigger picture in wolf-livestock conflicts. RRPs not only attempted to acknowledge the technical, on the ground aspects of wolf-livestock interactions, but also the social aspects of the conflict. Through mixed methods, RRPs sought to provide benefits to participants, coordinators, and stakeholders that included both technical solutions to reduce wolf-livestock encounters, and social benefits that helped ranchers live with wolves. One coordinator detailed his program’s broader view:

“Whether its wolves or whatever – we are trying to work with these producers to keep them on the landscape- keep their ranch functioning, and at the end of the

day, they like seeing wildlife in their backyard. They need to be ranching and making money, and at the end for conservation, we think that is one of the biggest things. So for a rancher to tolerate wolves or house elk that wolves eat, I think that all is in the bigger picture is. It's a good thing. So we maybe- maybe that's the crux of it- we focus bigger" (Joe).

Organizational Components of the RRP

The RRPs included in this study shared similar components. These included a coordinating organization or collaboration of organizations, a funding mechanism, and some form of operational structure that included a supervisor (i.e., a coordinator), the landowner(s) who utilized RRP's service (i.e., ranchers), someone in the field who did the work (i.e., the range rider), and a mechanism that provided communication and periodic feedback.

Coordinating Organizations

Coordinators of each RRP fell into one of three categories: conservation groups, community-based organizations, and state agencies. For this study, conservation groups were defined as non-governmental organizations that function to conserve natural resources, and are based outside of the communities in which they coordinate range rider efforts. Community based organizations were defined as local groups based in the community in which the range rider program was implemented (i.e. watershed groups, ranchlands groups, county stockgrowers associations). State agencies were defined as state governmental fish and wildlife agencies that are responsible for recovering/managing wolf populations.

Funding

Quotes for the cost of a RRP for one grazing season ranged from \$20,000-\$40,000. Funding for RRPs was varied, though several common sources were identified

in coordinator interviews. Program funding for nine efforts primarily came from non-governmental organizations (NGOs) and grants. Funding for two efforts came from state dollars, and funding for five efforts came from a combination of state money and NGO funds.

In Montana, NGO funding played a large role in financing a RRP. However, in 2014 the Montana Livestock Loss Board also provided one-time grants to several programs. In Oregon, funding initially came from the state Wolf Management Program, during the course of the RRP, the funding source changed. The new funds came from the Oregon Department of Agriculture, where money was funneled through the county to the RRP. Washington also had state money available to help fund their RRP. With funds provided by the state legislature, the state Department of Fish and Wildlife developed a 50:50 cost-share to help fund range riders or other proactive efforts with ranchers. In areas with wolves, a RRP cost-share was around \$10,000. To further assist with funding, a conservation group helped ranchers by providing matching funds for a RRP.

Operational Structure: The Coordinators

Each RRP was directed by an individual(s) who had the primary responsibility to coordinate the program. Coordination duties typically included designing and implementing the RRP; providing funding; training riders; providing rider support; and maintaining communication between partners, ranchers, and riders. In 12 of the 17 RRPs, one (or more) conservation group representatives were coordinators. In six of the efforts, a community-based organization representative was a coordinator, and in 12 of the efforts, a state agency representative, often a wolf biologist, was a coordinator in the effort. Additionally, five coordinators had overlapping identities: they were both coordinators and ranchers that used the RRPs. Furthermore, three of these five

coordinators were also the range riders. Thus, roles of coordinators, ranchers, and riders were not mutually exclusive and often overlapped.

The Ranchers

Ranchers that participated in the Montana, Oregon, and Washington RRP worked full-time on their livestock operations, whether as owners or managers. Three of 25 rancher participants managed a ranching operation for an absentee owner, while the rest (and vast majority) of ranchers described their ranches as family operations. All 25 ranches were identified as cow-calf operations, two of which included yearlings in the ranch description, and two of which included a secondary stocker operation.

I identified a broad spectrum of ranch characteristics through rancher interviews. Ranch characteristics that illustrated the greatest variation included the number of head each ranch ran, the ownership of land grazed by each ranch, and the area of land grazed by each ranch. The number of livestock for each ranch ranged from 100 cow-calf pairs to 1300 cow-calf pairs plus 150 stocker calves. Ranchers described the type of land grazed by their ranch as one of many combinations of the following: private, deeded, leased, state, Forest Service, BLM, and reservation. Rancher interviews also identified the area grazed by one ranch ranged anywhere from 2,000 to 20,000 hectares.

The Range Riders

Range riders were individuals that conducted monitoring of wolves and livestock, and in three programs, were responsible for herding cattle. Range rider duties varied based on program focus and targeted their efforts according to program “version” (i.e., livestock monitoring, wolf surveillance, livestock herding). Three of the six range riders interviewed had a background working with livestock. Two of these three worked on the

ranch prior to official hiring and funding through the RRP. A fourth rider had a background in hunting and trapping, and a fifth rider had a background in working with grizzly bears, illustrating tracking and wildlife skills. Five of the six range riders interviewed had lived/worked in the area they were hired to range ride and knew the ranchers prior to range riding. Four of the range riders were selected by ranchers, one rider was approached by a conservation group (though they were hired to ride for the family ranch), and one was hired by a community based organization.

Technical Components of the RRP

Human Presence

The basic tenet of all the RRP was the provision of RRP, human presence. Human presence was defined as routine human activity on the landscape around livestock that wolves would detect and avoid. Providing human presence as a depredation deterrent was a major tenet of all of the RRP programs. Despite program reliance on this concept, coordinators, rancher, and rider responses suggested this term was loosely applied and was not well understood in terms of optimal utilization.

Human presence was established to varying degrees in each RRP, and ranged from targeted and active presence to dispersed presence. The amount of effort a rider could put into one area was dependent on the size of the RRP area that needed monitoring, along with a variety of other factors (e.g. topography, number of ranches to monitor, number of livestock). Because each RRP effort was unique, no standardization of this concept was identified.

Radio-Collars

In 10 RRP, radio-collars were utilized to help target range rider efforts and increase rider efficiency. The radio collars provided wolf location information to determine locations with greatest risk for wolf-livestock conflict and to aid riders in planning their day's work. Seven RRP had no access to radio-collars, five programs used VHF collars, and five programs had GPS collars with VHF capabilities. However, 2 programs lost use of their GPS collars due to wolf mortality.

Rider Transportation

Range riders used a variety of transportation methods, based on the area they needed to cover and the objectives of their particular RRP effort. The most common were horses and all-terrain vehicles (ATVs) such as four-wheelers or motorcycles. Eight programs used only horses, four programs used only ATVs, and five efforts used a combination of horses and ATVs.

Range Rider Expectations

In 11 RRP, ranchers were involved in the range rider selection process, while in three efforts, program coordinators selected the individual. In another three efforts, a rancher was the range rider (and the rancher was also a coordinator). Regardless of who performed the hiring, expectations for an optimal range rider were identified. Most coordinators agreed that ranchers preferred a known and trusted individual to conduct range riding, often represented by someone that had worked for them in the past, a family member, or a local individual from the community. Ranchers further expected a strong work ethic, along with knowledge of the area, and knowledge of cattle, as one rancher suggested "older cowboys or ranchers – semi retired would be best. They need

knowledge of cattle and the environment and a good work ethic – a work ethic you don't see in the younger generation” (Bob). Ranchers also expected some level of wildlife knowledge or tracking skills, as well as horse skills, suggesting a rider should have “the ability to track animals, handle a horse, (and) communicate with the livestock owner” (Ron). Another rancher explained the importance of good communication skills. “I think the people skills are number one and they are a higher percentage of being number one. You've got to be able to deal with the people. You can know everything you want about the animals, but it doesn't do any good if you can't deal with the people” (Walter). Furthermore, many ranchers believed riders must be capable of working alone and safely in rugged, isolated areas that may be home to grizzly bears, citing they must “be able to be on their own, and to think on their own and manage their time and safety factors. How to be out and about. And not put themselves or anybody else at risk” (Marilyn).

DISCUSSION

Overall, RRP's were unique proactive efforts that were highly context specific. Though there were shared goals for these programs, each RRP's specific situation varied greatly in a variety of aspects including: location, time period and duration, federal status of wolves, level of wolf activity, number and type of coordinating groups, number of rancher participants, number of livestock, area and terrain, and availability of radio-collars. Regardless, all of them shared aspects of effective community-based conservation programs (Berkes 2004).

No Analysis of RRPs to Date

One explanation for the observed variation in RRP setup and protocols is that to date, no range riding efforts have been scientifically analyzed for effectiveness at mitigating wolf depredations. Especially for the earlier programs, there was limited information on how to use a range rider. Though the common concept was “you’ve got to put somebody out there,” ideas of rider duties varied from tracking and hazing wolves to accounting for all livestock and providing extra herd supervision. Because wolves were newly re-established and their actual impacts on livestock were largely unknown, early programs had to utilize trial and error to mitigate wolf-livestock conflicts in a variety of ways.

Thus, RRPs programs had to rely heavily on traditional and local ecological knowledge to develop their initial operating structures, but as new information became available, many of the programs adapted. For example, several programs added more riders after an initial field season to better cover the program area. Another program expanded efforts based on increased wolf activity and development of new wolf packs. Several programs also utilized existing partnerships to develop their effort. One program had a previously established collaborative framework in place for addressing other concerns, like watershed health. As wolves moved into the valley, the collaboration developed and implemented a range riding program, relying on the relationships that were already established. Through multiple field seasons, frequent communication, and participant feedback, program coordinators learned from personal experience how to adapt the effort to increase efficiency. Other programs, however, had to establish new relationships and are build collaborations to address wolf-livestock conflicts, though

several of these more recent efforts incorporated new technology, like GPS, into their RRP model.

Reasons RRPs were Implemented

Another explanation for why so many program variations were observed is related to the reason the RRPs were initially developed. The main reasons cited by program participants included: 1) to address an existing problem (depredations, lethal wolf removal in response to depredation, 2) to get “ahead of the curve” before problems occurred, and/or 3); to improve range health, while consequently reducing herd vulnerability to predators. In some RRPs, depredations had already occurred, and the riders were expected to function as an active deterrent. In other programs, wolf activity was low to non-existent and the riders were utilized to provide herd supervision and monitor for any new or increased wolf activity. Furthermore, two programs were designed to intensively herd cattle for influencing range health, with secondary benefits of protecting herds from carnivores. In this way, the reasons for RRP implementation and wolf activity levels in program areas influenced program focus and rider duties. Though programs varied in these ways, each effort targeted a specific set of challenges their unique situation presented. Therefore, these locally placed conservation efforts were designed to fit the needs of the locally effected population, and further illustrating how RRPs are a community based conservation tool.

RRP Coordination Influences Scale

The scale of RRPs also varied in response to coordinating groups. In several projects, a single conservation group funded an effort on an individual ranch, while partnering with the state agency for technical support. In other projects, a collaboration

of conservation groups, community based organizations, and the state agency all came together to implement a community wide program. Thus, the level of coordination efforts seemed related to the scale of the project, ranging from individual ranches to watershed level efforts. This principle is shared by successful CBC efforts (Berkes 2004).

Program Scale and Rider Duties

Similarly, the scale of a project appeared related to program focus and rider duties. A rider that had multiple ranches to monitor over thousands of hectares was limited in the level of human presence they could have in any one location, whereas a rider working for one specific ranch may be spread thin, but not to the same degree. In the same way, a wolf pack with a large territory was increasingly difficult to track when compared to a pack with a smaller territory. This also influenced the rider's ability to haze wolves or perform active deterrence. Therefore, the scale of the project influenced the degree to which riders could perform their duties.

Federal Wolf Status

The federal wolf status during the time a RRP ran also appeared to play a large role in RRP. For programs that ran when wolves were federally endangered, wolves were relatively new to the area and both coordinators and ranchers wanted to thoroughly understand wolf numbers, locations, and activity. This may explain why so many of these programs had a heavy emphasis on wolf location information through use of tracking, telemetry, or GPS locations. State agencies responsible for wolf recovery are tasked with monitoring wolf population growth. As such, state agencies must document numbers and locations of wolf packs, numbers of breeding pairs, etc. This need for wolf

information may can influence RRP focus toward wolf surveillance, if programs are implemented during this federal protection period and partner with state agencies. In contrast, RRP's tend to focus more on the livestock monitoring and less on following wolves in areas where: wolves are de-listed, landowners have lived alongside wolves for many years, and where a wolf hunting and trapping season is in place. This may be due to landowner perception: the "terror threat" is not as severe as they initially perceived. These illustrations suggest the fear of the unknown associated with newly established wolf populations may influence RRP focus and rider duties.

Radio-Collars

Variation in RRP focus also appeared related to the impacts that federal wolf status has on radio-telemetry approaches to wolf surveillance. When wolves are federally protected, state agencies are responsible for recovering wolves. Wolf recovery plans include a requirement and increased emphasis on monitoring populations. Radio-telemetry is an important tool in this process. In areas or states where wolves are federally de-listed, state agencies retain wolf management authority. With limited budgets and resources, managers must perform these duties in a cost-effective manner. Thus state agencies may change radio-telemetry protocols to adapt to management needs.

Though many range rider programs used radio-telemetry to target rider efforts, not all programs had this tool available. Concomitantly, some RRP's lost use of their collars due to wolf mortality or dispersal, and some programs found their "tool" became limited with technical challenges that arose. Placing a radio-collar on wolves is labor intensive and expensive, and in places where wolves are hunted and trapped, the chance of losing a radio-collared wolf to legal harvest is increased and wolves become increasingly challenging to trap. Additionally, expense and weather can limit helicopters

contracted for collaring purposes. Therefore, if a radio-collared wolf is lost due to dispersal or mortality, managers may not replace the radio-collar as quickly as a RRP or rancher would like. To help mitigate costs, another strategy by the state may be to replace expensive GPS collars with VHF collars as wolf populations grow and funds are limited. Decreasing the fix rate on GPS collars deployed may conserve battery life and suit management or recovery needs, but decrease location information available to riders. Or changes in software housing location data may suit management needs, but limit utility to riders. Ultimately, a variety of factors related to radio-collars seemed related to varying RRP focus and rider duties.

RRPs: Community Based Conservation

Community-based Conservation is a conservation strategy that incorporates; 1) a systems view of the world, 2) humans as a part of an ecosystem, and 3) participation from rural residents in conservation and management decision making (Levin 1999). Berkes' CBC model (2004) identified critical principles for successful collaborative conservation efforts. First, the scale of a management strategy must match scale of the system needing management. Next, adaptive management must be implemented through shared management power and joint decision making: not authority from some individuals and passive participation by others. This collaboration should result in development of mutual trust. Following joint decision making, the next key principle is that incentives are identified for all involved parties so that multiple stakeholders and interests are equally involved. (Empowerment is greater incentive than monetary incentive in this model for CBC). Finally, local and traditional ecological knowledge should facilitate development of management strategies, collaboration, and empowerment.

Based on Berkes' (2004) CBC framework model, the RRP demonstrated many aspects of a successful community-based conservation strategy. The RRPs illustrated the CBC adaptive and collaborative nature in the application of a non-lethal tool designed to mitigate wolf livestock conflicts. The RRPs varied in scale, based on wolf activity and potentially affected ranchers. Efforts were also adaptive through use of participant feedback to make program improvements each season (i.e., RRPs hired more riders, increased frequency of rider communication, altered areas of rider focus with new knowledge of wolf activity). Furthermore, RRPs incorporated multiple and diverse stakeholders in coordinating and decision making roles, though some programs involved ranchers in this decision making process more than others. As such, levels of trust were impacted by relationships and levels of cooperation. Incentives, or program benefits, were also identified by all respondents, and varied based on stakeholder group association. Finally, traditional and ecological knowledge was used to develop the RRPs in each location and situation to address the specific context, needs, and challenges for individual program areas. Thus, RRPs, to varying degrees, fit Berkes model and exemplified CBC: a collaborative approach in mitigating wolf-livestock conflicts.

CONCLUSIONS

Participant interviews identified a collection of shared goals for RRPs, regardless of program focus and structure. Though there was no standardization of efforts due to the context specific nature of this tool, the programs illustrated collaborative efforts that were implemented to mitigate wolf-livestock conflicts through addressing a variety of technical and social aspects of these conflicts. RRPs, in many cases, helped build trust

and relationships to better tackle wolf-livestock conflicts as a partnership. Overall, the RRP exhibited traits of successful CBC programs (Berkes 2004).

Investigation of participant perceptions can provide further insight into determining RRP value and what makes a range rider helpful to participating individuals. From that point, key themes identified could improve current efforts based on participant feedback, help develop future efforts, and guide future studies to quantitatively evaluate RRP. Upon identification of perceived program impacts, those impacts may be experimentally evaluated under a variety of conditions to better determine program effectiveness.

Chapter 3 identifies coordinator, rancher, and rider perceptions of RRP to develop this deeper understanding of the common themes, benefits, and challenges associated with these diverse efforts.

LITERATURE CITED

- Bangs, E., J. A. Fontaine, M. D. Jimenez, T. J. Meier, E. H. Bradley, C. C. Niemeyer, D. W. Smith, C. M. Mack, V. Asher, and J. K. Oakleaf. 2005. Managing wolf/human conflict in the northwestern United States. Pages 340-356 *in* R. Woodroffe, S. Thirgood, and A. Rabinowitz, editors. *People and wildlife: coexistence or conflict?* Cambridge University Press, Cambridge, England.
- Bangs, E. E., Jimenez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krsichke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D.W. Smith, V. Asher, and S. Stone. 2006. Nonlethal and lethal tools to manage wolf-livestock conflict in the northwestern United States. Proceedings of the 22nd Vertebrate Pest Conference, Davis, California.

