

REVISED DRAFT

Colorado Wolf Restoration and Management Plan

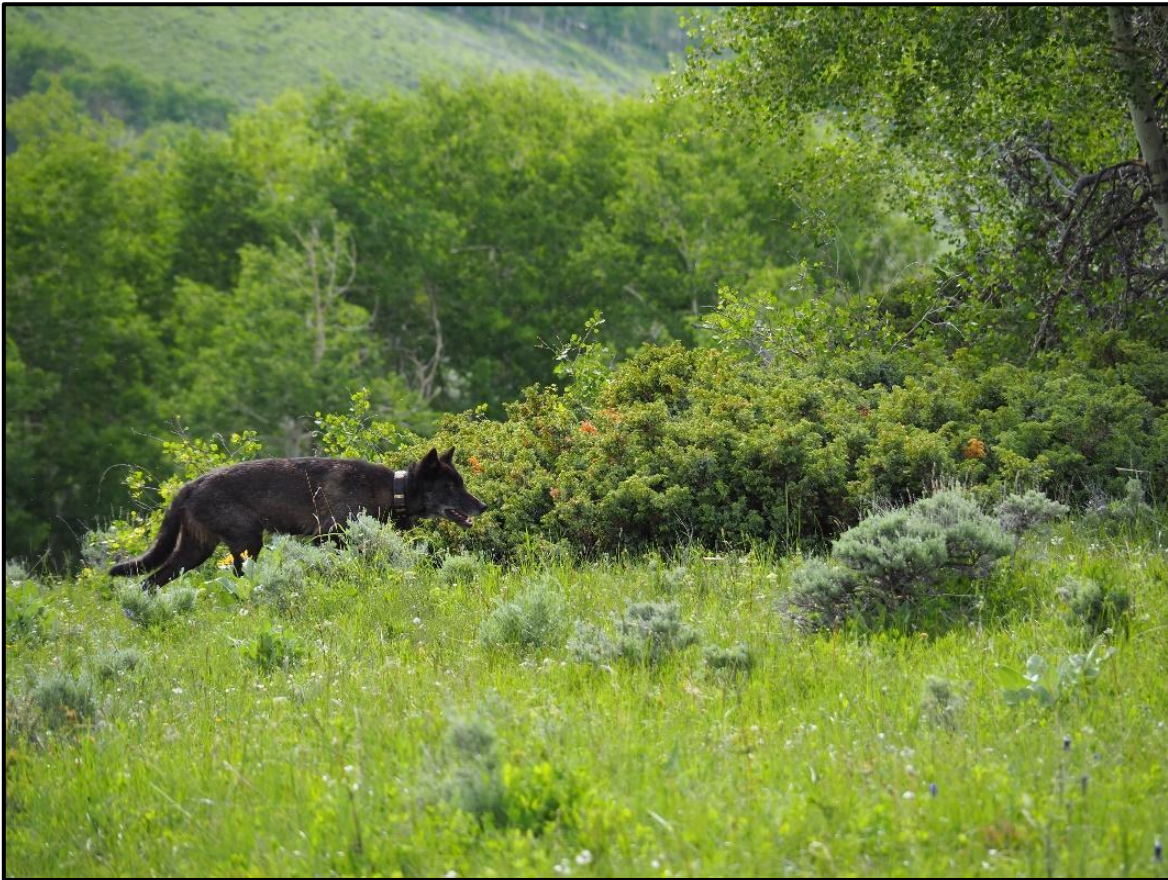


Photo of 1084F taken in North Park, Colorado, July 2019
Submitted anonymously to CPW