- Berkes, F. 2004. Rethinking community-based conservation. *Conservation Biology* 18: 621–630. doi: 10.1111/j.1523-1739.2004.00077.x.
- Bollig, M., M. Schnegg, and H. P. Wotzka. 2013. Pastoralism in Africa: past, present and future. Berghahn Books. New York, New York, USA. E-book Library. Website @ <http://USU.ebib.com/patron/FullRecord.aspx?p=1390926>>. *Last visited 3/2/2015*.
- Fritts, S. H., R. O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pages 289-316 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois, USA.
- Glaser, B. G., and A. L. Strauss. 1967. *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing Co. Chicago, IL, USA.
- Harper, E. K., W. J. Paul, L. D. Mech, and S. Weisberg. 2008. Effectiveness of lethal, directed wolf-depredation control in Minnesota. *Journal Wildlife Management* 72:778-784.
- Heberlein, T. A., and G. Ericsson. 2008. Public attitudes and the future of wolves *Canis lupus* in Sweden. *Wildlife Biology* 14:391-394.
- Houston, M. J., J. T. Bruskotter, and D. Fan. 2010. Attitudes toward wolves in the United States and Canada: a content analysis of the print news media, 1999-2008. *Human Dimensions of Wildlife* 15: 389-403.
- LaRocque, O. 2014. Revisiting distinctions between ranching and pastoralism: A matter of interspecies relations between livestock, people, and predators. *Critique of Anthropology* 34: 73-93.
- Levin, S. A. 1999. *Fragile dominion. Complexity and the commons*. Perseus. Reading, Massachusetts, USA.

- Meadow, R., R. P. Reading, M. Phillips, M. Mehringer, and B. J. Miller. 2005. The influence of persuasive arguments on public attitudes toward a proposed wolf restoration in the Southern Rockies. *Wildlife Society Bulletin* 33:154-163.
- Naughton-Treves, L., R. Grossberg, and A. Treves. 2003. Paying for tolerance: rural citizen's attitudes toward wolf depredation and compensation. *Conservation Biology* 17:1500-1511.
- Ramler, J. P., M. Hebblewhite, D. Kellenberg, and C.A. Sime. 2014. Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*. doi: 10.1093/ajae/aat100.
- Shivik, J. A. 2004. Non-lethal alternatives for predation management. *Sheep & Goat Research Journal* 19: 64-71.
- Sime, C., E. Bangs, E. Bradley, J. Steuber, K. Glazier, P. Hoover, V. Asher, K. Laudon, M. Ross, and J. Trapp. 2007. Gray wolves and livestock in Montana: a recent history of damage management. *Proceedings of the 12th Wildlife Damage Management Conference*, Corpus Christi, Texas.
- Singleton, R., and B. C. Straits. 2010. *Approaches to social research*. New York: Oxford University Press, USA.
- Treves, A., and J. T. Bruskotter. 2011. Gray wolf conservation at a crossroads. *BioScience* 61:584-585.
- United States Fish and Wildlife Service. 2014. Gray wolves in the northern Rocky Mountains: news, information and recovery reports. USFWS with cooperating agencies on reports: Blackfeet Nation, Confederated Salish & Kootenai Tribes, Idaho Department of Fish and Game, Montana Fish, Wildlife, and Parks, National Park Service, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Utah

Department of Natural Resources, Washington Department of Fish and Wildlife,
Wildlife Services, and Wind River Tribes. Annual Reports for 1999 to 2013.

Updated Sept. 23. Website @

<http://www.fws.gov/mountain-prairie/species/mammals/wolf>.> *Last visited*

2/3/15.

CHAPTER 3

**PARTICIPANT PERCEPTIONS OF RANGE RIDER PROGRAMS USED TO
MITIGATE WOLF-LIVESTOCK CONFLICTS IN THE WESTERN UNITED
STATES**

ABSTRACT

Range Rider Programs (RRPs) are one example of a proactive non-lethal tool that has been implemented in the northern Rocky Mountain Region (NRM) of the western United States to mitigate gray wolf (*Canis lupus*)-livestock conflicts. Little is known about the effectiveness of RRP in mitigating conflicts. Participant perceptions of program effectiveness can provide information needed to initiate more comprehensive evaluations. I surveyed 51 participants from 17 Range Rider Programs (RRPs) in 3 states to determine RRP participant perceptions regarding the potential benefits of RRP in mitigating wolf-conflicts. I completed phone and face-to-face interviews of RRP coordinators (n=20), ranchers (n=25) and range riders (n=6) to obtain information to describe the RRP operating in the NRM and assess their perceptions of program effectiveness. Most respondents identified a suite of benefits they considered which made the program valuable and worthy of their continued participation. These benefits were often indirect and represented composite of other benefits. Livestock management benefits identified by participants included: 1) depredation mitigation, 2) increased information on livestock, and 3) rapid carcass identification. Social benefits identified included: 1) program influence on public perception, 2) empowerment, 3) reduced stress, and 4) trust building. Long-term challenges to RRP continuity included: 1) monitoring large areas where riders were spread thin, 2) better application of radio-collarenhancing

trust, 4) debates over use of lethal control by riders, and 5) dependable funding sources. Although, the primary stated objective of most RRP's was to proactively reduce wolf-livestock conflicts, participants recognized the difficulty in determining actual reduction in these interactions.

INTRODUCTION

Since the gray wolf (*Canis lupus*) introduction into the Northern Rocky Mountain region (NRM) in 1995-1996, wolf-livestock interactions have generated concern and controversy for producers, state wildlife managers, and wolf conservation stakeholders (Fritts et al. 2003). While the natural prey species of gray wolves are primarily large ungulates (Mech 1970, Chavez and Gese 2006), wolves are also described as opportunistic hunters (Mech 1970). Consequently, domestic livestock may become an anthropogenic food source, particularly during the grazing season when cattle abundance increases on the landscape (Oakleaf et al. 2003, Morehouse and Boyce 2011). Because wolf-livestock conflicts can decrease human tolerance for wolves, these conflicts present significant economic and political challenges for management agencies (Naughton-Treves et al. 2003, Meadow et al. 2005, Heberlein and Ericsson 2008).

In response to reports of potential wolf depredation on livestock, state and federal agencies, often the U.S. Department of Agriculture Animal Plant Health Inspection Service – Wildlife Services (WS) are contacted to conduct an investigation. In the event a depredation is confirmed, WS may be authorized to use lethal control to mitigate future depredation scenarios. However, rancher or livestock producer concerns are not limited to depredations.

In domestic cattle (*Bos bos*), higher calf susceptibility to disease and increased mortality have been associated with stress from increased wolf presence (Sommers et al. 2010), along with decreased weight gain and reduced reproductive output (Fanatico et al. 1999, Lehmkuhler et al. 2007). Furthermore, a study by Ramler et al. (2014) found ranches with depredations in western Montana experienced an average 10 kg (22 pound) reduction in weight gain for calves. These indirect effects of wolf-livestock interactions, along direct losses from depredations, illustrate the need for proactive methods to reduce wolf-livestock encounters.

Both lethal and non-lethal management options have been utilized to reduce the impacts of wolves on livestock, though conflicts still remain (Sime et al. 2007, Harper et al. 2008). While lethal wolf control plays a critical role in mitigating conflict in ranching communities (Mech 1995, Bangs et al. 2005), this method has not proved a singularly effective management tool (Sime et al. 2007), and may also conflict with wolf conservation goals (Shivk et al. 2003). Furthermore, while the general public may be more accepting of lethal control used surgically in response to conflicts (Messmer et al. 1999), non-lethal management options are typically preferred over lethal alternatives (Reiter et al. 1999). Additionally, proactive non-lethal strategies may enhance wolf conservation efforts by increasing stakeholder tolerance for wolves, particularly when proactive measures are subsidized (Nyhus et al. 2005, Treves et al. 2006, Karlsson and Sjoström 2011). Thus, continued development of non-lethal wolf management strategies is warranted (Shivik 2004).

As the NRM wolf population has grown and wolf-livestock conflicts have continued, opinions of wolves have become increasingly polarized (Houston et al. 2010, USDA APHIS WS et al. 2012). Views of wolves and wolf management range from

strong anti-predator and anti-government sentiments to a great fondness for wolves and a strong desire to protect the species at all costs (Mech 1995, USDA APHIS WS 2012). Frequent litigation by pro-wolf groups against wildlife management agencies further intensifies the dramatic polarization of these opinions (Treves et al. 2006, Treves and Bruskotter 2011). In several cases, litigation has resulted in re-establishment of federal protections for wolves, yielding formal and inflexible rules that challenge the adaptive management strategies that are critical for managing human-wildlife conflicts. (Treves et al. 2006). For example, state wolf management activities such as hunting and trapping are suspended when wolves are re-listed (USFWS 2014). Because hunting and trapping can reinforce wolves' fear of humans and improve effectiveness of non-lethal management strategies (Conover 2001), both ecological and social implications result from re-establishment of federal protections for wolves.

Hunting and trapping also create opportunities for the public to actively participate in management of this controversial species, though these opportunities are lost when federal protections are re-established. Because hunting and trapping are tools that can build tolerance for wildlife and wildlife damage (Conover 2001), loss of these management options may impact human tolerance for wolves, further polarizing public opinions. While rural residents may experience an increased sense of control over wolf related risks when wolves are delisted (Houston et al. 2010), these individuals instead experience a sense of powerlessness when opportunities for participation in management are removed, further fueling social conflict (Heberlein and Ericsson 2008). Thus, the dynamic status of wolves and wolf management affects public attitudes that can impact wolf conservation (Messmer et al. 2001, Bruskotter 2013).

In managing wolf-livestock interactions, both the biological and the socio-political setting surrounding conflicts influence effective management (Treves and Karnath 2003, Treves et al. 2006). Understanding public attitudes toward wolves and developing human tolerance for these carnivores remains vital to wolf conservation (Houston et al. 2010, Treves and Karnath 2003). Because negative public attitudes can impede carnivore recovery and conservation, successful conservation relies on socio-political tolerance. Consequently, wildlife managers must assess public approval for management options through public outreach and collaboration with social scientists. (Treves et al. 2006). Ultimately, attitudes of the relevant public should play a key role in making appropriate management decisions. By identifying relevant public attitudes toward wolves and factors influencing those perspectives, wildlife managers may adapt management policies and strategies to appease the public and affected rural residents to optimally manage wolves (Messmer et al. 2001, Bruskotter 2013). Because the general public prefers use of non-lethal alternatives over lethal options to manage wildlife conflicts, further research on new non-lethal tools will be valuable.

Range Rider Programs: A Non-lethal Tool for Mitigating Wolf-Livestock Conflicts

Range Rider Programs (RRPs) are being implemented in the western North America as a proactive non-lethal tool to reduce wolf-livestock encounter rates by increasing herd supervision on large western landscapes (S. Wilson personal commun. 2012). Range riders provide a human presence among livestock and function to deter wolves from frequenting livestock grazing areas (Bangs et al. 2006). Other benefits commonly attributed to RRP include: 1) increasing knowledge of livestock herd health and behavior, 2) increasing knowledge of wolf locations and activity patterns, 3)

identifying carcasses for investigation or removal, and 4) identifying additional concerns in grazing areas that lead to increased herd vulnerability.

Historically, herd supervision was used as a strategy to increase livestock productivity and reduce vulnerability to predators (Bollig et al. 2013, LaRocque 2014). While RRP in the western U.S. are incorporating this ancient animal husbandry technique to mitigate wolf-livestock conflicts, the programs are new and lack evaluation. Little is known about the application, benefits, and challenges of this non-lethal strategy, so a first step to increase our knowledge of RRP is examination of participant perceptions of the program.

In a study evaluating the perceived effectiveness of Livestock Guard Dogs in Namibia, Marker et al. (2005) described how rancher perceptions were often just as important as any objective calculations of efficacy. Elmore et al. (2007) echoed this sentiment in their investigation of perceptions of wildlife damage by Utah prairie dogs. This study concluded that whether wildlife damage was perceived or real was inconsequential: the concerns of local stakeholders must be addressed, even if those concerns were perceived conflicts. Furthermore, Conover (1994) suggested perceptions of wildlife damage influence how the agricultural community will respond to environmental issues. Therefore, while a rigorous scientific evaluation of RRP effectiveness is also greatly needed, a qualitative examination of RRP coordinator and participant perceptions may provide vital information regarding variation in the context in which current and past RRP were implemented, as well as perceptions of program outcomes.

Qualitative research methods can illuminate variation in RRP procedures and outcomes through sharing participant's experiences (Patton 2001). A qualitative

methodology can also generate a rich description and theoretical explanation for perceptions of RRP through a valid interpretation of participant responses (Corbin and Strauss 2008). Thus, the goal of this study was to provide insight into RRP that may enable program coordinators to learn from the collective experience of other programs, incorporate this information into program design, and enhance current range rider efforts, as well as guide development of future programs. Finally, the results of this study may facilitate development of experimental research to evaluate the impacts of range riders on wolf-livestock interactions.

METHODS

Study Area and Sampling Frame

A list of known RRP in the western United States was developed through communications with a key informant (Singleton and Straits 2010). In this case, the key informant was a RRP coordinator from the longest running program in Montana. The initial RRP list included efforts in Idaho, Montana, Oregon, and Washington. However, because the range rider efforts in Idaho are limited to monitoring domestic sheep (*Ovis aries*), while the Montana, Oregon, and Washington range riders monitor domestic cattle, Idaho was not included in this study. This decision was made because the RRP the focus on cattle may better reflect the landscape scales inhabited by wolves. This is an important consideration in evaluating the success of community-based conservation programs (Berkes 2004). Additionally, the sheep RRP have historically incorporated herders as a human presence because of historic coyote (*C. latrans*) depredations (Shivik 2004).

At the time my study was initiated, I identified 13 RRPs in the NRM for possible inclusion. This initial list included 9, 1, and 4 programs in Montana, Oregon, and Washington respectively. I included all of these programs in my study. However, as the study progressed, 4 new programs emerged and were subsequently added to the study. These programs were identified at the 4R: Rancher Range Rider Rendezvous that took place in Washington in November, 2014. Thus, I studied 10 from Montana, which exhibited larger wolf populations (i.e., more packs), the longest running programs, and a greatest number of RRPs. Five programs were selected from Washington and two programs were selected from Oregon. These RRP areas exhibited smaller wolf populations and few RRP efforts. Thus, the range of cattle RRPs selected to complete this typology reflected the best contemporary knowledge regarding the operational NRM RRP environments.

It is important to note each of the Washington RRP efforts was funded and coordinated by the same 2 groups (an NGO and the state agency), though all efforts were geographically distinct. Similarly, 2 efforts in Montana were sponsored by the same NGO, but were geographically distinct. Additionally, the coordination duties and leadership changed for 1 RRP in Oregon halfway through the study period, changing the program focus and creating 2 unique RRPs and two separate “efforts.” Thus, the 5 efforts in Washington, the 2 efforts in Montana, and the 2 efforts in Oregon were described as individual programs.

Participant Interviews

Individual RRPs were compared using information collected through interviews with program coordinators (i.e., key informants from all partnering agencies), ranchers involved with the programs, and range riders. Non-random snowball sampling,

beginning with known RRP coordinators, was used to select participants to be included in this study. This sampling method was warranted because the primary objective was to develop an understanding of breadth and depth of current (and historic) NRM RRP efforts (Singleton and Straits 2010). This method was also appropriate because the number of identified RRPs in the western US is small (< 20). Therefore, all identifiable and cooperative participants warranted inclusion in the study (Singleton and Straits 2010).

All recommended participants were contacted for interviews. For the few larger range rider programs (>20 rancher participants), interviews were conducted until interview data reached a point of saturation. In social research, saturation is a concept developed in the framework of grounded theory, and describes the point at which no new information can be obtained from further data collection (Glaser and Strauss 1967). Accordingly, when RRP participant interview responses became repetitive, interviewing for that individual program was terminated. While the combination of snowball sampling and sampling to a point of saturation could produce a bias where individuals recommend other like-minded individuals for additional sampling, the programs with >20 ranchers sampled the key individuals most involved with the RRP. Ultimately, the producers most affected by wolf activity and with the most range rider activity were interviewed, providing insight from those closest to the program. All survey instruments (Appendix) were pretested to address areas of concern prior to implementation in the field. The survey instruments used were reviewed and approved for use by the Utah State University IRB process (IRB Protocol #5491).

RRP Coordinator Interviews

Key personnel from agencies partnering in each RRP effort (n = 20) were interviewed January 2014 – April 2014 using a semi-structured phone interview to identify program duration, design, and perceptions of efficacy and rancher satisfaction. The interviews identified: the time span of the program, if the program has ended - what are the reasons, how information is communicated in the program, how many range riders are employed, rider duties, time periods that riders actively monitor cattle, area that riders monitor, what type of transportation each rider uses (i.e., horse [*Equus caballus*], four-wheeler, dirt-bike, truck), information regarding risk reduction actions, and levels of wolf activity. Interviews also identified any other non-lethal tools that were used in addition to the RRP (e.g., carcass removal programs, fladry) and trends in livestock losses prior to RRP implementation and during the course of the program. Finally, perceptions of the program's strengths, weakness, successes, and areas for improvement were collected to further describe each program.

Rancher Interviews

Through interviews with RRP coordinators, ranchers utilizing the programs were identified and contacted by RRP personnel to determine interest in participation and to initiate interview scheduling. Participant interviews (n = 25) were conducted October 2014-January 2015 using a semi-structured face-to-face interview protocol and were used to identify rancher perceptions of RRP. Ranchers were asked a suite of questions to: identify perceptions of program effectiveness in mitigating wolf-livestock conflicts, identify program benefits and challenges, identify if participation in RRP affected their opinion of wolves on the landscape, and determine if they feel the RRP is the best use of

allocated resources to reduce wolf-livestock conflict. The ranchers were also asked a series of questions to allow the RRP criteria most related to satisfaction to emerge.