2023

Contents

Executive Summary	i
Chapter 1: Introduction and Background	1
Ballot Process and Description.....	2
Wolf Restoration and Management Plan Development.....	4
Plan Goals.....	5
Previous Planning Efforts for Wolves in Colorado	5
Summary of Historical Distribution of Wolves in Colorado	6
Legal Status	7
Federal	7
State	9
Chapter 2: Background and Key Elements for Conservation and Management	10
Wolf Management	10
Overall Management Philosophy.....	10
Key Elements.....	12
Key Element 1: Social Tolerance for Wolves and Economic Impacts	12
Key Element 2: Wolf Recovery	13
Key Element 3: Wolf Management with Respect to Wolf-Livestock Interactions.....	15
Livestock Loss to Wolves.....	16
Livestock Losses to Other Causes	17
Management Tools	17
<i>Non-Lethal Methods</i>	18
<i>Lethal Removal to resolve livestock conflicts</i>	18
Key Element 4: Wolf Management with Respect to Wolf-Ungulate Interactions.....	20
Predator-Prey Interactions	20
Vegetation effects.....	22
Ungulate Management.....	23
Status of Elk, Deer, and Moose Populations in Colorado	24
Elk Summary	24
Deer Summary	25
Moose Summary	26
Key Element 5: Wolf Interactions with Other Wildlife Species.....	27
Key Element 6: Wolves and Human Safety Concerns	28
Wolves and Domestic Dogs.....	29

Key Element 7: Monitoring and Research.....	29
Chapter 3: Reintroduction Implementation	31
Reintroduction Methodology.....	31
Release Locations.....	32
Post-Release Monitoring.....	35
Evaluating Success of Reintroduction	35
Chapter 4: Recovery of Wolves in Colorado	37
Phased Management of Wolves	37
Chapter 5: Wolf Management	42
Management Limitations.....	42
Impact-Based Management.....	43
Wolf Specimen Disposition	48
Land Use Restrictions.....	<u>49</u> 48
Managing for landscape scale movement	49
Chapter 6: Wolf-Livestock Interactions	50
Wolf-livestock Compensation and Conflict Minimization Planning Process	50
CPW Conflict Minimization Program	51
CPW Compensation Program.....	52
Chapter 7: Monitoring, Ungulate Management, Research, and Reporting	59
Wolf Population Monitoring	59
Wolf Mortality Monitoring.....	60
Wolf Health Monitoring	61
Ungulate Population Monitoring	62
Research Needs.....	63
Reporting.....	64
Chapter 8: Education, Outreach and Agency Coordination	65
Education and Outreach	65
Coordination with Other Governments, Agencies, and Organizations	66
Chapter 9: Funding	68
Conclusion	70
Glossary	71
Literature Cited	75
Appendices	88

List of Figures

Figure 1. Proposition 114 election results by county showing percentage of each county in favor of/opposed to initiative.	3
Figure 2. Proposition 114 election results by county and by relative population of the state.	3
Figure 3. Ecological suitability and conflict risk of wintertime landscape for wolves in Colorado (Ditmer et al., 2022).	33
Figure 4. Area for consideration for wintertime releases of wolves. 60-mile buffers from neighboring states and tribal lands, and areas west of the Continental Divide are depicted.	34
Figure 5. Flowchart illustrating livestock depredation compensation alternatives.	58 <u>57</u>

List of Tables

Table 1. List of confirmed wolves in Colorado 2004-2021.....	7
Table 2. Start and end points of Phases describing wolf recovery in Colorado.....	39
Table 3. Circumstances and associated wolf management tools	47

List of Appendices

Appendix A. Colorado Revised Statute 33-2-105.8.....	89 <u>88</u>
Appendix B. Technical Working Group Synthesis Report.	91 <u>90</u>
Appendix C. Stakeholder Advisory Group Synthesis Report.	92 <u>91</u>

Recommended Citation: ~~Complete when final~~ Colorado Wolf Restoration and Management Plan. 2023. Colorado Parks and Wildlife. Denver, CO. ~~XXX~~ pages.

Executive Summary

Through the passage of Ballot Initiative 114 in the November 2020 state election, codified at Colo. Rev. Stat. § 33-2-105.8, as amended (attached as Appendix A), the ~~citizens-voters~~ of Colorado mandated that the Colorado Parks and Wildlife Commission (hereafter, Commission) restore the gray wolf (*Canis lupus*) to the state. This Colorado Wolf Restoration and Management Plan (hereafter Plan) describes how this will be achieved and fulfills the planning components of the statutory requirements of CRS 33-2-105.8.

Chapter 1 describes the background for how and why this plan was developed.