To further insight into rancher perceptions of the varying RRP efforts, rancher interviews also questioned respondents regarding history and description of their ranching operation. Ranchers were further questioned about any additional concerns they had and perceptions of wolf presence. Because interviews were semi-structured, unidentified parameters were emergent. Thus, the structure of the interviews was flexible to accommodate these new findings.

Range Rider Interviews

Range riders employed by each program were also identified in RRP coordinator interviews, and contacted for participation in this study to gain an “on-the-ground” perspective. Range rider interviews (n = 6) were conducted October 2014 – January 2015 using a subset of questions from the coordinator interview guide. These interviews collected information on rider background, rider duties and activities, levels of wolf activity, communications, perceived impacts, and areas for program improvement.

RRP Coordinators, Ranchers, and Range Riders: Groups Not Mutually Exclusive

It is important to note that interview respondents in each group (i.e., coordinator, rancher, range rider) do not strictly fit in a single category: groups are not mutually exclusive. A coordinator for one program may also be a producer, a producer may be the range rider, or the coordinator may be the range rider. Or they may all be one in the same. Thus, more individuals in each group were contacted than the sample size suggests. For example, though 6 interviews were conducted with range riders, 3 additional range riders were previously interviewed as coordinators. Therefore, the

overlapping roles of participants observed in several RRP's influenced the sample size by reducing the number of interviews conducted.

Data Analysis

Interviews were transcribed, printed, and initially read to increase familiarity with interview responses. A second reading of transcripts enabled development of an outline of key points for each interview. Using these outlines, and third review of the interviews, transcripts were hand coded to identify common themes identified for each group (i.e., coordinators, ranchers, and range riders). These themes were used to illustrate similarities and differences for the programs, as well as identify participant perceived benefits and challenges.

RESULTS

Interview Themes: Coordinators, Ranchers, and Range Riders

Interview responses from coordinators, ranchers, and range riders revealed a diverse collection of emergent themes that influenced the overall perceptions of RRP's and their perceived effectiveness. Although RRP's may have differed in longevity and operations, four common themes emerged in coordinator interviews. These themes were mirrored in rancher and range rider interviews, and discussion within groups and among groups illustrated a diverse collection of perceptions. The 4 themes included: 1) sustaining a human presence as a depredation deterrent, 2) the use of radio-collars to monitor wolf packs, 3) trust, relationships, and politics, and 4) funding to ensure program continuity. In addition to these themes, participant responses facilitated identification of a suite of benefits and challenges central to these programs.

Human Presence

In RRPs, human presence was generally defined as routine human activity on the landscape around livestock that wolves would detect and avoid. Interview responses suggested there was a wide range of perceptions regarding varying levels of human presence and effectiveness of this component of RRPs.

Coordinator Perceptions

Human presence was established to varying degrees in each RRP, and ranged from targeted and active presence to dispersed presence. One coordinator described active presence as “just being there. Wolves typically don’t like being around people, and they’re not going to be hunting livestock when there’s people to chase them around and follow them around and being in that area” (Brad), while another felt “it’s hard for one rider to really have a presence out there when they’re covering so much ground” (Rose). The amount of effort a rider could put into one area was dependent on the size of the RRP area that needed monitoring, along with a variety of other factors (e.g. topography, number of ranches to monitor, number of livestock). Nevertheless, many respondents felt human presence was responsible for reducing conflicts. A coordinator highlighted one example:

“(The rancher) turned out cows onto a pasture 7 miles away from where known wolf locations were for that evening. Those wolves were there before morning checking out that activity. (The rancher) was still there, not the rider but a human, and nothing happened. We know that from the telemetry data. Even without telemetry data that probably happens all the time. It disrupts that depredation activity” (Josh).

However, concerns regarding effectiveness also arose in interviews. If a range rider was monitoring cattle that were widely dispersed over a large landscape, human

presence was also widely dispersed. Targeted presence in response to wolf monitoring was also presented as a challenge because:

“the amount of area and extent to which the wolves moved – one person could just not be in the presence of those wolves around livestock all of the time. You just can’t keep up with them. And a lot of that is because of topography. If a range rider has the wolf located in an area, a couple hours later the wolves could be in an area that might take a half a day or more to get to. So keeping up with wolves is very, very difficult, even with the collars” (Alfred).

Thus, effects on deterring wolves were questioned.

Another coordinator noted that riders primarily rode during the day, but wolves were active at night, suggesting riders were unlikely to have a direct effect in deterring wolves.

“I think that it’s really hard to measure the human presence part of this – having someone out there more around the cattle – to keep wolves out of there, because guess what, the wolves are out there at night- that’s when they will go in the cattle and we usually don’t have range riders out there at night – again you’re stuck going out in the day and see what happened last night, right?” (Mary).

Furthermore, a rider could ride at night, but may have difficulty determining where to target efforts on a large landscape where cattle were dispersed. Coordinators discussed how wolves can travel large distances quickly, and targeting a specific area at night was ineffective. Even with radio-collars, wolves from a pack were not always together, increasing difficulty of night monitoring. Coordinators noted that riders out at night were limited in the dark, even if they were in the right place at the right time to hear a problem.

Additional concerns were voiced by coordinators regarding the effectiveness of human presence in deterring wolves. Wolves were described as intelligent animals that habituate to humans when no negative consequence is associated with the interaction. One coordinator proposed the question “does human presence deter? No. We’ve had sheep attacks out here, the guys was firing a weapon in the air, and the wolves were

eating sheep right around the wagon. So no, human presence doesn't deter it, but I guess we might try to pretend it might" (Lucy). Coordinators also described how hazing efforts temporarily moved wolves, but the effect was rarely permanent.

"The real examples we could see would be ... where we actively and forcefully hazed wolves with gunshots, went to where we knew they were, located them by radio, moved in on them, and actively hazed them, and then data from GPS collars could show us how they moved after that and left the area, even if it was temporary. We never saw permanent effect, it was always temporary. We never changed really, how they utilized the land. But we saw examples to where that clearly was the one bright spot in a whole range rider equation" (Alfred).

Several coordinators even gave examples of hazing wolves out of one area with livestock, then learning the wolves moved to another livestock grazing area nearby and began causing problems there.

"The last couple years, when we were able to make contact with those wolves, we moved them from the area where we had our cattle just to another area. We didn't know we did that, but it just makes sense if you are moving them from one area they are going to go someplace else. And they moved into the West-fork area which is the drainage just to the north of where we were, and then they started having a lot of wolf problems" (Harry).

Thus, the philosophical debate of moving the wolf "problem" to neighbors was presented.

Another aspect of human presence that was identified in interviews was the potential "territorial effect" humans could have around cattle. Some riders attempted to "make a human presence where –in and around –the way I look at it is to make a territorial effect to say hey we're here, these are our cattle. Just connect that human presence." (Rick)

The facet of human presence coordinators agreed upon most was use of active herd supervision as a tool to provide information through trusted reports and observations. One coordinator felt

"it gave people an idea of what was really happening out there- so they (riders) had more information for the landowner and producer. So it's hard for one rider

to really have a presence out there when they're covering so much ground, so I think we saw- it was getting more information out there to the landowners and producers" (Rose).

While human presence received mixed reviews regarding actual effectiveness in deterring wolves and reducing losses, most coordinators felt some human presence still provided benefits and was the best non-lethal option for a large landscape. "People don't understand that we're grazing 60,000 acres – you can't fence that! It just doesn't work" (Josh).

Rancher Perceptions

Similar to coordinator responses, rancher views of human presence were also diverse. The concept of human presence in RRP received frequent attention in rancher interviews, where participants provided a wide variety of perceptions regarding the effectiveness. On one end of the spectrum, ranchers described how human presence helped deter wolves and reduce depredations. One rancher described an event where his rider was

"right in the middle of them when wolves were trying to kill something. He called me up one time about 6:30 in the morning and it was just getting light and all foggy out, and he was right in the middle of my cows, and the wolves shoved them through a fence and over a cattle guard, and he said he 'you better get up here and help me out.' He was shooting off his shotgun and stuff. And by the time I got up there the wolves had taken off. But he saved some cattle that morning" (Gabe).

Ranchers further provided examples where their rider was interacting with and hazing wolves throughout the season, and though the wolves never left, they did not attack livestock. One rancher noted "the last 3 years that we've used her, we have not lost one animal to wolves. We can almost say that for certain, we've lost to logging trucks hitting them or for other natural reasons, but not to wolves" (Adam). Another rancher believed that though they had some depredations while using a range rider, they

would have had more if it weren't for his constant human presence, explaining "it helped reduce depredations. It didn't permanently get rid of the wolves by any stretch. But I think while he was out there it prevented kills" (Lynn).

In contrast, other ranchers felt that human presence did not deter wolves, and was unlikely to reduce depredations. One rancher suggested that wolves know when humans are present, and simply come when the humans have left, describing how "it didn't seem to bother the wolves if we were there. They'd still come in – and bears. When you leave, they know you left. They're not dumb" (Bud). Another felt that wolves have adapted to humans, noting there is consistent human activity on the landscape aside from range riders (recreation, logging, etc.) that does not stop wolves from hunting in an area. Many also concurred that riders are so widely dispersed, the limited presence in any one area is not enough to affect wolf utilization of an area as one rancher voice his perception of human presence:

"I can't imagine other than an occasional serendipity, I can't imagine it actually say it (human presence) keeps a calf from being killed, other than occasionally you might bump something. But because of the time when they hunt, and they're solo animals and cattle and wolves are so wide spread, I can't imagine. I'd be surprised if presence, twice or 3 times a week, deters them from hunting in that area. There are enough people around in the woods and around and about that that's not going to move them out of the area" (Mike).

Several ranchers expressed their skepticism of human presence on mitigating depredation due to personal experience. "Two years ago we had a cow killed, and we sat on the carcass all night long with the truck running and lights on, and the wolves came through and killed an elk calf less than a half a mile from us. So I don't think human presence really does anything" (Walter). A similar sentiment was echoed by rancher from another program.

"I don't think the presence of a range rider out there makes a lot of difference. They tend to just do a lot of their traveling, tend to feed at night, so I know a year

ago he was out in the night listening to them howl, listening to the cattle bawling and running and going through fences, and the next day there were a couple calves with fence posts sticking through them, and he was right there. So I don't think his presence there makes a lot of difference" (Jack).

While the participant responses were divided regarding effectiveness, most agreed human presence was beneficial. Ranchers described this function of a range rider as helpful in providing extra herd supervision, helping identify concerns, and detecting a potential problem with wolves before it escalates.

Rider Perceptions

Despite the mixed opinions of coordinators and ranchers regarding RRP ability to reduce livestock losses, most riders felt their human presence was effective in reducing livestock losses. One rider felt

"it's not just a matter of human presence, it's a matter of knowledgeable human presence...knowing cattle, and knowing wildlife, and being able to pinpoint problem areas... I think the human presence relaxes cattle, and sit back and watch and see if something continues to happen then you can either move the cattle or whatever" (Zach).

Several riders suggested that even though wolves were routinely in the area, few or no depredations occurred. One rider stated "the wolves that I've found around domestic cattle - it seems to have affected their behavior for sure. Just having the presence – the human presence" (Max). Another believed they had communicated to the wolves that the cattle were associated with humans, noting "I think the pack is small enough to where just the human interface, interaction, I think might keep them on their toes a little bit. I don't know that. But they see me all the time and they associate me with the cows" (Chris).

A few riders were skeptical, however, and questioned whether their presence was likely to stop wolves from attacking cattle. One rider described how the wolves were not

deterred by him, explaining one hazing attempt: “I tried using my air horn, and they howled back at me” (Taylor). Another rider posed the question “if I am going through the cattle and there’s a wolf in the trees thinking about killing a cow, is me riding through there prevent that wolf from killing that cow? I can’t say. There’s just so much that happens out there that I don’t know” (Sean).

Range Rider Tools

Use of radio-collars on wolves was another common theme identified in coordinator, rancher, and rider interviews. The discussions regarding radio-collars, either VHF or GPS, highlighted the multi-faceted and complex nature of this tool. Benefits and challenges associated with wolf radio-collars were described as having both technical and social components, and further illustrated the diverse methods used for range riding in the west.

Coordinator Perceptions

Program coordinators illustrated a diverse collection of opinions regarding radio-collars. These views ranged from beliefs that the collars are highly beneficial and necessary for a successful RRP to opinions that collars should not be used by riders at all. For proponents of radio-collars, the most common response was that collars can help range riders target their efforts on a large landscape. “Some of the areas, especially on the FS permits, are extremely rough terrain. It’s extremely forested and rocky and cliffy, and really, really steep country with lots of forest and that’s a really hard area to work in” (Ruth). Therefore, many coordinators felt radio-collars could help riders determine areas of highest wolf activity and highest risk to cattle to focus their efforts and increase efficiency. One coordinator discussed the use of GPS collars, explaining “if we had

access or knowledge of wolf locations or a problem, we would literally send them (the rider) somewhere. ‘We would like you to go to that property and get those wolves out of there’ and they would do that” (Alfred).

Coordinators also noted the collars could be useful in determining a potential wolf kill, based on repeated wolf presence at a specific location.

“The telemetry data gives cluster data so if you see they have been in one place for 3-4 locations, they have been around 2 days at a spot or coming back to a spot, typically they have killed something, so a range rider can go to investigate that - give it some time after they move off to go see what it was. If it was a deer or elk great, make a note” (Josh).

Coordinators also suggested GPS collars could help investigate the effects of wolf-range rider interactions.

Aside from using collars to increase range rider efficiency, coordinators described how ranchers appreciate information on wolf locations. But several challenges complicated the use of this tool, including limited collaring opportunities and questions of sustainability for future collaring efforts. One coordinator explained “as a region we aren’t allowed to trap there for wolves, because of grizzly bear density. So my hands are tied in that way and we don’t have a contract to put out collars with helicopter” (Sarah) while another coordinator noted: “I have fought really hard to fight the “collar and faller” approach because I think it’s a losing battle, I don’t think it’s the long term of wolf management” (Joe).

When wolf radio-collars were available and utilized by range riders, additional challenges were identified. One concern from coordinators was that radio-collars could be misleading. They explained that wolf packs were not as cohesive in the summer as they are in winter. Therefore, a signal from a collar only told the rider if one wolf is present or absent. Concern was also raised over the false sense of security a collar could

give riders or ranchers because they knew where the collar was located. “Having one collar up there can be misleading, especially in summer when wolves are not as grouped up, and people can have false assumptions and security knowing where that one collared wolf is” (Sarah). This sentiment was echoed by another program, explaining “I have seen telemetry really mislead people... you get too reliant on telemetry, and you miss a signal and think everything’s ok and you have nothing to worry about, and then it turns out you’re pushing cattle in right on top of wolves” (Jim).

Not only were collars limited by the fact they may only represent one individual, but technical issues also limited collar utility. Both GPS and VHF collars were reported to have technical limitations that included inconsistent downloads from GPS collars and difficulties associated with rider access to GPS locations. One coordinator explained “we may go 4 days in a row with no satellite download” (Mark).

As for VHF collars, coordinators explained how a rider’s telemetry skills could also limit use this tool because the terrain and topography influence the radio signal. “In retrospect I realize I needed to spend more time on the wolf end of things and training them (riders) up on how to use the telemetry. It was hard. They didn’t pick that up right away – being able to monitor collars” (Mary).

Social aspects of radio-collar utilization were also identified in coordinator interviews. In several programs, the use of collars and subsequent sharing of location data (or lack of sharing) generated trust issues among state agencies, conservation groups and ranchers. While many RRP’s partnered with the state agency, and wolf location information was shared with the range rider, location data was sensitive. One coordinator pointed out “a range rider requires a radio receiver and access to those radio frequencies for those collars, and we don’t just give that to anybody” (Alfred). Thus, conflict arose in

several programs due to distrust between a state agency and ranchers. One program “had telemetry because there were collars on some of the wolves, but it didn’t work very well because they wouldn’t give us the frequencies because they were afraid we were going to kill them” (Harry). Another coordinator explained:

“one of the things we’ve been requesting lately, and I asked that of the commission at 2 different meetings now, is for exact GPS points. And I know in (another state), they’re giving that data out. The argument is that if they give those out, that gives us direct location where they’re at and then we go in there and poach them” (Mark).

This distrust and frustration was primarily illustrated in programs where wolves were federally endangered, and sharing wolf locations and radio-collar frequencies was controversial.

In contrast, RRPs that maintained open communication of wolf information generated positive social impacts.

“The rider worked with WS on one capture last year where they put a collar on, so I think it really helped work the most- it helped the producers be more connected to the issues. Give them information and to be an active player. And so it had a bit of an indirect rather than direct result. I don’t necessarily think that it helped reduced the conflict on the ground, but it gave them more control over the situation” (Rose).

Due to the variety of benefits and challenges associated with radio-collars, a broad spectrum of opinions were identified regarding their use and effectiveness in RRPs. Coordinators of RRPs that began their efforts using GPS collars felt collars were “paramount to success” (Mark). In contrast, several other RRPs explained they did not feel collars were necessary, as one coordinator stated:

“I’ll be totally honest, I don’t think that the collars have helped that much. I don’t think it’s that big of a deal to be in a certain area. I think helps to know where to focus efforts, but we really haven’t had - we’ve had very few interactions - like with livestock where you’re scaring them off. It just hasn’t really happened that much” (Mary).

More prominently, these coordinators voiced their opinion that a RRP should “focus on the haystack, not the needle” (Jim) and “to focus on livestock husbandry rather than chasing wolves, which I think is a really good direction for a range rider project” (Sarah).