Beginning in the summer of 2019, the Rocky Mountain Wolf Action Fund, ~~a citizen-led group~~, circulated petitions asking Colorado voters to place the following question on the ballot: “Shall there be a change to the Colorado Revised Statutes concerning the restoration of gray wolves through their reintroduction on designated lands in Colorado located west of the Continental Divide, and, in connection therewith, requiring the Colorado Parks and Wildlife Commission, after holding statewide hearings and using scientific data, to implement a plan to restore and manage gray wolves; prohibiting the commission from imposing any land, water, or resource use restrictions on private landowners to further the plan; and requiring the commission to fairly compensate owners for losses of livestock caused by gray wolves?” (Colorado Secretary of State 2020).

A total of 215,370 signatures were submitted to the Colorado Secretary of State office on 10 December 2019, and subsequently certified on 06 January 2020, indicating that this issue would appear on the ballot in November 2020. This became Proposition 114. The Proposition passed with 50.91 percent of votes cast (1,590,299) voting in favor, and 49.09 percent of the voters (1,533,313) opposing (Colorado Secretary of State 2020). Support for the ballot measure was inconsistent across the state. The resulting state statute (CRS 33-2-105.8) requires the Colorado Parks and Wildlife Commission to develop a plan to restore and manage gray wolves in Colorado and take steps necessary to begin reintroductions by December 31, 2023.

The primary goal of this Plan is:

To recover and maintain a viable, self-sustaining wolf population in Colorado, while concurrently working to minimize wolf-related conflicts with domestic animals, other wildlife, and people.

The Commission was responsible for developing the Plan per state statute. The Commission served as the decision-making body responsible for approving the Plan. The Commission and the Colorado Division of Parks and Wildlife (Division), collectively CPW, convened a Technical Working Group (TWG; Appendix B) and a Stakeholder Advisory Group (SAG; Appendix C) to assist in making recommendations as the Plan was developed. A professional facilitator (Keystone Policy Center, hereafter Keystone) was hired to manage these processes, as well as the public comment process.

Chapter 2 describes key issues for conservation and management of wolves in Colorado.

This Plan is predicated on managing wolves in Colorado using “impact-based” management within an adaptive management framework that will allow CPW maximum flexibility to manage wolves. An adaptive management framework incorporates monitoring and evaluation components in an ongoing effort that helps participants accumulate knowledge regarding the system of concern (Walters 1986).

Fundamentally, this impact-based management can be summarized by one of the core tenets presented by the SAG:

- If wolves are creating conflict, manage to resolve the problem. When conflicts occur, they should be addressed on a case-by-case basis using a combination of appropriate management tools, including education, non-lethal conflict minimization techniques, lethal take of wolves, and damage payments. Proactive and reactive non-lethal conflict minimization techniques should be encouraged and explored as a first line of defense, with consideration of individual and community-level approaches. Lethal management should not generally be the initial response to conflicts, however there may be certain conditions under which lethal removal of wolves may be used first to support effective conflict management.

Another key assumption is that wolves will have both positive and negative impacts.

- Positive impacts, where they occur, should be recognized and fostered, and may include, but are not limited to: providing complementary offtake of ungulates in management units where they are overpopulated; dispersal of wild ungulates that may result in habitat improvement due to less herbivory on vegetative communities; selective removal of individual diseased animals from herds; and social, economic or non-monetary values, such as intrinsic value, existence value, and other possible values for present and future generations.
- Negative impacts could include, but are not limited to: depredation and harassment of livestock, herd dogs and guard animals; loss of pets and hobby animals; concentration of wild ungulates on private lands possibly resulting in property damage; reduced ungulate hunting or viewing opportunities and related economic considerations; reduced hunting license sales resulting in a reduction in recreational opportunity and decreased revenue for wildlife management; and declines in ungulate populations or in ungulate recruitment rates. Some negative impacts may be low on a statewide scale but can be acute on a local or individual scale, with social and economic impacts for those that are affected.

A successful restoration program for wolves in Colorado requires focus on several key issues for conservation and management. CPW identified seven key issues that are considered most significant for the future of wolf conservation and management: 1) social tolerance for wolves and economic impacts, 2) wolf recovery, 3) wolf management with respect to wolf-livestock interactions, 4) wolf management with respect to wolf-ungulate interactions, 5) wolf interactions with other wildlife species, 6) wolves and human safety concerns, and 7) monitoring and research. Each of these are detailed in this chapter.