Rancher Perceptions

Radio-collars were another frequent topic in rancher interviews. Ranchers agreed that use of collars by riders could increase RRP efficiency, particularly in programs where riders were faced with finding dispersed cattle on a large landscape. One rancher explained:

“What has helped us is one of the wolves in the pack, one or two have been collared, so we know where they’re at... We don’t have to try and monitor them on 20,000 acres. We know where they’re at from the signal the collar sends off and that makes it a heck of a lot easier” (Ryan).

Another rancher described how wolves move quickly over large distances, so “if you think of that and of the area a range rider has to cover on a permit - I mean, how in the world are they going know where to even go?” (Lynn). One rancher further explained that when he began using the RRP, his rider benefited from a collar that helped target efforts, but once the wolf was killed by a cougar, subsequent monitoring became increasingly challenging, stating “it was easier when the GPS collar was in. Now it’s harder to know where to go. Once cattle are dispersed, it’s hard to monitor” (Adam).

Several ranchers also thought wolf locations from collars could be valuable in providing information for investigation if a livestock carcass was discovered. One rancher explained:

“if I did lose an animal out there... and a wolf collar was also in the same area for several days or a few days, that would kind of indicate to the state that a wolf probably ate that animal, and that there’s confirmation. Then there’s a wolf fund that the state legislature has that would pay me for that animal” (Tom).

Finally, the rancher discussion on collars echoed that of the program coordinators in regards to trust. Ranchers identified collars as a source of conflict and distrust between government agencies and the ranching community, though ranchers felt these situations often improved as time went on and trust was developed.

Range Rider Perceptions

Range riders also addressed the use of radio-collars when discussing the size of their monitoring area. Riders (that monitored livestock or tracked wolves) agreed the large areas their cattle grazed, combined with rugged terrain made them feel spread thin. One rider explained “the allotments were like 35,000 acres ...It was incredibly hard to track down cows, especially the FS cows” (Jacob) while another noted “I could use more help, but at least I’m making my rounds. Just not as intensive and long as I would like to” (Sean). Because riders had thousands of acres to cover, they also noted how it was impossible to account for all cattle in a day.

For riders tracking wolves, they also described how quickly and how far wolves could travel, explaining the challenges of knowing where to focus efforts. One rider stated “I don’t think there’s an efficient way of monitoring wolves, even if you had 10 people, because they move so fast and so far so quickly” (Chris). Radio collars, either GPS or VHF, were believed to be a helpful tool to mitigate some of these challenges, offering some guidance for where to begin the day. GPS collars were believe to be most helpful, provided locations were consistently downloaded and easy to access, though one rider noted:

“I do feel a little bit stretched, now that we’re dealing with this crappy software...It’s scrambled, it’s disorganized, it’s very hard to read, they don’t have good maps...So now I can’t go on and find exactly where they are or where they were an hour ago, so it’s difficult for me to say, oh here they are and so I’ll move cows up here” (Chris).

VHF collars were also thought to be somewhat helpful to riders, though their use was limited, as one rider pointed out “the receiver only gave me a general notion... it was more just general area and never lead to much focused hazing” (Jacob).

Importance of Trust and Relationships

Another topic that coordinators, ranchers, and riders discussed frequently was the large role relationships play in RRP. Interview responses emphasized the social aspect of this non-lethal tool. One coordinator explained that “politics between the agencies can play into how these things are going to work or not” (Mary).

Coordinator Perceptions

Coordinators believed relationships between any combination of partnering agencies and organizations, ranchers, and range riders could influence the outcome of a program, suggesting there was more to RRP effectiveness than simply reducing depredations. One coordinator presented her perception of the role relationships play in RRP, suggesting the challenge to be

“the human dynamics. Number one between ranchers, and number two between the ranching community and the NGOs. So just trying within the ranching community itself, as well as within the bigger community of wildlife people and ranchers – finding the middle ground and finding something that inspires each different group to want to be a part of it” (Ruth).

Positive relationships among coordinating groups, ranchers, and riders were believed to build trust and increase collaboration, resulting in beneficial social impacts.

“The deeper level of success is how the ranchers feel, and the way ...it was such a good collaborative type project, where the ranchers are often saying ‘you stuffed wolves down our throats, now we have to live with them and no one is helping us.’ And this was a way that said well here we are, we’re here to help. Our riders are here to help around the ranch, they can watch your livestock for you, and you don’t have to pay them anything. I think that is a social perspective that it’s a huge success” (Brad).

Another coordinator explained how collaboration improved trust over time, noting “we gained some trust from the people working with the wolves over time. They trusted us a little more that we weren’t going out to kill wolves just to be killing wolves” (Harry). However, coordinators also felt if relationships were strained or challenging, they could complicate or even end a RRP.

The relationship between ranchers and range riders was one example that was frequently discussed. Coordinators explained that ranchers must trust their rider for the program to work, and noted the importance of ranchers choosing their own rider instead of the coordinators selecting an outside individual, as one coordinator explained:

“A big part of working in (our area), particularly (here) with these historic ranching families, is getting someone they will let on their place and that they trust and feel comfortable with. That’s the key. If we don’t have that - for any of our programs, not just RRP but any of our programs - we are dead in the water” (Bev).

Despite the common goals for a RRP that defined the effort, coordinating agencies and organizations still had their own individual goals, which affected relations with other groups, and in turn, levels of trust for their partners. When state agencies partnered with conservation groups on RRPs, relationships could become challenging when discussing lethal removal of wolves in response to livestock conflicts.

“Despite use of proactive, non-lethal tools, depredations can still occur and the state must still address these conflicts. We treat everybody the same as managers, so we’re gonna offer the same level of help, depending on what happens, that we would somewhere else. But (the conservation group) had different expectations of that lethal part of that. What we could do there. I think the sense there was they are putting their money into it, that we shouldn’t have to kill any wolves out there. And nobody wants to see that happen – to get to that point. But there was pretty low acceptance of that part of the picture” (Mary).

Ranchers’ goals were described as wanting a solution to living with wolves without losing livestock or money. Though ranchers were often open to trying non-lethal

tools, several coordinators believed ranchers still wanted lethal wolf control to be an option if wolves began attacking livestock.

“the reality is, these ranchers wouldn’t be as likely to try this stuff and do it if they didn’t know—when and if wolves start killing their livestock—that we didn’t have an effective program in place to make that killing stop. We have to prove to them we don’t tolerate wolves killing livestock, and especially given their investment in working with us on these programs, I think it makes it even more important that we follow up when the time comes, and we’re pretty aggressive on wolves that kill livestock” (Mary).

Conservation group coordinators often aimed to improve coexistence with large carnivores and reduce the number of wolves killed. This goal was not always shared by ranchers, but coordinators explained that a trusted representative could facilitate hard discussions with ranchers and gain cooperation. While some programs were successful in building cooperative relationships, others struggled to find adequate compromise. One coordinator explained:

“We felt like there had to be some tolerance – a loss or 2... but if you’re killing wolves every time you have a single conflict, it destabilizes the pack...so keeping a pack stable, even though there might be a few losses- as long as that pack doesn’t become habituated to killing livestock and that’s what they’re living off of, is part of the compromise that needs to be made to make these programs more effective” (Jane).

Ultimately, disagreement between ranchers, conservation groups, and state agencies resulted in loss of funding for two programs, as one coordinator indicated:

“We had to end the (specific) project before we wanted to, which was too bad. But the state- there was one calf killed by the pack that was up there, and I think there was one depredation. And the state went in and lethally removed -killed the alpha female I think and the pack broke up. And we decided at that point to end that project, because the landowner allowed them to come in and do that...” (Jane).

On the other end of the spectrum, coordinators from several programs described how their program had developed a level of trust with partners and participants through the practical approach of “we’ll still probably have losses, but we need to see what we

can do to reduce some of them” (Ruth) and “we’re going to do everything we can to prevent lethal control, but at if at a point the agency thinks it needs to take place, then (we aren’t) going to put any restrictions on that” (Brad). In contrast, others suggested that regardless of the intent of the RRP, distrust was prevalent and the involvement of a conservation group or state agency was enough to limit rancher participation. Coordinators stated “there were a few people that didn’t want to be involved because there are NGOs involved” (Sarah) and “(ranchers) didn’t want anything to do with wolf management or anything. It was trust as part of it – trust in the state agency, they believe it was some sort of government terrorism and so they didn’t want any participation with management” (Alfred).

One additional finding to emerge from coordinator interviews was that rancher participation in RRP’s could be also be influenced by social factors at work in the ranching community. One coordinator highlighted the importance of needing “that strong local rancher voice that can speak well to the community- get people behind it – that is really key” (Rose). This sentiment was echoed by another coordinator:

“So in the case of (one rancher), he is one of the major ranchers in the state, and he has more cattle than any of them, and he is doing the right thing, and he will come out and say it ‘I don’t like wolves and I wish they weren’t here’ but if they are, I’m gonna do what I can do. I’m a businessman... And I guess the more that that goes on, and he’s a respected cattle rancher, I think the more people will turn and take advantage of what they can do” (Josh).

However, rifts in the community could also limit rancher participation.

“It’s such a small community. They’re so tight knit... If somebody said no it’s probably one of two or three things. 1: they just don’t want to be involved with anything to do with getting along with wolves. 2: they don’t like (the rider)... and 3: ...they don’t like (a rancher). There’s just these little rifts in the community” (Jim).

Another coordinator further explained the effect of rancher relations noting: “there has been a history of challenging relationships between neighbors up there for all sorts of reasons, mostly due to a clash of values” (Hillary).

Rancher Perceptions

Throughout the rancher interview process, a similar theme was prevalent: trust between ranchers, government agencies (state or federal), and conservation groups. Ranchers described the need for current wolf information, and expressed that communication should be open, transparent, and frequent.

“Being secretive about “I’m not going to tell you where the den is, how many are in the pack, how many young they have, their patterns” - that kind of secrecy stuff does no good – being real transparent, real candid – you’re going to have to trust the ranchers sometimes and sometimes they’re probably going to stab you in the back, but in the long run, the whole thing, the whole program, the whole ability to learn to coexist will be better be with maximum transparency in my opinion” (Mike).

The federal status of wolves appeared to be associated with the level of trust and collaboration between ranchers, government agencies, and conservation groups (Table 3-1). Ranchers involved with RRP in times or places where wolves were federally endangered shared a common skepticism and distrust for government agencies. One rancher explained “we had some issues with the wolf management people. We didn’t feel that they were giving us the information that they set out to... So there was a little distrust in some of them” (Ralph). Even after delisting wolves, some ranchers felt some level of distrust for agencies, as one rancher mentioned:

“I sometimes wonder if we’re getting the information we need from (the state agency). And that’s critical if you’re going to have a RRP through a private organization like (ours) - that there is a good line of communication between them and the agencies. And I’ll be straight up honest, I think we’ve struggled with that – with getting good information from (the state agency) at times” (Jerry).

Table 3-1. Maturity of RRP (years) by state and associated federal wolf status in Montana, Oregon, and Washington.

<u>State</u>	<u>RRP</u>	<u>Years Run</u>	<u>Years</u>	<u>Federal Wolf Status</u>	<u>RRP Status</u>	<u>Wolf Packs</u>	<u>Coordinating Groups</u>
MT	B	7	2008-present	listed-delisted	Running	13	NGO, State, CBO
MT	E	5	2004-2008	listed	Ended	2	2-3 NGO, State, CBO
MT	F	5	2003-2007	listed	Ended	1	NGO, State, CBO
MT	A	4	2011-present	delisted	Running	1-2	2 NGO, State, CBO
MT	C	3	2005-2007	listed	Ended	2	2 NGO, State, CBO
OR	L	3	2012-present	listed	Running	2	State, CBO
WA	M	3	2012-present	listed	Running	1	NGO, State
MT	G	2	2007-2008	listed	Ended	1	NGO, State
MT	H	2	2013-2014	delisted	Ended	1	NGO
MT	I	2	2012-2013	delisted	Ended	1	NGO, State
MT	J	2	2013-present	delisted	Running	1	3 NGO, State
OR	K	2	2010-2011	listed	Ended	1	NGO, State
WA	N	2	2013-present	listed	Running	1	NGO, State
WA	O	2	2013-present	listed	Running	1	NGO, State
MT	D	1	2014-present	delisted	Running	0-1	NGO, CBO
WA	P	1	2014-present	listed	Running	1	NGO, State
WA	Q	1	2014-present	listed	Running	1	NGO, State

Furthermore, controversy over sharing radio frequencies with riders created conflicts, as one rancher described how:

“the (conservation group) wanted our riders to have the telemetry equipment, where the federal wolf management people did not because they were afraid the riders would go find the wolves and shoot them. Even though our riders weren’t allowed to carry... any lethal means of killing the wolves” (Clancy).

In many cases, ranchers felt that the wolf information that they needed or deserved was withheld, creating frustration and distrust.

Another topic that surfaced in rancher interviews was how the perceived use of funding by conservation groups influenced rancher perception of these groups. Ranchers felt the pro-wolf conservation groups should use their funding to help people on the ground living with wolves. One rancher suggested “if these environmental groups would take their money and use it to work with the people that are affected by the problems created by I guess what they want, rather than taking all that money and just tying stuff up in court cases and litigation, then we could make things better for everybody. They would get more of what they want and we would get more of what we want” (Clancy).

Another rancher echoed this sentiment, noting frustration with:

“the pro-wolf side talking about how many of them there are, and how they are a majority. Then you have a group like Rocky Mountain Elk Foundation who is a fraction of that 8% that raises millions of dollars to enhance hunting privileges and you have this other supposed 92% who are pro-wolf and can’t raise enough money to do anything other than hire a lawyer” (Tim).

Related to trust and relationships, another theme that emerged in rancher interviews from two states was how politics play a role wolf conflicts. Several ranchers described how urban majorities influence wolf policy and affect ranchers. Ranchers felt ranching communities are a minority, and the majority of their state population lives in cities, where environmental groups are also frequently based. They continued to describe

how the urban majorities are pro-wolf and complicate wolf management because they are vocal and politically pressure the state agency. One rancher noted: "...Our fish and wildlife department isn't geared to run the department under scientific protocol, but more of a political agenda of the people in (a large city)" (Tom). Another rancher had similar sentiments about challenges for their program: "Stupid people from urban areas that have no knowledge of cattle or wolves, I shouldn't say wolves – predator behavior and they are the biggest challenge because they have all of the politics or votes" (Ryan).

That rancher later voiced further political concerns:

"(Several) counties of our state are sure having conflict problems. And then politics enters into it, and all the people from the (cities), a large percentage of them feel the wolves are cuddly little lovey animals and that they shouldn't be killed if they kill livestock. They say we'll take the livestock out. They've actually- that's actually been the solution proposed by some of them. And that's bullshit. It's really unfair to those guys, and there's not very many of them, so they don't have a political voice" (Ryan).

Another rancher from a different state highlighted further political concerns, describing a calf depredation that resulted in a kill order being placed on an iconic wolf. An assemblage of environmental groups learned of the event, and filed a lawsuit over killing wolves while they were still endangered in the state. After settlement was reached, ranchers were left with some "horrendous things" (Mark) that increased the difficulty of confirming depredations and removing chronic depredating packs.

Range Rider Perceptions

Playing a role in trust and relationships, range rider responses identified the importance of communication with ranchers and agencies. Wolf activity reports were highly valued by ranchers, so routine reporting of wolf observations or a lack of wolf activity was thought to be a critical role of the riders, as one rider stated: "these guys like to know when there's wolves in the neighborhood and you can tell them every day

there's wolves here and they never get tired of hearing it" (Max). Several riders also felt frequent communication with state agencies was important to maintain communication between ranchers and agencies about wolves, suggesting "range riding works also in terms of the dialogue. I think I was a way in for (the wolf biologist). I think I was a way to facilitate various conversations that wouldn't have been had otherwise" (Jacob). Several riders also voiced the importance of communication to build the trust and working relationships needed to successfully mitigate wolf-livestock conflicts, suggesting a range rider could be "that person that bridges the gap – because so many people don't believe agencies, don't trust the government – that person helps them believe what we're saying and trust that we're just trying to do the right thing" (Sean).

Riders suggested frequent communication not only built trust, but also helped relieve stress for ranchers. As one rider explained "I think that most the rancher satisfaction would have more to do with the communication. The peace of mind of knowing someone's out there kind of looking out for you and giving you updates on what's going on and ready to act in the event that there is a problem" (Ruth).

Riders concurred that the people and politics further exacerbate wolf-livestock conflicts, more so than actual depredation numbers. Another rider further detailed the role of politics in wolf-livestock conflict, describing the influence of:

"city spaces and how they view predator management...they are very uninformed, but they are places that have an idea of what cattle operation is that is very distorted, and they can get really quick about wanting the mountain lion that killed their poodle euthanized immediately, but do not touch that wolf... if you're so ok with killing a top tier predator in your backyard, but you're not ok with managing them thousands of miles away from where you live, it's problematic. And a lot of that money in political agencies comes from us (cities)" (Jacob). In light of these political challenges, several riders felt the RRP's had potential to

impact the social aspects of these conflicts, as well as reduce losses. One rider suggested

the development of a class for range riding to facilitate education and produce positive social impacts. Ultimately, riders felt education and collaboration could improve the world of wolf-livestock conflict.

Funding

A predominant need identified by coordinators and echoed by ranchers and range riders was funding for RRP. Throughout the interview process, funding was primarily described as short-term and difficult to obtain from year to year. Furthermore, questions emerged regarding who should pay for a RRP. Thus, respondents from all three groups highlighted concerns over long-term sustainability for programs.

Coordinator Perceptions

Program coordinators identified the primary sources of funding as NGO funds, grants, and state dollars. A few programs developed a cost-share to offer support to ranchers by matching rancher dollars or effort. Regardless of funding source, the overwhelming majority of coordinators were concerned that funding was not stable or sustainable. One coordinator from a conservation group explained the need for “having funding available in the long term, and not having it be NGO dependent, because at some point we stop being able to be involved... basically management or leadership on high is saying ‘we can’t just keep throwing money into this’”(Betty). Another coordinator explained “we are constantly searching for funding. And part of that, more specifically, is the one year funding-cycle, that all the foundations seem to be stuck in. That seems to be the real barrier to projects like this. Because it’s hard to fund an overall project” (George). As far as rancher support, several coordinators described how “most of the

ranchers that are participating in this are more mom and pop kind of places and don't have a lot of extra money for it" (Mary).

Though most ranchers did not directly fund a range rider, they often provided in-kind support such as rider housing, atvs, pasture for horses, investment in time, and more. One coordinator believed there was a significant "amount of hours those ranchers have put in as in-kind helping range riders...the ranchers are definitely invested in this, but it's been more of an in-kind investment vs cash" (Peter).

Another facet of the funding challenge was the prevalent discussion over who should pay for a RRP. Coordinators frequently explained their impression of rancher sentiments on funding: "From (one rancher's) perspective, they didn't choose to have the predators here, and so they shouldn't have to pay to reduce the conflict and it should be something that comes from the outside" (Bev). Another coordinator commented:

"as we go forward and have 100 packs like Idaho, or Montana, how's that all going to work out and who's going to pay that bill? Where's that money going to come from? I don't see anybody really stepping forward to take ownership... conservation groups, you say you guys are the ones who wanted the wolves here. You wanted this. I don't seem them emptying out their pockets" (Mark).

Because most coordinating agencies and organizations were limited in funding ability, several coordinators indicated they would like to see cost-shares established with ranchers. But cost-shares presented challenges of their own. One coordinator explained that though they developed a great cost-share, "you've got to sign a contract with the department, which is not a popular thing to do...we're having a tough time getting people to sign up" (Rick). Furthermore, some ranchers decided not to pay for a range rider program, but preferred to incorporate some aspect of the RRP into their operation, though it was not in a manner consistent with how a RRP was set up. One coordinator explained

"those environmental groups didn't want to fund it anymore because we were gonna kill wolves or planned o killing wolves if we saw them killing livestock..."

essentially what they (ranchers) did, rather than hire somebody that lived with the wolves, was hire another rider that would ride with the cattle and spend more time out there” (Harry).

Overall, RRP's were expensive. With estimates ranging from \$20,000-\$40,000 for a grazing season, several coordinators reported that there may not be enough livestock losses to wolves to warrant paying for a RRP. One coordinator stated “it worked really well but like I said, it was expensive. Since that time, we still run the cattle in the same places. We have lost a few cattle. But probably not enough to financially afford riders again” (Harry). Others explained that while there were benefits to RRP's, the program was not perceived as reducing losses, suggesting some ranchers didn't feel the benefits outweighed the costs. Another coordinator stated “I come from a ranching background. I don't know if I would be doing some of these (non-lethal strategies) on my own dime because I realized my death loss isn't that great personally, and I'm hearing that out of producers” (Joe). Coordinators further agreed it was difficult to prove causation in a complex system: how could you tell if the rider was in fact saving cattle?

“What were' trying to do with range riders has not been documented yet. So there is some anecdotal documentation, but there is nothing very rigorous yet... I think we have demonstrated there are advantages to having a rider, but I don't think we've demonstrated yet, not conclusively anyway, that a rider pays for themselves. But I think we are going to prove that” (George).

Another coordinator pointed out “I feel like I can't really say, to be honest, has it been effective at reducing livestock depredations. Would we have had more livestock depredations if we didn't have a rider out there? We don't really know that” (Mary). Coordinators also highlighted a question of program value to ranchers. “My guess, you will hear out of our guys ‘it doesn't work, so why?’ That cost-benefit...we were in a funding crunch last year. We had a FS grant that was falling apart, and we kind of pushed back and said, ok will you (help fund)? Nope” (Joe).

One last funding challenge that emerged from coordinator interviews pertained to the debate over range riders carrying a rifle while working. This was illustrated in several programs, but one coordinator described how their program approached this issue. The RRP:

“was funded by (multiple) NGOs... It’s kind of a constant thing to manage their interests butting up against the interests of livestock producers, like them funding the program but not being comfortable with the range rider carrying a rifle, whereas some of our landowners will not participate unless the range rider is carrying a rifle and can shoot a wolf in the act... (another coordinator) has done a good job at balancing the interests of both sides there and I really feel like its successful because she is standing up for what works for the landowners because that’s the limiting factor there” (Sarah).

Rancher Perceptions

Rancher concerns regarding long term funding a RRP were another common theme. The majority felt the ranching community should not have to pay for a rider program, as one rancher explained “nobody felt like... none of the ranchers felt that we should be paying for this out of our own pockets. If we could have kept the funding, it still would be going on” (Bill). Furthermore, pro-wolf groups (or in some cases, the federal government) were cited as the entities that should be responsible for funding this non-lethal tool, where one rancher noted “some of these wildlife organizations –if they want to protect the wolves and stuff, that they should come up with some funding to help” (Ralph). While ranchers often felt they shouldn’t pay for a RRP, a few ranchers did utilize a cost-share to help support their rider, and explained that they worked with state agencies and conservation groups to do whatever it takes to be successful.

As far as costs and benefits associated with RRP, ranchers agreed that the programs had value and benefits, and they may have really liked the program, but they were businessmen and the costs outweighed the benefits. One rancher explained: “I don’t

think we're ever going to get it out of the producer. They don't see that as the most bang for their buck. They see a value in it, but if they're going to fund something, it's going to be something lethal rather than non-lethal" (Jack). Another rancher felt:

"while the funding was there, it was ok, but it's hard to justify because you don't know for sure if you're actually doing something good or helpful. We thought we did, but I don't know if was worth everybody chipping in out of their own pocket to do that. Nobody is convinced totally that it helps 100%" (Ralph).

A rancher from another program proposed if ranchers were going to hire someone themselves, they would say "I've got better things for my cowboys to do than range ride" (Adam). One additional response from ranchers was a proposed alternative to funding a RRP: if they had to pay for a solution to wolf-livestock conflict, they would use their money for lethal options as opposed to non-lethal options because:

"the other problem is the people that are doing the removal of the wolves are losing the funding as far as hiring helicopters and that type of thing. So we actually- all the livestock owners in (our) County have allowed a tax bill on the head of livestock to raise money to help with depredation. It isn't to pay the people for their livestock, but to actually have the people out there to remove the wolves or buy helicopter time to remove the wolves" (Harry).

Overall, ranchers valued RRPs, provided they were externally funded efforts.

Rider Perceptions

While riders believed they provided benefits to ranchers and felt RRPs were valuable in various ways, they also discussed the challenges of obtaining stable funding for a program. Riders agreed that ranchers won't pay for a program, and highlighted concerns over grant funding. One of the biggest challenges was therefore described as

"rancher participation and support. Without a doubt. I think in my case that's the biggest objective because all my money comes from elsewhere. The ranchers, other than keeping my horse, doing little things that don't involve money – direct money I should say. I think the ranchers need to come about... These groups that are presently paying me will only pay me for so long" (Max).

Another rider shared this sentiment, and described his program's biggest challenge: "Money. It's a soft money job, and year to year, we don't know if there's going to be enough money" (Sean).

Shared Perceptions Regarding Benefits of RRP

Coordinator, rancher, and range rider responses facilitated identification of shared RRP benefits. Because programs were context specific and unique in many ways, these benefits may have been weighted differently for each effort. However, this list was still central to most RRP, and included depredation mitigation; technical benefits that included increased information on livestock and wolves, and rapid carcass identification; proactive non-lethal; and social benefits that included reduced stress, improved public perception, empowerment, and trust building (Table 3-2).

Depredation Mitigation

Throughout the interview process, anecdotal stories surfaced that suggested range riders successfully prevented potential depredations by hazing wolves away from cattle. However, respondents also noted that despite frequent detection of wolf activity, actually seeing a wolf was rare, and hazing opportunities were uncommon. One rider noted "I was all ready to haze. I had the cracker shells and the rubber bullets that don't shoot straight for 20 feet – all that good stuff. But the receiver only gave me a general notion – the ranch was too big, the country too spread out..." (Jacob). Furthermore, a common response from coordinators and ranchers was that range riders do not reduce the likelihood of a wolf attacking livestock because "the wolf is a very intelligent animal. He'll be where the range rider isn't" (Ron) or:

"what we have is GPS collars that give us data that most of the time is 28-48 hours old, and we're working on assumptions of where they're going to be at.

And it's very hard to be effective...what you are up against is these huge ranges where the cattle are spread out over a huge amount of area. Which bunch of cattle do you ride at that time?" (Mark).

Regardless, RRPs were believed to provide a suite of other benefits, both technical and social, that helped mitigate wolf-livestock conflict from a broader perspective. As one coordinator described:

"By having somebody out there more frequently, you can tell what's going on. You know if you're seeing wolf tracks, you know if you're seeing a sick calf, you know if you're seeing the cows were here, and now they're here. Thus you're able to be more proactive and able to make decisions that are more appropriate given the set of circumstances that are actually unfolding, as opposed to guessing at what happened after something's happened" (Ruth).

Livestock Management Benefits: Herd Information

Technical benefits of RRPs were primarily observed in response to increased information acquisition and communication. While ranchers identified a variety of helpful aspects of RRPs, the most common response from ranchers was simply "more eyes on the ground." Ranchers appreciated information on wolf activity, assistance monitoring their herds, and any communication regarding potential concerns. One rancher explained that

"knowing that someone is with the cattle, whether there's a predator with the cows or not, that would give me a lot of peace of mind, and if that person was able to come back at the end of the day and say, hey (Charlie), I saw three cows up there that have got pneumonia. If they're not given some attention they might die. That kind of information would be huge. And I think that happens quite a bit" (Charlie).

Another rancher described further benefits, explaining how the rider "can manage cattle better to affect herd health and range issues. With her intensity, she should know quickly if problems start to develop. Also, if something dies, she knows about it and we can determine cause of death" (Adam).

Rapid detection and response to concerns was described as both a benefit for a rancher's business and helpful in reducing the affected animal's vulnerability to wolves.

Ranchers also reported that increased information on cattle location was helpful. One rancher explained:

“there's a border of my grazing allotment that isn't fenced, so the cattle can go out onto private ground, and also on up to the highway where they like to sit in people's yards and count cars. So they would give me updated info, like if the cows were getting close to the highway, I could run up there and get them back to where they belong” (Tom).

Wolf Information

Range riders also provided technical benefits by increasing information on wolf locations. Ranchers liked “knowing where wolves are. I think from the collar aspect, people like knowing where the wolves are – how many – what's going on?” (Joe). Thus, they appreciated information on wolf activity, which enabled them to make informed decisions such as increasing monitoring efforts or moving livestock. One coordinator addressed the value of information on both cattle and wolves when describing the best things their program had done:

“That is probably one of the most important pieces of the whole program- that is getting good info out that helps dispel some of the fear that is very much characterized by living alongside wolves while trying to raise livestock” (Peter).

Rapid Carcass Identification

Rapid carcass identification was also identified by ranchers and coordinators as a highly beneficial function of range riders. Ranchers felt that the large allotments with varied terrain and tight drainages make finding a carcass nearly impossible, and further described how quickly a carcass is consumed, as one rancher described:

“Often times, you find the carcass when you see the birds fly off and that’s way too late. I mean, I had a depredation on private land where...4 in the pack killed a cow - a 1250 pound cow - and probably ate 70% of her one night. So add a few birds to that and a couple days, and there’s not much left- or a coyote or 2” (Jack).

Thus, a rider that rapidly identified a carcass could protect the site for investigation, leaving more evidence for determining the cause of death. Coordinators believed an increased awareness of livestock losses during the grazing season could take undeserved blame off wolves if causes of death identified were not wolf-related. Next, if enough of the carcass was left to provide evidence to confirm the event was a wolf depredation, the rancher could receive compensation for the animal. Additionally, confirmed depredation events was helpful in facilitating lethal removal of offending wolves, which could reduce future livestock losses associated with a chronic depredating pack. Finally, carcass identification played a critical role in carcass removal or, in remote locations, hanging fladry around the site so wolves did not become accustomed to eating livestock. One coordinator described an added benefit of carcass detection, stating:

“I think that probably is the bigger side of it, and on the most extreme end, knowing somebody is out there to find the carcass quicker and then be more likely for you to get compensated is a big draw for some of the real traditional guys who are having a hard time adopting any sort of new method” (Ruth).

Proactive Non-lethal

Range riders further provided a benefit to ranchers by simply being the only proactive non-lethal tool they could use on a vast landscape where cattle were widely dispersed. Though many non-lethal tools were believed to be useful in small pastures, ranchers felt range riders were the only non-lethal tool they could use on their rugged grazing allotments to monitor cattle. One rancher noted “I just don’t know how effective

the range riding is, but I don't know what would be more effective" (Ryan). This sentiment was shared by another rancher:

"I don't know any other method they could fund – the electric fencing, the fladry, and other things they think can help – I don't see much use in that. Lowland, fenced pastures you might get away with something like that but it's not even worth trying up where I'm at. Then the people from (the city) would complain about all the unnatural stuff strung out through the national forest" (Tom).

Therefore, RRP's gave ranchers a proactive option, where they would otherwise have none. This was of particular importance for ranchers in the states of Washington and Oregon. In both states, non-lethal strategies must be in place prior to a depredation for lethal wolf control to be considered an option. In essence, range riding was believed to provide benefits to ranchers, but it was also described as helping "check the box" so that lethal control was still available if conflicts arise, as one coordinator expressed:

"I think we're a little different in (our state), because we mandate- there will be no lethal control, unless there's this stringent set of non-lethals that have been done. Because of that, they (ranchers) are willing to play along, meaning they check the non-lethal boxes so they have the option for lethal control" (Alfred).

Social Benefits: Sleep at Night Factor

Program coordinators and ranchers also reported social benefits from using the RRP. Increased information on livestock not only helped inform decision making, but provided peace of mind for ranchers. One coordinator believed "pursuing these programs where we access resources from somewhere else (so) that people can have another set of eyes and ears out there - someone they trust keeping track of what's going on out there - it helps them sleep better at night" (Jim). Many ranchers agreed, describing how "We do sleep better at night though, now that (the rider) is out monitoring...it does reduce the stress some" (Walter). Similarly, several ranchers noted that increased information on

wolves also helped reduce their fear of the unknown with an increased knowledge of wolves in the area.

“Often times we fear what we don’t know – and the more we know, the less fear there will be. I think I personally have a lot less fear of wolves in terms of what we were experiencing economic loss and cattle loss today than I did 5 years ago, and the RRP has vastly speeded up my knowledge and my comfort level of ‘can we do this?’” (Mike).

Ranchers identified yet another helpful social aspect of a RRP: the ability of improve public perception. Some ranchers felt they were demonized by conservation groups and the public, so RRP provide a way to positively impact public perception as one rancher suggested:

“I think the biggest value for the rancher, with any of these non-lethal things, is the perception of the public that we are doing more than just lethal control. Perception is everything. But they say all we want to do is shoot them – shoot every wolf that comes by. And it’s not true. There’s a lot of us out there- not all of us – but a lot of us out there trying different things. Some work, some don’t. Some work to a small degree, some to a larger, and I think that in our situation where once we do have a depredation issue, it kind of takes away the argument – like we have been working and doing some non-lethal things, and in this situation, we need to do something lethal” (Jack).

Empowerment

Another important set of social benefits of RRP applied to the broader context of wolf-livestock conflict. Both coordinators and ranchers identified RRP as a tool that helped remove the feeling of powerlessness by ranchers because they have something to actually do. “I suspect that the level of conflict is related to the feeling of powerlessness – not being able to do anything about it, basically. Whereas a program like this gives somebody something they can do” (George). RRP also incorporated ranchers as an active participant, and in many programs, involved them in decision making because “the objectives are defined by the landowners involved” (Sarah). Thus, the programs gave

ranchers something proactive to do, thereby giving more control in a situation they didn't want to be in. Ranchers agreed this social aspect of RRP was helpful. Particularly in times or places where wolves were endangered, ranchers stated the program helped them feel better and get through a tough period of time when they felt they couldn't protect their livestock.

Building Trust

RRPs provided additional social benefits by building trust. Range riders were identified as individuals that could bridge the gap between ranchers, agencies, and conservation groups and help improve trust and relationships for all parties involved.

“There is a big distrust of agencies and environmentalists and wolf proponents. There is a big distrust of them, so the range rider is a key communicator between those two. So let's take (our wolf biologist)...someone in (that) position can be perceived by the rancher as pro-wolf. The range rider not necessarily so because the rancher knows you...They need to establish that reputation and they need to believe that you are on their side and you are trying to save their cattle, which obviously you are. And it's ok if I think you also want to save the wolves, but it's imperative that I think you want to save my cows as much as you want to save the wolves. So if I think that, and I trust you, then you're my link to (the wolf biologist) or my link to ESA when they were on the list, or the other side who I fear and don't know” (Mike).

Whether RRP reduced depredations or not, they frequently brought ranchers, conservation groups, state agencies, and community organizations together to take action and proactively work toward reducing wolf-livestock conflicts. One coordinator suggested:

“the primary change that's been occurring is that folks are communicating more and there's more willingness and interest and apparently some excitement in doing some of these approaches, and at least its willingness to even talk about them that is different than the past” (Betty).