Chapter 3 describes the restoration implementation.

It is anticipated that wolf reintroduction efforts will require the transfer of about 30 to 50 wolves, total, over a 3 to 5 year time frame. It is desirable to source wolves from the northern Rockies states (Idaho, Montana, and Wyoming) or other suitable donor sites (Oregon, Washington, as recommended by the TWG) with assistance from other state wildlife management agencies. Based on the TWG recommendations, CPW will aim to capture 10 to 15 wild wolves annually from several different packs over the course of 3 to 5 years by trapping, darting, or net gunning in the fall and winter. By reference, the TWG recommendations for Restoration Logistics (Appendix B) are incorporated into this plan, and will guide actions taken by CPW as work to restore gray wolf populations to the state is implemented.

Within Colorado, preliminary release locations are constrained by several geographic criteria. State statute requires that wolves be released only west of the Continental Divide. Scientists found that wolves released in Yellowstone and central Idaho in the mid-1990s moved substantial distances in the months immediately after release (average distance was approximately 50 miles, ranging from

approximately 22 to 140 miles from the release sites). Because of this, releases in Colorado will occur a minimum of 60 miles from ~~the Colorado's northern borders of with~~ Wyoming, ~~the western border of~~ Utah, ~~the southern border of~~ New Mexico, as well as a similar buffer, as requested by the Southern Utes, of sovereign tribal lands in southwestern Colorado.

There is an immediate need for post-release monitoring to assess and modify reintroduction protocols, if necessary, to ensure the highest probability of survival and site fidelity for released animals. All released wolves will be monitored using satellite GPS collars, which will inform managers on survival and dispersal, as well as future release protocols.

Chapter 4 describes the State recovery metrics and thresholds for wolves in Colorado.

As of February 10, 2022, wolves in Colorado are listed as endangered under the federal Endangered Species Act (ESA). ***This Plan does not replace a federal recovery plan, nor does it outline federal recovery goals.*** As this Plan is implemented, CPW will work in cooperation with the United States Fish and Wildlife Service (USFWS).

Wolves will be managed within Colorado using a phased approach, based on the minimum number of animals known to be present in the state. These phases correspond with status of the species on the Colorado Threatened and Endangered Species list.

A minimum wintertime count is the metric that will be monitored in the early phases of reintroduction. This count will include all wolves in the state, whether they are wolves that have naturally migrated into the state and their progeny, as well as those that were reintroduced. Any wolf anywhere in the state will count towards the minimum count.

This Plan authorizes downlisting of wolves from State Endangered (Phase 1) to State Threatened (Phase 2) when CPW biologists document a minimum wintertime count of 50 wolves anywhere in the state for four successive years. It authorizes delisting from the State Threatened and Endangered Species list and reclassification as nongame wildlife (Phase 3) when a minimum count of at least 150 wolves anywhere in Colorado is observed for 2 successive years, or a minimum count of at least 200 wolves anywhere in Colorado is observed, with no temporal requirement. At the time that the Parks and Wildlife Commission is considering delisting the species, CPW will conduct a Population Viability Analysis, or similar population modeling effort. This would be done to assess the extinction probability of the wolf population in Colorado, using Colorado-specific demographic parameters gained from research and monitoring the population in the state in the years between reintroduction and recovery. Wolves may be reclassified as a game species in Phase 4. Necessarily, this phase The long term management of wolves can only be framed in general terms at this time because forecasting the details of this future is impossible using currently available information.

Minimum counts for delisting are not intended and should not be interpreted as population objectives or maximum target populations.

Chapter 5 describes wolf management in Colorado.

All management of wolves in Colorado will be done in compliance with all state and federal laws and regulations. The Commission may pass regulations related to this Plan. In the event of any conflicts between the Plan and such regulations, such regulations will control.

Concurrent with this planning process, the United States Fish and Wildlife Service (USFWS) has embarked on a rulemaking process designed to provide management flexibility by designating Colorado's wolves as an experimental population under section 10(j) of the federal ESA. CPW and

USFWS anticipates that the resulting 10(j) rule will take effect prior to the reintroduction of wolves into the state, as was done when wolves were reintroduced into the northern Rocky Mountains in the mid-1990s. The 10(j) rule provides management flexibility that is a critical component to the success of this Plan and on which other components of the Plan depend.