Herding

One final set of RRP benefits were identified in the three RRP that focused on intensive herding. The coordinators, ranchers, and riders utilizing these programs felt the riders increased herd accountability, stating “it was easy to pick up health problems, easy to get them the minerals they need. It had a lot greater accountability for the cattle” (Luke) and provided herd protection from carnivores resulting from safety in numbers due to “that kind of surveillance – there wasn’t anything that was going to happen” (Luke). Ranchers further believed herding methods helped improve range utilization and health, “because the cattle weren’t grazing where they wanted to graze, but where we wanted them to graze” (Leo).

Table 3-2. Perceived Benefits and Challenges of Range Rider Programs (RRPs) in Montana, Oregon, and Washington.

<u>Shared RRP Benefits</u>	<u>Current & Future Challenges</u>
Depredation Mitigation	Riders Spread Thin
Herd Information	Use of Tools
Wolf Information	Social Challenges: Varying Levels of Trust
Rapid Carcass ID	Use of Lethal Control by Riders
Proactive Non-lethal	
Sleep at Night Factor	
Empowerment	
Building Trust	
*Herding Benefits	

*For 3 RRP

Current and Future Challenges for the RRP

Riders Spread Thin

Based on the discussion of emergent themes, program participants identified multiple aspects of RRPs that were helpful, but also identified challenges for the programs (Table 3-2). A key theme was the need more range riders. Ranchers felt that riders were spread thin due to large allotment sizes combined with rugged terrain, as one rancher described “in that big area, there’s a lot of forested ground, a lot of swamps and brush, where if you were truly to try to look at all the cattle every day, one person cannot do it. So if they’re truly wanting to make this range rider a real useful tool, it would be site specific” (Walter). Thus, many ranchers believed riders have a difficult time adequately covering their area. Numerous ranchers felt that “more people on the ground” (Marilyn) would be needed to make programs more effective. One rancher further explained:

“you’re developing a program that assumes that he can check all 40 acre pastures at one time. Well we don’t have 40 acres pastures, we have 1000 acre pastures, and that’s a small one. So you can’t in this country, there’s no way in the world you can do that... if you give us enough money to hire 50 of him, then we can do something” (Lucy).

Range Rider Tools

Wolf collars were another challenge presented by ranchers. Ranchers stated that they would like to see more collars deployed, preferably “a collar on every pack” (Mike) and further felt that the limited collaring efforts were a challenge for RRPs, noting “that’s the weakness of the game department. They haven’t kept the collars up or gave us enough of them” (Adam). Aside from concern over the number of collars, several ranchers voiced concerns over the GPS technology and location accessibility.

Social Challenges

Social challenges were also identified by ranchers. Several ranchers called into question the level of trust between ranchers and coordinating groups. Some feared that conservation groups would use participating ranchers in a pro-wolf manner for publicity, political leverage, or to obtain funding. One rancher noted:

“I don’t agree with a whole bunch of things they say or do, but since they wanted to put some skin in the game, I would meet them half-way and see what for one year what it was all about... I thought maybe they want to find some middle ground. But... I’m still waiting to see whether I’m just going to be a political tool for them to raise money, saying ‘well this guy used our Range Rider fund for his range rider and he didn’t have any wolf problems,’ but I don’t have any wolves in my allotment or have any problems yet” (Tom).

Another rancher suggested:

“Some ranchers may want to participate in these sorts of things, but at the same time, are not comfortable with ... (a conservation group) writing a story on their website saying here is this family ranch that is helping us save wolves. That family ranch can be like, I will participate, but I definitely don’t want that to happen” (Charlie).

One rancher further identified trust concerns illustrated by broken promises by the state agency. The rancher explained how he had a confirmed depredation, and the state agency stated they would lethally remove the pack if depredations continued, but

“They (the wolves) continued and they didn’t do it. And so our level of trust went way downhill. And then right after that meeting...they were telling the (conservation group), the same people were telling the conservancy agencies that they had no intention of taking the pack out. I’m going – wow, really?” (Mark).

Use of Lethal Control by Riders

Ranchers also frequently mentioned the debate over whether or not a rider can carry a rifle while range riding. One rancher explained he would prefer the rider take care of a problem in progress rather than simply reporting it, stating:

“If they’re going to be up there, they need to pack a gun. And if the wolves are killing our livestock, why take a picture and call us on the phone and say you’ve

got a dead cow or dead calf... And originally that was the plan. But now I see now that they're not even packing rifle. The time's I've seen him, no. The first year I think he may have, and I think that was part of the program was they were going to take care of a problem if they came upon it. But now I think that's kind of fell by the wayside" (Will).

Most ranchers agreed that opportunities to catch a wolf in the act were extremely rare, but the common rancher sentiment was: if a wolf is caught attacking cattle, it should be shot. Thus, the debate over carrying a rifle was a suggested program challenge.

Overall, there was a mixed review regarding RRP ability to stop depredations or decrease livestock losses. Several anecdotal stories were presented where a rider hazed wolves away from livestock and stopped a depredation from occurring. However, riders were thought to be spread too thin, wolves were believed to be intelligent, and riders were thought to have limited impact on actual depredations.

DISCUSSION

Overall, the participants agreed that RRPs were unique proactive efforts that were highly context specific and varied considerably in many aspects (e.g., location, federal wolf status, level of wolf activity). While, the primary program objective of most RRPs was to proactively reduce wolf-livestock conflicts, coordinators and ranchers felt it was difficult to determine actual reduction in these interactions.

Regardless, most respondents reported a suite of benefits that made the program valuable and worth participating in, though these benefits were often indirect. Ultimately, interview responses suggested a RRP's primary contribution may not be a direct reduction in livestock depredation by wolves. Instead, the program's major contribution to mitigating wolf-livestock conflicts is the collection of other benefits this

tool provides. These findings suggest RRP may be difficult to prove effective, but are still helpful to participants.

No Standard Metrics for Measuring RRP Effectiveness

Because RRP throughout western North America varied in program focus, rider duties, scale, wolf activity, and tools available for riders (i.e., radio-collars), no standard metrics were identified to measure program effectiveness. Not only were RRP dramatically diverse in each of these aspects, but programs also had mixed outcomes that may have been perceived as effective in one program area or to one group (ranchers, coordinators), but not in another. For example, RRP effectiveness could not be assessed based on depredations or losses. Four programs never had wolf conflicts before or after implementation of the RRP and three of those efforts never detected wolves around their cattle at all. At least five programs still had depredations after beginning a RRP, but coordinators and participants felt they would have had more losses had it not been for the rider. Most of these programs also had lethal removal of wolves occur in response to depredations. Therefore, it is also difficult to use wolf removal as a metric for success because wolves were not necessarily saved, though more wolves could have attacked livestock and been lethally removed if the rider had not been there.

To further complicate evaluation of RRP effectiveness, coordinators and participants frequently explained how they could not measure prevention or “what did not happen” because the rider was there. Range riders were often believed to be an active wolf deterrent around livestock, with participants suggesting the riders were preventing wolves from attacking cattle. But would wolves have attacked more livestock if the rider was not there? Thus, respondents agreed it was difficult to know what was prevented to assess true program effectiveness.

Human Presence and RRP Effectiveness

Range rider programs were fundamentally based on the use of human presence to reduce wolf-livestock conflicts. Responses from interviews highlighted how little we know about the impacts of human presence on wolf activity under a variety of conditions. Interview respondents often felt human presence in RRPs helped deter wolves from areas with livestock, stating this was the reason for little to no depredation activity. However, many of these respondents provided examples throughout their interviews that contradicted this sentiment. One rider explained how he believed his presence communicated to the wolves that the livestock are associated with humans, suggesting his presence disrupted any predatory behavior. However, the rider explained elsewhere in his interview that the cattle behavior had changed once wolves came to the area: the cattle were running in bigger groups and were nervous around dogs. The rider felt this change was because the wolves were “probing” or testing the herds. But if human presence was deterring wolves, why would they test the herds? Overall, numerous examples from interviews illustrated our lack of knowledge and current need to assess the actual impacts of human presence on wolf activity to facilitate evaluation of actual RRP effects.

RRP Benefits Differs by Sponsor and Participant

Interview responses also suggested program effectiveness might mean something different to everyone involved in a program. A RRP may accomplish any one or combination of the following: 1) reduce losses, 2) deter wolves from areas with cattle, 3) reduce risks to cattle, 4) increase knowledge of herd health and behavior, 5) increase knowledge of wolf activity, 6) improve range health, 7) reduce stress and anxiety, 8) increase trust among ranchers, conservation groups, and state agencies, and/or 9) increase

social tolerance for wolves. Because participants may place different values on each of these effects, individual perceptions of overall program effectiveness vary. For example, one program was developed under the premise that human activity would deter wolves. As the program continued, coordinators and ranchers both agreed that human presence was unlikely to deter wolves due to the large scale of their program, but both groups found other benefits. Rancher interview responses indicated livestock management benefits from just having someone else out there and increased information on wolves, while coordinator responses suggested positive social impacts from collaboration and increased communication that were beneficial to ranchers and in the broader context of wolf-livestock. Therefore, different stakeholders in a RRP may have different perceptions of what a program is actually capable of accomplishing, what the greatest benefits are, and how effective the program is overall.

Despite variation in perceived RRP benefits, most respondents expressed the perceived value in RRP because they felt the programs were the best use of allocated funding to reduce wolf-livestock conflicts. Many respondents believed RRP were the only proactive tool that could be used with any success on a large landscape. In Oregon and Washington, this was critical because both states require non-lethal tools to be utilized before lethal control can be considered in response to depredations. These findings suggest RRP are helpful in both proactively tackling wolf-livestock conflicts and, in some cases, maintaining lethal options in a worst case scenario.

Funding Considerations: Costs vs Benefits

The RRP in this study were expensive endeavors, ranging from \$20,000 to \$40,000 for a grazing season. Respondents believed stable, long term funding was required to make this proactive tool sustainable, but such a funding source has not been

identified. For example, loss of funding resulted in termination of three RRP in Montana, illustrating the need for external funding to maintain programs. This example poses a question of costs and benefits: if the program was so valuable, why didn't ranchers continue it after funding ran out? Once again, the need to identify the actual effects of riders was highlighted. None of the participants were 100% convinced the program helped.

While both ranchers and coordinators felt programs provided benefits, the type of benefits a stakeholder received could influence their willingness or ability to financially support a RRP. For example, if a rancher valued collaboration and increased information on wolf activity that they could not obtain by themselves, they may be more likely to contribute to a program than a rancher who views the primary benefits as increased knowledge on herd health or location. Similarly, a coordinator may have a difficult time fundraising for a project that is not believed to reduce depredations, but instead provides an extra "hand" to ranchers.

Overall, range riding was argued to be the best use of funding to proactively reduce wolf-livestock conflicts on a large landscape with dispersed cattle. However, sustaining these programs in the long term continues to prove challenging for many coordinating groups. Thus, funding was one of the largest obstacles to RRP maintenance or success.

Though RRP appear to be an expensive conflict mitigation strategy, other alternatives are costly as well. For example, In July 2014, the Idaho state legislature appropriated \$400,000 USD from the state general fund to fund the newly developed Wolf Depredation Control Board. This board was developed to fund lethal control of wolves in response to conflicts with livestock (State of Idaho 2014). Current figures

indicate 31 wolves were removed from July 1- January 1 at a cost of roughly \$140,000, averaging \$4600 per wolf removed (Russell 2015). While lethal removal may reduce future depredations, these Idaho estimates indicate lethal control is also an expensive strategy.

Compensation is another option frequently used in response to wolf-livestock conflicts. In Montana, the Montana Livestock Loss Board (MLLB) compensation program was created by the 2007 state legislature to provide reimbursement for losses out of the state general fund. This program was developed based on the beliefs that both government and livestock producers desire cost-effective strategies to reduce losses, livestock owners should not sustain disproportionate impacts resulting from Montana wolf population recovery, and recognition that it is impossible to prevent all losses. From 2008-2011, an annual average of 220 livestock was paid out at just over \$100,000 (MLLB 2015), though this figure includes payments for all livestock (e.g. cattle, sheep, goats, llamas). While compensation is useful in easing some of the financial burden associated with livestock losses from wolves, this method does not address the source of the conflicts or reduce future depredations.

USFWS data indicates there were 1900 confirmed cattle depredations from 1987-2013 in the NRM Federal Recovery area (MT, ID, WY) and 2107 wolves were killed: legally shot by livestock owners or lethally removed through government control. In Washington and Oregon, from 2009-2013 (the recent wolf re-colonization of these areas) 38 cattle depredations have been confirmed and 11 wolves have been killed by livestock owners or government control (USFWS 2014). These figures suggest that while targeted lethal control of depredating wolves is one important tool for mitigating wolf damage on livestock, it is not singularly effective and conflicts still occur. For optimal management

of wolf-livestock conflicts, wildlife managers and ranchers need all the tools in the toolbox: proactive non-lethal options, lethal strategies, and compensation. Because RRP appear to be the only proactive tool that can be employed on large landscapes with dispersed cattle, these programs are critical to maintain.

RRPs: Broader Implications for Wolf-Livestock Conflict

Wolf-livestock conflict is a highly polarized topic that encompasses not only the technical aspects of wolf-livestock interactions, but also the social and political components associated with diverse opinions of wolves. Messmer et al. (2001) described predator management as a pendulum, identifying dramatic shifts in predator policy between two extremes: overharvest to overprotection. Bruskotter (2013) elaborated on this concept, noting the social and political facets of wolf controversy. While socio-political factors influence the contentious debate over wolves and wolf management, and exacerbate social conflict surrounding this species, acknowledgement of the role these factors play can help shape solutions that slow the predator pendulum and find middle ground.

Bruskotter (2013) recommended use of collaborative planning efforts to give relevant stakeholders a voice in damage management decision making. Collaboration can provide a source of empowerment to reduce social conflict surrounding wolf-livestock interactions. Furthermore, this author recommends that state agencies promote non-lethal “coexistence” efforts, suggesting that the public will be more accepting of lethal control when proactive efforts have been implemented first and proved unsuccessful. Therefore, use of non-lethal efforts could reduce social conflict surrounding use of lethal strategies. RRP illustrate the use of these strategies, providing

both a source of rancher empowerment via a participatory role in this conflict mitigation tool, and a non-lethal coexistence option that can positively influence public perceptions.

Echoing the recommendation for collaborative planning efforts, Treves (2006) suggested combining technical expertise with local knowledge in transparent, democratic participatory planning to improve conflict mitigation. RRP's incorporate these suggestions, highlight a largely collaborative framework and proactive strategy to coexist with wolves, and further exemplify Berkes (2004) model for Community Based Conservation (CBC).

The RRP's in Montana, Oregon, and Washington addressed these multi-faceted wolf-livestock conflicts from a comprehensive perspective. Programs were largely collaborative efforts that brought conservation groups, state agencies, community based organizations, and landowners together to discuss a common problem, detect common ground, and work toward implementing solutions that were beneficial to all stakeholders involved. Thus, many of these programs functioned to build trust and relationships among individuals with diverse values and perspectives to successfully implement a wolf-livestock conflict mitigation strategy.

Collaboration and empowerment were not the only social benefit provided by RRP's. Range riders also helped reduce the burden on ranchers operating in wolf territories by reducing stress and providing peace of mind. Particularly in areas where wolves were federally protected, these social impacts associated with RRP's helped ranchers feel their concerns were validated and that someone was there to help at a time when their options for protecting their livestock were limited. These social impacts play a role in developing tolerance for wolves on the landscape, and influence wolf conservation efforts. Thus, RRP's provided benefits to multiple and diverse stakeholders,

and provided a forum to identify common ground to shape productive solutions to a common conflict.

The social benefits from collaborative RRP should not be undervalued. Even if a RRP is limited in its ability to reduce depredation levels or other indirect effects of wolves on livestock, the empowerment of ranchers and the trust and relationship development among various stakeholders are crucial to shifting the polarized and political opinions of wolves closer to middle ground for more productive conflict management strategies to be employed now and in the future. By finding the common ground for all stakeholders (i.e., reduce the number of livestock killed by wolves), these groups with can work together in a non-threatening manner to help ranchers live alongside wolves while working toward conservation goals. As one coordinator suggested, it just takes one respected rancher to use proactive tools and set the example for others. Similarly, it may only take a few RRP to set the example for others to follow: we can work together and develop solutions that mitigate wolf-livestock conflicts. There is a productive path forward.

Interviews illuminated the apparent association between the age of a RRP and the levels of collaboration and trust associated with the effort. Montana yielded the longest running efforts, with the overall greatest levels of collaboration between diverse stakeholders, including state agencies, multiple NGOs, and community based organizations. The RRP in Montana also exemplified the most efforts used at a community level, as opposed to a RRP functioning on a single ranch. Thus, these mature programs appeared to have more positive perceptions of trust and positive relations among partners, based on interview responses.

In contrast, RRP in Washington and Oregon were more recently developed, and interviews revealed more negative perceptions of trust levels and collaboration between ranchers, state agencies, and conservation groups when compared to the long-running Montana efforts. These reduced levels of perceived trust and collaboration are likely a result of multiple factors: 1) the relatively new wolf population and associated “fear of the unknown” in response to living alongside wolves for the first time, 2) the federally protected status of wolves and debate over management/lethal control of wolves, and 3) the recent development of collaborative frameworks for addressing wolf-livestock conflict, and consequently, the development of new relationships where trust is still being established. Ultimately, the Washington and Oregon RRP are similar to early Montana efforts, where wolves were relatively new to the landscape and federally listed. Thus, as collaborations continue, open and honest communication is improved, and ranchers learn more about ranching alongside wolves, these RRP may mature into efforts that yield increased levels of trust and improved relationships among all partners to enhance this non-lethal tool.