Following reintroduction, some forms of aversive conditioning and lethal take will be necessary in order to protect human safety, reduce livestock depredation, or to mitigate substantial risks to or effects on ungulates will be necessary management tools. These management options are limited, however, while the gray wolf is listed as state or federal endangered or threatened. If the Colorado state listing status, Commission regulation, and ESA legal status of wolves were to change, including the anticipated adoption by USFWS of a 10(j) rule to direct management of wolves in the state, CPW expects to have increased management flexibility, including authority to lethally remove wolves for management purposes consistent with this Plan.

Not all impacts can be predicted, and that future management flexibility is crucial for adaptively managing impacts as they arise. With such uncertainty, the full gamut of potential management actions cannot be comprehensively identified this Plan.

Three primary categories of conflict and specific management considerations are described in this Plan. The three categories of impacts are: 1) Livestock Interactions, 2) Wildlife Species Interactions, and 3) Other Situations. For each of these categories, the impact and management tools are described. The deployment of these tools may be affected by the Phase that the wolf population is in.

Non-lethal, non-injurious hazing of wolves includes scaring off an animal(s) by making loud noises (e.g., confronting the animal(s) without doing bodily harm). These tools are acceptable in all Phases of wolf management. Non-lethal potentially injurious hazing means scaring off a wolf (or wolves) without killing but with potential for minor injury to the wolf (i.e., rubber bullets, etc.).

Assuming lethal take is legally authorized, this Plan describes conditions under which it may be used sooner or first to support effective conflict management, in tandem with successful recovery (e.g., specific scenarios, situations where non-lethal methods are unlikely to be effective, described in Chapter 5). CPW program managers, and if appropriate, USFWS personnel, will consider context on the ground (biological and social considerations for population growth, pack dynamics and distribution of wolves, recent and proximal depredations, etc.) when determining if lethal control should be applied. A preponderance of evidence, including dead or injured livestock or working dogs, or other physical evidence should be present, which would lead a reasonable person to believe that a depredating wolf or wolves were involved, or that a wolf attack on livestock or dogs was occurring or imminent.

There will be no Commission-imposed land, water, or resource use restrictions placed on landowners due to the presence of wolves or under this Plan. Federal land management agencies have sole management discretion over their lands. CPW has no legal authority to implement restrictions or land management prescriptions on lands it does not own or lease. Therefore, it will be important for federal agencies and CPW to collaborate on public land use issues as they relate to wolf management, which may include recreation, grazing management, public access, or habitat manipulation.

Chapter 6 describes wolf-livestock interactions, including compensation and conflict minimization programs.

Providing fair compensation to livestock owners for economic losses when livestock are injured or killed by wolves is a legally required and critically important part of the Plan. Pursuant to CRS 33-2-105.8 (4.5), CPW's funding program for wolf-livestock damage shall be appropriated from sources other than the

sale of hunting and fishing licenses or from associated federal grants. Instead, CPW will pursue a variety of funding sources to develop sustainable and robust wolf-livestock compensation and conflict minimization programs.

Temporary conflict minimization materials, such as turbo fladry and scare devices, will be provided to livestock owners on a case-by-case basis and CPW may evaluate the risks to livestock when providing these materials. Risks include but are not limited to the proximity of wolves to livestock based on monitoring data, previous depredating/non-depredating behavior of wolf pack, whether there has been a confirmed wolf-livestock depredation, ~~etc.~~). Temporary conflict minimization materials will be loaned to livestock owners and such materials will be delivered by CPW with instructions on their use and installation.

CPW will also provide education/outreach to livestock owners on other conflict minimization techniques (e.g., carcass management, herders/range riders, herd composition, etc.) that are identified and recommended in CPW's Wolf Resource Guide (https://cpw.state.co.us/Documents/Wolves/Wolf_Hands-on_Resource_Guide_Depredation_Prevention.pdf).