CONCLUSIONS

Investigation of RRP identified a diverse range of efforts that varied considerably in context, program focus, and scale. Despite this variation, interviews suggested the RRP shared common goals, benefits, and challenges. While a number of benefits (e.g. increased information on wolf activity, extra herd supervision, rapid carcass identification) attracted participants, several challenges were considered limiting in program maintenance or sustainability. While challenges pertaining to trust and open communication were noted in several programs, challenges were also largely resource

driven. Respondents believed more riders were needed to cover program areas and stable funding was needed to ensure program sustainability. The final challenge central to RRP's was the largely unproven success of this proactive tool: a greatly desired assessment.

Throughout the interview process, it became evident that human presence is a core concept the programs are based on, yet little is known about the actual effects of range rider presence on wolf activity, and to what scale this presence is needed to be effective. Thus, future research is greatly needed to determine the impacts of range riders on wolf activity under various conditions and with different variables (i.e. size of grazing area, terrain, number of wolves, number of riders, number of hours a rider is present in an area, time of day monitoring occurs, management status of wolves: hunted/ trapped vs protected). Therefore, an experimental evaluation of range rider programs could help standardize RRP protocols to maximize rider efficiency and minimize costs.

To improve current RRP's and develop future efforts, programs should be realistic in expectations and work with rancher participants to develop a program that meets their needs, maintains transparent and frequent communication, and provides a forum for feedback. Programs may not be able to prevent all livestock losses to wolves, but should be set up as an adaptive strategy that can change with shifts in wolf activity, loss (or gain) of radio-collars, occurrence of depredations, and even changes in federal wolf status. Furthermore, program coordinators, ranchers, and riders could benefit from discussion at the start of a program (or field season) to address how to handle complex situations and get all parties involved on the same page. Examples could include: how to handle sharing information with the press in an appropriate fashion agreed upon by the group, how to handle sensitive location data, how to handle changes in radio-collaring protocols,

or how to handle a depredation situation. Open, transparent, and frequent communication can, therefore, build trust and help all collaborative partners address unforeseen challenges to reduce conflict.

Shifting RRP focus away from the “collar and faller” approach to focusing on livestock would also be a useful approach for future programs. While radio-collars were believed to provide benefits in targeting range rider efforts, they were also identified as a source of conflict, particularly if sharing location data was limited or questioned. Furthermore, radio-collaring wolves may not play a large role in the future of wolf management. Therefore, to avoid the concerns of distrust that often surround use of radio-collars, and to reduce reliance on a non-sustainable tool, programs may be better served if they develop their focus and protocols based on livestock monitoring and tracking efforts in livestock grazing areas, as opposed to pursuing radio-collars. Montana Fish, Wildlife, and Parks is investigating ways to shift their wolf monitoring strategy away from reliance on radio-collars and toward a Patch Occupancy Model. This decision is based on robust wolf populations, limited resource availability, and the desire to manage wolves more like other big game species (Bradley et al. 2014). Thus, collaring efforts may be limited in the future, which will impact RRP based on use of this tool.

In Oregon and Washington, where wolves are federally protected and populations are expanding, RRP may benefit from continued use of radio-collars. Because wolves recolonizing new areas tend to have larger territories, riders may have great difficulty identifying high risk areas without location data. Thus, riders in these states, particularly in programs that monitor multiple ranches with one rider, are spread thin and may need continued guidance to target their efforts with any efficiency.

In summary, RRP's can be used to mitigate both technical and social aspects of wolf-livestock conflicts. While programs may share common goals and provide similar benefits, each program faces a unique set of challenges that must be addressed for maximum efficiency. Thus, there is no single optimal protocol to standardize these efforts. However, future research may inform optimal use of human presence, given a specific set of conditions and needs of local ranchers.

LITERATURE CITED

- Bangs, E., J. A. Fontaine, M. D. Jimenez, T. J. Meier, E. H. Bradley, C. C. Niemeyer, D. W. Smith, C. M. Mack, V. Asher, and J. K. Oakleaf. 2005. Managing wolf/human conflict in the northwestern United States. Pages 340-356 *in* R. Woodroffe, S. Thirgood, and A. Rabinowitz, editors. *People and wildlife: coexistence or conflict?* Cambridge University Press, Cambridge, England.
- Bangs, E. E., Jimenez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krsichke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D. W. Smith, V. Asher, and S. Stone. 2006. Nonlethal and lethal tools to manage wolf-livestock conflict in the northwestern United States. *Proceedings of the 22nd Vertebrate Pest Conference*. Davis, California.
- Berkes, F. 2004. Rethinking Community-Based Conservation. *Conservation Biology* 18: 621–630. doi: 10.1111/j.1523-1739.2004.00077.x.
- Bollig, M., M. Schnegg, and H. P. Wotzka. 2013. *Pastoralism in Africa: past, present and future*. Berghahn Books. New York, New York, USA. E-book Library. Website @ <http://USU.ebib.com/patron/FullRecord.aspx?p=1390926>>. *Last visited 3/2/2015*.

- Bradley, L., J. Gude, N. Lance, K. Laudon, A. Messmer, A. Nelson, G. Pauley, K. Podruzny, M. Ross, T. Smucker, and J. Steuber. 2014. Montana Gray Wolf Management and Conservation. 2013 Annual Report. Montana Fish, Wildlife, and Parks. Helena, MT. Pp 54.
- Bruskotter, J. T. 2013. The predator pendulum revisited: Social conflict over wolves and their management in the western United States. *Wildlife Society Bulletin* 37: 674–679. doi: 10.1002/wsb.293
- Chavez, A. S., and E. M. Gese. 2006. Landscape Use and Movements of Wolves in Relation to Livestock in a Wildland-Agriculture Matrix. *Journal of Wildlife Management* 70:1079-1086.
- Conover, M. R. 1994. Perceptions of grass-roots leaders of the agricultural community about wildlife damage on their farms and ranches. *Wildlife Society Bulletin* 22: 94-100.
- Conover, M. 2001. Effect of hunting and trapping on wildlife damage. *Wildlife Society Bulletin* 29: 531-532
- Corbin, J., and A. Strauss. 2008. *Basics of qualitative research: techniques and procedures for developing grounded theory*. Third edition. Sage Publications, Thousand Oaks, California, USA.
- Elmore, R. D., T. A. Messmer, and M. W. Brusnon. 2007. Perceptions of wildlife damage and species conservation: lessons learned from the Utah prairie dog. *Human-Wildlife Interactions* 1: 78-88.
- Fanatico, A., R. Morrow, A. Wells. 1999. Sustainable beef production. National Center for Appropriate Technology (NCAT) Agricultural Specialists, Appropriate Technology Transfer for Rural Areas (ATTRA) Publication #IPO18/18.

- Fritts, S. H., R.O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pages 289-316 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois, USA.
- Glaser, B. G., and A. L. Strauss. 1967. *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing Co. Chicago, Illinois, USA.
- Harper, E. K., W. J. Paul, L. D. Mech, and S. Weisberg. 2008. Effectiveness of lethal, directed wolf-depredation control in Minnesota. *Journal Wildlife Management* 72:778-784.
- Heberlein, T. A., and G. Ericsson. 2008. Public attitudes and the future of wolves *Canis lupus* in Sweden. *Wildlife Biology* 14:391-394.
- Houston, M. J., J. T. Bruskotter, and D. Fan. 2010. Attitudes toward wolves in the United States and Canada: a content analysis of the print news media, 1999-2008. *Human Dimensions of Wildlife* 15: 389-403.
- Karlsson, J., and M. Sjoström. 2011. Subsidized fencing of livestock as a means of increasing tolerance for wolves. *Ecology and Society* 16: 16. Website @ <http://www.ecologyandsociety.org/vol16/iss1/art16/>.
- LaRocque, O. 2014. Revisiting distinctions between ranching and pastoralism: A matter of interspecies relations between livestock, people, and predators. *Critique of Anthropology* 34: 73-93.
- Lehmkuhler, J., G. Palmquist, D. Ruid, D. Willig, and A. P. Wydeven. 2007. Effects of wolves and other predators on farms in Wisconsin: beyond verified losses. Website @ http://dnr.wi.gov/org/land/er/publications/pdfs/wolf_impact.pdf. Last visited 9/12/2013.

- Marker, L. L., A. J. Dickman, and D. W. MacDonald. 2005. Perceived effectiveness of livestock-guarding dogs placed on Namibian farms. *Rangeland Ecology and Management* 58:329-36.
- Meadow, R., R. P. Reading, M. Phillips, M. Mehringer, and B.J. Miller. 2005. The influence of persuasive arguments on public attitudes toward a proposed wolf restoration in the Southern Rockies. *Wildlife Society Bulletin* 33:154-163.
- Mech, L. D. 1970. *The wolf: the ecology and behavior of an endangered species*. Natural History, Garden City, New York, USA.
- Mech, L. D. 1995. The challenge and opportunity of recovering wolf populations. *Conservation Biology* 9: 270-278.
- Messmer, T.A., M.W. Brunson, D. Reiter, and D.G. Hewitt. 1999. United States public attitudes regarding predators and their management to enhance avian recruitment. *Wildlife Society Bulletin* 27: 75-85.
- Messmer, T. A., D. Reiter, and B. C. West. 2001. Enhancing wildlife sciences' linkage to public policy: lessons from the predator-control pendulum. *Wildlife Society Bulletin* 29:1253–1259.
- Messmer, T. A. 2009. Human-wildlife conflicts: emerging challenges and opportunities. *Human-Wildlife Conflicts* 3: 10-17.
- Montana Livestock Loss Board (MLLB). 2015. Department of Livestock. Website @ <http://liv.mt.gov/LLB/default.mcp>. *Last visited 5/22/2015*.
- Morehouse, A., and M. S. Boyce. 2011. From venison to beef: seasonal changes in wolf diet composition in a livestock grazing landscape. *Frontiers in Ecology and the Environment*. 110324084539019 DOI: [10.1890/100172](https://doi.org/10.1890/100172)

- Naughton-Treves, L., R. Grossberg, and A. Treves. 2003. Paying for tolerance: rural citizen's attitudes toward wolf depredation and compensation. *Conservation Biology* 17:1500-1511.
- Nyhus, P. J., S. A. Osofsky, P. Ferraro, H. Fischer, and Madden, F. 2005. Bearing the costs of human-wildlife conflict: The challenges of compensation schemes. Pages 107-121 *in* R. Woodroffe, S. Thirgood, A. Rabinowitz, editors. *People and wildlife: conflict or coexistence?* Cambridge University Press, Cambridge, England.
- Oakleaf, J. K., C. Mack, and D. L. Murray. 2003. Effects of wolves on livestock calf survival and movements in central Idaho. *Journal of Wildlife Management* 67: 299-306.
- Patton, M. 2001. *Qualitative research & evaluation methods*. Sage Publications, Thousand Oaks, CA, USA.
- Ramler, J. P., M. Hebblewhite, D. Kellenberg, and C.A. Sime. 2014. Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*. doi: 10.1093/ajae/aat100.
- Reiter, D.K., M.W. Brunson, and R.H. Schmidt. 1999. Public attitudes toward wildlife damage management and policy. *Wildlife Society Bulletin* 27:746-758.
- Russell, B.Z. 2015. New Idaho board has spent \$140k to kill wolves. *The Spokesman Review*. Website @ <http://www.spokesman.com/stories/2015/feb/03/new-idaho-board-has-spent-140k-kill-31-wolves/>. *Last visited 3/20/15*.
- Shivik, J. A. 2004. Non-lethal alternatives for predation management. *Sheep & Goat Research Journal* 19: 64-71.

- Shivik, J., A. Treves, P. Callahan. 2003. Nonlethal techniques for managing predation: primary and secondary repellents. *Conservation Biology* 17: 1531-1537.
- Sime, C., E. Bangs, E. Bradley, J. Steuber, K. Glazier, P. Hoover, V. Asher, K. Laudon, M. Ross, and J. Trapp. 2007. Gray wolves and livestock in Montana: a recent history of damage management. Proceedings of the 12th Wildlife Damage Management Conference, Corpus Christi, Texas.
- Singleton, R., and B. C. Straits. 2010. Approaches to social research. New York: Oxford University Press, USA.
- Sommers, A. P., C. C. Price, C. D. Urbigkit, and E. M. Peterson. 2010. Quantifying economic impacts on large-carnivore depredation on bovine calves. *Journal of Wildlife Management* 74:1425-1434.
- State of Idaho. 2014. Press Release. Website @ <http://gov.idaho.gov/pdf/Press%20Release/Wolf%20Board%207-7.pdf>
Last visited 3/20/2015.
- Treves, A., and K. U. Karanth. 2003. Human–carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology* 17:1491–1499.
- Treves, A., R. B. Wallace, L. Naughton-Treves, and A. Morales. 2006. Co-managing human wildlife conflicts: a review. *Human Dimensions of Wildlife* 11: 383-396.
- Treves, A., and J. T. Bruskotter. 2011. Gray wolf conservation at a crossroads. *BioScience* 61:584-585.
- United States Department of Agriculture Animal Plant Health Inspection Service: Wildlife Services (USDA APHIS WS). 2012. Environmental assessment: gray wolf damage management in Montana for the protection of livestock, other domestic animals, human safety, and other resources. USDA APHIS WS with

cooperating agencies: Montana Fish, Wildlife, and Parks, United States Fish and Wildlife Service, Bureau Land Management, United States Forest Service, Montana Department of Livestock, Confederated Salish & Kootenai Tribes, and Blackfeet Nation. Website @

[http://www.aphis.usda.gov/regulations/pdfs/nepa/Montana%20Wolf%20EA%20October 2012.pdf](http://www.aphis.usda.gov/regulations/pdfs/nepa/Montana%20Wolf%20EA%20October%202012.pdf). *Last visited 2/3/15.*

United States Fish and Wildlife Service. 2014. Gray wolves in the northern Rocky Mountains: news, information and recovery reports. USFWS with cooperating agencies on reports: Blackfeet Nation, Confederated Salish & Kootenai Tribes, Idaho Department of Fish and Game, Montana Fish, Wildlife, and Parks, National Park Service, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Utah Department of Natural Resources, Washington Department of Fish and Wildlife, Wildlife Services, and Wind River Tribes. Annual Reports for 1999 to 2013. Updated Sept. 23. Website @ <http://www.fws.gov/mountain-prairie/species/mammals/wolf>.> *Last visited 2/3/15.*

CHAPTER 4

CONCLUSIONS

Range Rider Programs (RRPs) were highly context specific and varied greatly in program focus and structure, ranging from focus on livestock monitoring, to wolf surveillance, to intensive livestock herding. Yet participants identified a collection of shared goals for RRPs. While no standardization of efforts was observed, the programs illustrated collaborative efforts that were implemented to mitigate wolf-livestock conflicts, and addressed a variety of technical and social aspects of these conflicts. Many RRPs helped build trust and relationships among collaborators in an adaptive, democratic approach to address wolf-livestock conflicts as a partnership. Overall, the RRPs exhibited many characteristics of Community Based Conservation (CBC) programs (Berkes 2004).

Investigation of participant perceptions further provided insight into RRP value. Numerous benefits (e.g. increased information on wolf activity, extra herd supervision, rapid carcass identification) were appreciated by participants, but several challenges were believe to be limiting in program sustainability. Challenges pertaining to open communication and trust were identified in several programs, while additional challenges were resource driven. Respondents indicated stable funding was needed to ensure program sustainability, and many believed more range riders were needed to cover program areas. But the ultimate challenge for RRPs was the largely unproven success of this proactive tool: a greatly sought after assessment.

Though little is known about the actual effects of range rider presence on wolf activity, and to what scale this presence is needed to be effective, participants indicated that human presence was a core concept the programs were based on. Thus, future

research is greatly desired to determine the actual impacts of range riders on wolf activity under various conditions (i.e. size of grazing area, terrain, number of wolves, number of riders, number of hours a rider is present in an area, time of day monitoring occurs, management status of wolves: hunted/ trapped vs protected). An experimental assessment of RRP's could help standardize protocols to maximize rider efficiency and minimize costs.

To optimize current RRP's and develop efficient future efforts, programs should identify realistic expectations and work with participants to develop a program that meets their needs, maintains transparent and frequent communication, and provides a forum for feedback. Not all losses to wolves cannot be prevented, but RRP's should be set up as an adaptive strategy to increase effectiveness. Range riding should be modified with shifts in wolf activity, loss (or gain) of radio-collars, occurrence of depredations, and even changes in federal wolf status. Additionally, discussions with all collaborators (i.e. coordinators, ranchers, riders) at the start of a field season could help participants decide on how to handle complex situations that may arise. Examples could include: how to handle sharing information with the press in an appropriate fashion agreed upon by the group, how to handle sensitive location data, how to handle changes in radio-collaring protocols, or how to handle a depredation situation. Open and frequent communication could help all partners address unforeseen challenges to reduce conflict and build trust.

Future RRP's may also benefit from shifting program focus away from heavy radio-collar reliance to track wolves ("collar and faller"), and instead focus on livestock. Radio-collars were thought to help increase range rider efficiency by targeting efforts, but they also created conflicts, predominantly as a result of limited or questionable wolf location data. Furthermore, radio-collaring wolves may not play a large role in the future

of wolf management. Due to robust wolf populations, limited resources, and the desire to manage wolves in a manner consistent with other big game species, Montana Fish, Wildlife, and Parks is investigating ways to shift their wolf monitoring techniques away from reliance on radio-collars and toward a Patch Occupancy Model (Bradley et al. 2013). Thus, collaring efforts may be limited in the future, which will impact RRP's relying on radio-collars for wolf location data. Therefore, programs may benefit from limiting their need to pursue radio-collars, while developing their focus and protocols based on livestock monitoring and tracking efforts in livestock grazing areas to both minimize the concerns of distrust that often surround use of radio-collars and reduce reliance on a potentially non-sustainable tool.

In areas where wolf populations are expanding and remain federally protected (i.e. Oregon, Washington), RRP's may still benefit from continued use of radio-collars. Range riders have large areas to monitor and may struggle to identify high risk areas because wolves recolonizing new areas tend to have larger territories. Therefore, programs that are spread thin trying to monitor multiple ranches with one rider may need continued guidance to target their efforts with any efficiency.

In conclusion, RRP's can be used to address both technical and socio-political aspects of wolf-livestock conflicts. Programs share common goals and provide similar benefits, but each effort is unique. To ensure maximum efficiency, each effort must address the set of challenges unique to their location. Overall, there is no single optimal protocol to standardize these efforts, but future research may inform optimal use of human presence, given a specific set of conditions and the needs of local ranchers.

LITERATURE CITED

Berkes, F. 2004. Rethinking Community-Based Conservation. *Conservation Biology*

18: 621–630. doi: 10.1111/j.1523-1739.2004.00077.x.

Bradley, L., J. Gude, N. Lance, K. Laudon, A. Messmer, A. Nelson, G. Pauley, K.

Podruzny, M. Ross, T. Smucker, and J. Steuber. 2014. Montana Gray Wolf

Management and Conservation. 2013 Annual Report. Montana Fish, Wildlife, and

Parks. Helena, MT. Pp 54.

APPENDIX

SURVEY INSTRUMENTS

Range Rider Program Coordinator/Partner: Interview Guide

A. Introduction

1. Could you give me a general overview of how you got involved with this Range Rider Program?

B. Program Origins

Great. Now I'm going to ask a few questions about the origins of this Range Rider Program.

1. What year did this RRP begin operating?
2. Who got this RRP started?
3. What situation was the RRP trying to address?
 - a) Was this something that was locally driven or did an outside agency or group make it happen?
 - b) How much support for the RRP was there from the local ranching community when it started?
4. To the best of your knowledge, can you describe the wolf activity in your program area?

Packs?

Collars?

Dens?

5. Throughout the course of this program, has the wolf population increased, decreased, or remained constant?
6. *Is the RRP currently active? Y/N*
If not – what happened?

7. What is your role in the RRP?

C. Program Support and Logistics

Ok. To allow me to compare different kinds of RRP's, I have some more detailed questions about how the program was supported.

1. Who are the key organizations/partners involved in this RRP program, and what is the role of each organization/partner?

PARTNER:

ROLE:

2. Over the last year (few years?) how has this RRP program been funded? Do you have any...

<i>Funding Type</i>	<i>Yes?</i>	<i>Details/Provided By:</i>
---------------------	-------------	-----------------------------

Grants?

Contracts?

Donations?

Producer assessments/

Head Tax?

Other: Please specify

3. What is the most important source of funding for the project now?

D. Activities of the Range Riders

Thanks. Next I have some questions about how range riders are used in this program.

1. How many range riders are involved in the program? How many of them are out on a typical week?

2. What are a typical range rider's duties?
 3. In a typical year, in what months do riders start and stop monitoring livestock grazing areas?
Start (month): _____ *End (month):* _____
 4. Do you think your range riders adequately cover their area or are they spread too thin?
 5. How do you determine where each rider works?
 6. How much influence does each rancher have over the areas or time spent monitoring livestock by riders?
 7. To what extent does a rider's schedule change depending on what they see – for example awareness of wolf activity developing in a new location or occurrence of a depredation event?
 8. How is the number of hours monitoring livestock each day determined?
 9. What times of the day do your riders typically monitor livestock? (select all that apply)
Morning (6am-12pm)
Afternoon (12pm-6pm)
Evening (6pm-12am)
Night (12am-6am)
 10. Do your riders usually camp out with the herds they monitor? Y/N
 11. If riders camp with the herds, which of the following do range riders use for shelter?
(select all that apply)
Cabin/house *Camper* *Tent* *No shelter* *Other: Please Specify*
 12. Is safety a concern for riders camping with the herds? Y/N
If Yes, please what are the concerns:
(could prompt with Grizzly bears, other things??)
Are there Grizzly bears in the vicinity? Y/N
 13. What type of transportation do most riders use? (select all that apply)
Horse *Four-wheeler* *Dirt-bike* *Truck* *Other: please specify*
- RIDER ACTIONS: Data Collection and Risk Reduction Activities***
14. What is the method and format for data collection by riders, if any?
 15. Are range riders provided with a daily protocol or checklist to follow in the field?
Y/N
If yes – what is included on that checklist or protocol?
- Risk reduction actions are sometimes taken by Range Riders to actively reduce wolf attractants in livestock grazing areas. These actions can take many forms including but not limited to:***
- ***notifying ranchers of carcasses for investigation and removal***
 - ***notifying ranchers of injured livestock for treatment or removal***
 - ***notifying ranchers of livestock separated from the herd***
 - ***notifying ranchers of broken fences***
16. Do you ask or expect your range riders to engage in any of these kinds of risk reduction actions?
if yes, what kinds of RRAs are most common?
 17. Based on your experience and observations, roughly how many risk reduction actions are taken by range riders throughout a grazing season?
Daily (at least one action daily)
Weekly (> 1/week but < 1 per day)
Monthly (>1 per month but < 1 per week)

Less frequently (<1 per month)

None

RECRUITMENT

18. How do you recruit people to be range riders? (Get open ended answer, then ask each of the following as prompts if not mentioned)

Method _____ *Y/N?* _____ *Where?* _____ *When?* _____

Do you Advertise

Do you rely on Word of Mouth

Do you use any other method: please specify

19. What skills/desired characteristics do you look for in a potential range rider?

20. Once hired, do you provide any formalized training for your range rider(s)? Y/N

If yes - What kinds of training are provided

21. Have you had the same range rider(s) since the beginning of the program, or have you had multiple riders?

22. If there has been turnover, why do you think that is?

23. Do you think this turnover has impacted the rancher perceptions of the program? If yes, how?

E. Program Administration

Next I have some questions about the leadership and organization of this RRP.

1. Overall – who is responsible for organizing, coordinating, and leading RRP activities in this program?

2. Specifically, who is in charge of making day-to-day decisions about RRP operations?

3. Once the field season has begun, how much time is spent directly supervising the range rider(s)?

4. Do you collect data from your riders? Y/N

5. What do you do with the data collected?

Do you create any of the following?

Wolf Activity Reports

Annual Report

Other Publications

Management Decisions

RRP alterations

Other: Please specify

F. Program Area Description

- ***FOR Wildlife Agency personnel, skip to F9***

Great. Now I would like to ask you some questions to describe the program area.

1. How many ranchers are involved in your program?

_____ *ranchers involved*

What percent of the local ranchers are involved?

2. Did any ranchers in the area actively decline to be involved with your program?

3. Why do you think these ranchers declined to be involved?

4. Are there any other proactive efforts utilized in addition to the RRP? *Prompt for each for the following if not mentioned:*

Carcass Removal

Fladry

5. How do you think this RRP has affected the attitudes of local ranchers and landowners towards wolves in this area?

Do you think the program has increased landowner ability to live with wolves in the area with less stress or concern?

If yes - What things have you seen that suggest this change?

6. Do you think ranchers perceive the RRP as an effective tool for mitigating wolf-livestock conflict?

If yes – why?

If no – why not?

7. Do you feel RRP coordinators/partners and ranchers have the same level of satisfaction with this RRP?

If yes – why?

If no – why not?

I. Making Improvements

Great. Next, I'd like to ask you for some ideas and suggestions about how to make RRP's more effective.

1. What are the best things this RRP has done that you'd recommend to other RRP's?

What specific components or activities of your program appear to be most related to rancher satisfaction?

2. What do you think could be done to make this program more beneficial to ranchers?

3. What are biggest remaining obstacles to the success or maintenance of this program?

Funding?

Range Rider Turnover?

4. Do you think ranchers in this area are satisfied enough with the RRP to financially support the effort?

Y/N

5. Do you think ranchers feel this program is the best use of the allocated funding to reduce wolf-livestock conflict?

J. Wolf Activity

(For Wildlife agency interviews) Finally, I have some questions that will help us understand the amount of wolf activity in your area. Based on your understanding...

1. How many wolf packs have territories that overlap with livestock grazing areas in your RRP?

_____ wolf packs

If the program has run multiple years, what has the trend looked like?

2. How many wolf dens are in livestock grazing areas? (or within X miles)

_____ wolf dens

If the program has run multiple years, what has the trend looked like?

3. Has wolf activity changed over the course of the program in your program area?

Increased by more than 2 wolf packs

Increased by 1-2 wolf packs

Remained Constant

Decreased by 1-2 wolf packs

Decreased by more than 2 wolf packs

4. Based on changes in wolf packs, has your program changed the number of range riders used for monitoring? (example: an extra rider for more wolf activity?)

5. How do you monitor wolf activity in your program area? (open ended first – then prompt if necessary)

Do you (or others associated with the RRP) have GPS collars or VHF radio-collars on wolves in the area? Y/N

Does the RRP or a partner agency ever conduct radio-telemetry flights to monitor wolves in the area? Y/N

5. Do you regularly communicate updates on wolf activity with local ranchers?

If yes – how do you share this information?

Who usually communicates wolf activity updates with ranchers?

RRP Coordinator/partner Range Rider Other: please specify

6. How often are updates shared?

Thank you so much for your time. That completes my list of questions for today. I appreciate everything you have shared with me. If there is any other information you think is important to have for a more complete understanding of this Range Rider Program and its effectiveness in this area, please feel free to share it at this time. Otherwise, I again thank you for your time and will look forward to sending you a summary of the results when they have been compiled.

Range Rider Rider: Interview Guide

A. Introduction

1. Could you give me a general overview of how you got involved with this Range Rider Program?

B. Activities of the Range Riders

Thanks. Next I have some questions about how range riders are used in this program.

1. What are your typical duties as a range rider?
 2. In a typical year, in what months do you start and stop monitoring livestock grazing areas?

Start (month): _____ *End (month):* _____

3. Do you think you adequately cover their area or are you spread too thin?
 4. How do you determine where you work?
 5. To what extent does your schedule change depending on what you see – for example awareness of wolf activity developing in a new location or occurrence of a depredation event?

6. How is the number of hours monitoring livestock each day determined?

7. What times of the day do you typically monitor livestock?

8. Do you usually camp out with the herds you monitor? Y/N

9. If you camp with the herds, which of the following do you use for shelter?

10. Is safety a concern for camping with the herds? Y/N

If Yes, please what are the concerns:

11. What type of transportation do you use? (select all that apply)

Horse *Four-wheeler* *Dirt-bike* *Truck* *Other: please specify*

RIDER ACTIONS: Data Collection and Risk Reduction Activities

12. What is the method and format for data collection, if any?

13. Are you provided with a daily protocol or checklist to follow in the field? Y/N

If yes – what is included on that checklist or protocol?

Risk reduction actions are sometimes taken by Range Riders to actively reduce wolf attractants in livestock grazing areas. These actions can take many forms including but not limited to:

- ***notifying ranchers of carcasses for investigation and removal***
- ***notifying ranchers of injured livestock for treatment or removal***
- ***notifying ranchers of livestock separated from the herd***
- ***notifying ranchers of broken fences***

14. Do you engage in any of these kinds of risk reduction actions?

if yes, what kinds of RRAs are most common?

15. Based on your experience and observations, roughly how many risk reduction actions are taken throughout a grazing season?

C. Communications

Next, I would like to discuss how communications are maintained among partners in this program.

1. On average, how many ranchers do you work with?

_____ ranchers

2. How do you usually communicate with these ranchers?

Communication _____ Y/N? _____ Frequency _____ Information

Exchanged

Phone

Face to face

Email

Other: please specify

D. Program Effects

Perfect. We'll now move on to some questions about what you've learned about the impacts of this RRP.

1. Prior to establishment of the RRP, how severe was the problem of wolf-livestock conflicts?
2. Overall – do you think the RRP has been effective at reducing wolf-livestock conflicts?
 - If yes – what is the best evidence you have to show this impact?
 - If no – why not?
3. *If conflicts appear to be reduced:*
In your opinion, which of your range rider activities seem most related to this reduction in conflicts?
4. Are there other concerns besides livestock depredations that ranchers look to your program to address? Y/N
 - d) If yes – what are these other concerns?
 - Weight loss?*
 - Increased susceptibility to disease?*
 - Lack of information on wolf activity?*
 - e) How well has the program addressed these other concerns?
 - f) What is the best evidence that might show this kind of impact?
5. How do you think this RRP has affected the attitudes of local ranchers and landowners towards wolves in this area?
 - Do you think the program has increased landowner ability to live with wolves in the area with less stress or concern?
 - If yes - What things have you seen that suggest this change?*
6. Do you think ranchers perceive the RRP as an effective tool for mitigating wolf-livestock conflict?
 - If yes – why?
 - If no – why not?
7. Do you feel RRP coordinators/partners and ranchers have the same level of satisfaction with this RRP?
 - If yes – why?
 - If no – why not?

E. Making Improvements

Great. Next, I'd like to ask you for some ideas and suggestions about how to make RRP's more effective.

1. What are the best things this RRP has done that you'd recommend to other RRP's?
 - What specific components or activities of your program appear to be most related to rancher satisfaction?*
2. What do you think could be done to make this program more beneficial to ranchers?
3. What are biggest remaining obstacles to the success or maintenance of this program?
4. Do you think ranchers in this area are satisfied enough with the RRP to financially support the effort?

Y/N

5. Do you think ranchers feel this program is the best use of the allocated funding to reduce wolf-livestock conflict?

Thank you so much for your time. That completes my list of questions for today. I appreciate everything you have shared with me. If there is any other information you think is important to have for a more complete understanding of this Range Rider Program and its effectiveness in this area, please feel free to share it at this time. Otherwise, I again thank you for your time and will look forward to sending you a summary of the results when they have been compiled.

Rancher Participant: Interview Guide

A. Ranch Characteristics

1. Could you give a brief history and description of this ranch? For example, how long have you been ranching, or has the ranch been in your family?
2. Roughly what is the acreage of public and private land used for grazing by this ranch? How would you describe the terrain in your pastures?
3. How often do you check your livestock during the grazing season? (aside from the RRP)

B. Program

1. Could you give me a general overview of how you got involved with this Range Rider Program? (-when? why? who initiated?)
2. To the best of your knowledge, how much support is there from the local ranching community for this RRP?

C. Activities of the Range Riders

Thanks. Next I have some questions about how range riders are used in this program.

1. How many riders monitor your livestock? How many head do they monitor for you?
2. Do you think your range rider coverage is adequate? If not what changes would you suggest?

Risk reduction actions are sometimes taken by Range Riders to actively reduce wolf attractants in livestock grazing areas. Some examples include:

- *notifying ranchers of carcasses for investigation and removal*
- *notifying ranchers of sick/injured livestock for treatment or removal*
- *notifying ranchers of livestock separated from the herd*
- *notifying ranchers of broken fences*

3. What do you expect from your rider when they are monitoring your livestock? (duties)
4. Which of the range rider's activities are most helpful for you? Why?
5. What type of transportation does your rider use?

Horse Four-wheeler Dirt-bike Truck Other: please specify

6. What type of transportation would you prefer the rider use? Why?

D. Recruitment

1. In your opinion, what key skill sets would you expect the optimal range rider to possess?
2. How has your range rider met or not met these expectations?
3. Have you had the same range rider(s) since the beginning of the program?
 - a) *If applicable:* Has turnover impacted your view of the program? If yes, how?

E. Program Administration

Next I have some questions about the leadership and organization of this RRP.

1. Overall – have you been satisfied with the organization of this program? Why or why not?
2. Have you been satisfied with the range rider? Why or why not?

3. Did the agencies or organizations that run this RRP influence your participation in the effort? Why or why not?
4. Did any ranchers in the area actively decline to be involved with this program? (Reference?)

F. Communications

Next, I would like to discuss how communications are maintained in this program.

1. How do you communicate with or receive updates from your range rider or the RRP? Has communication been adequate? If not, what would you change?
(Frequency? Content? Trusted message?)
2. Are you getting the information out of the program that you desire?
 - a) If not, how could information sharing be improved?
3. Do you share information about your participation in the program with others?
 - a) If so, to whom and how do you do this?

G. Program Effects

Thank you. We'll now move on to some questions about what you've learned about the impacts of this RRP.

1. In your opinion, how severe was the problem of depredation or other wolf-livestock conflicts before this RRP?
2. Do you think the RRP has helped reduce depredations or other wolf-livestock conflicts?

If conflicts appear to be reduced:

 - a) In your opinion, which of your range rider's activities seem most related to this reduction in conflicts?
3. Overall, do you think the RRP is an effective tool for mitigating wolf-livestock conflict?

Why or why not?
4. Has having a range rider changed your opinion of wolves? How?
5. Do you feel that you have the same level of satisfaction with this RRP as the coordinators/partners?

Why or why not?

H. Making Improvements

Thank you Next, I'd like to ask you for some ideas and suggestions about how to make RRP's more effective.

1. What specific components or activities of this program are most useful? Least useful?
2. What could be done to improve this tool for producers?
3. In your opinion, what are biggest remaining challenges for this program?
4. Do you think this program is the best use of the allocated funding to reduce wolf-livestock conflict?

Thank you for your time. That completes my list of questions for today. I appreciate everything you have shared with me. If there is any other information you think is important to have for a more complete understanding of this Range Rider Program and its effectiveness in this area, please feel free to share it at this time. Otherwise, I again thank you and will look forward to sending you a summary of the results when they have been compiled.