CPW's wolf-livestock compensation program provides 100 percent fair market value (FMV) compensation, up to a maximum of ~~\$815,000~~ \$815,000 per animal, for the confirmed death or injury of livestock (cattle, horses, mules, burros, sheep, lambs, swine, llama, alpaca, and goats, pursuant to CRS 33-2-105.8(5)) and guard/herding animals. Conflict minimization techniques are not required to be eligible for compensation; however, CPW will work with livestock producers to implement conflict minimization to reduce the risk of further depredations.

Once a confirmed livestock depredation event occurs (injury or death) to cattle or sheep, which is compensated at 100% FMV up to ~~\$815,000~~ \$815,000, livestock owners may *either* apply for missing calf, yearling, ~~or~~ sheep losses through a basic compensation ratio (i.e., number of calves, yearlings, or sheep ~~compensated that may be claimed per for each~~ confirmed depredation) *or* apply for itemized production losses (i.e., missing calves, yearlings, or sheep, decreased weaning weights, reduced conception rates and additional losses on a case-by-case basis) by providing specific baseline documentation. This allows livestock owners to choose whether to pursue a more simplified process versus one that will require additional documentation to support their claim. It would also allow livestock owners who sustain damage amounts greater than is covered by the compensation ratio to seek production loss compensation based on documentation they provide as part of the claim. For each claim submitted, the livestock owner has the option to choose between the simple compensation ratio or itemization but may not do both. ~~Claimant producers bear the burden of proof.~~

Chapter 7 describes the monitoring, ungulate management, research and reporting components of wolf restoration and management.

A comprehensive population monitoring program is an essential part of the wolf conservation and management program and will be conducted throughout the implementation of this Plan. CPW will have primary responsibility for monitoring wolves, but collaboration with tribes, other state and federal agencies, colleges and universities, landowners, local governments, non-governmental organizations, and the public will be necessary for a successful monitoring program. This coordination will be especially important when monitoring animals located on or near federal, tribal, and private lands, and along state borders. CPW will work with the USFWS to coordinate monitoring activities while the species remains federally listed as threatened or endangered under the ESA.

Whereas monitoring is an effort of systematic observation/measurement to assess population status and trends, research is an effort to test theory and use data to examine the efficacy of wildlife management techniques (or tools). Both are important for wolf management. Wolf research in Colorado will provide data that can be interpreted and used to inform management decisions. Research pertinent to wolf management in Colorado takes both socio-political and ecological environments into consideration.

Following reintroduction, wolf populations will be monitored to estimate annual population size and trends. All wolves released as part of the reintroduction will be equipped with GPS satellite collars. As packs establish, efforts will be made to collar at least one member of each pack with emphasis on breeding adults. The desired standard will be to have two collars in each pack; whether this is achievable for every pack in the state will be determined following reintroduction. There should be no expectation that every wolf in every pack will be collared – in fact as the wolf population grows, it may become challenging to maintain one collar in every pack. While not all packs will be expected to have collared wolves, managers will consider the proximity to livestock and history of wolf-livestock conflict when prioritizing collaring efforts.

In addition to collars, a variety of other monitoring tools are at the disposal of CPW biologists. Each is suited for different purposes and the deployment of these techniques will be done in a manner that efficiently and effectively addresses the monitoring questions being posed. Non-invasive techniques, such as winter track counts, aerial surveys, hair sampling, scat collection, howling surveys, trail cameras, and observations by field personnel and the general public may be used for basic population and distribution data collection.

Causes of wolf mortality will also be monitored. In unexploited populations, infectious disease, starvation, and intraspecific strife are the primary causes of wolf mortality. Monitoring and research activities will be the primary means of identifying both human-related and natural mortality factors for wolves. An important component of Colorado's wolf management program will be to adequately monitor and manage any potential sources of human-caused mortality.

Wolf health will be monitored following established CPW wildlife health monitoring practices including both active and passive disease surveillance. During live capture operations, animals will undergo a brief physical exam to assess body condition, estimate age, and survey for external parasites. Blood, feces, and other biological samples will be collected from live-captured animals, when feasible, and submitted to the CPW Wildlife Health Laboratory. Disease diagnostics will be tailored to the individual based on known health concerns in the population, research objectives, and disease surveillance priorities. The CPW Wildlife Health Laboratory will maintain banked serum, tissue, and other biological samples.

Monitoring prey in Colorado will also be important to the success of this program. The effects of predators on prey populations were one of the greatest concerns expressed by the public about wolf recovery in the northern Rockies. Recent community engagement in Colorado suggests that those same concerns occur across much of the state, particularly on the Western Slope. CPW extensively monitors all ungulate populations throughout the state. The reintroduction of wolves to the state will not cause any of these efforts to diminish. In fact, CPW has already invested in expanded, pre-wolf reintroduction ungulate monitoring, which is only likely to expand into additional areas as wolf populations grow and disperse across the state.

Future research priorities for CPW will examine both the social and ecological effects of having wolves in the state. All studies will be designed to provide meaningful data and information that will inform on-going and future management. Research emphasis may include social tolerance for wolves, wolf ecology

in Colorado, wolf-livestock interactions, wolf-ungulate interactions, and wolf interactions with other wildlife and effects on vegetation.

Because of the intense interest in wolves and the implementation of this Plan and because of statutory requirements, CPW will produce an annual report that summarizes required components of the wolf restoration program activities that occurred in Colorado during the previous year. Following the conclusion of the initial release, CPW staff will provide updates on the plan at least annually to the Commission on the plan's progress, but staff can be asked to provide an update at any time interval as there are new developments. A formal review of the progress of the plan will be scheduled five years after the completion of the reintroduction efforts.

Chapter 8 describes education, outreach, and agency coordination.

A well-informed public is essential to gray wolf conservation. Some authorities even consider outreach efforts to be the highest priority in restoring the species. It is crucial that wolves and wolf management issues be portrayed in an objective and unbiased manner, and that the public receives accurate information on the species. In this way, the solutions and compromises needed to resolve conflicts with wolves can be discussed honestly.

Colorado's citizens-residents and visitors need access to factual information about wolves and wolf management from wildlife managers. Likewise, to effectively manage wolves in the state, wildlife managers need to receive information from the public on sightings, depredation events, and wolf behavior, and to factor in public opinion. With this two-way communication, implementation of the Plan will have a higher probability of success and both managers and the public will have the necessary information to make conservation and management decisions to achieve Plan objectives.

CPW will continue to coordinate with other agencies and organizations to achieve wolf conservation and management objectives. This will be accomplished by continuing to use the expertise of the USFWS, the U.S. Department of Agriculture's Wildlife Services Program Animal Plant Health Inspection Service (APHIS), U.S. Forest Service (USFS), Bureau of Land Management (BLM), Colorado Department of Agriculture (CDA), tribal governments, private sector professionals, and other state agencies. Coordination with other state land management agencies such as the State Land Board, Colorado State Forest Service, and others will occur as needed. Further, CPW will engage non-governmental stakeholder organizations for input regarding wolf management in Colorado.

Chapter 9 describes funding needs.

Implementing this Plan will create logistical and financial challenges. The Division's capacity, through additional personnel, will have to be increased to ensure that the Plan is properly implemented. A variety of funding sources will be needed to conserve and manage this native species. Management costs for wolves will likely exceed costs currently in place for other carnivore species, such as black bears and mountain lions. Therefore, additional funding will be required to implement wolf population monitoring and management (and associated activities), including research, education and outreach, and compensation for livestock depredation. Livestock depredation investigations alone are likely to require a significant investment of staff time, detracting from an already high volume of existing responsibilities. Adequate resources for public information and public engagement will also need to be made available to meet the increased demands on the agency.

The Plan proposes programs that do not currently exist, both to monitor wolf and prey populations, and to mitigate impacts of wolf depredation on livestock. Successful implementation of the Plan will require additional staff, financial resources, and possibly legislative and regulatory updates to support those

programs. To fully implement the elements and strategies of the Plan, a formal wolf conservation program will need to be developed within CPW, as funding and additional staffing are made available.

As with any wildlife management program, CPW anticipates that the wolf program will evolve through time. CPW will undertake a thorough adaptive review of the wolf management program post-reintroduction. Cooperating state and federal agencies and tribes will also participate. Findings of the review will inform ongoing management of wolves in Colorado.

Chapter 1: Introduction and Background

Through the passage of Ballot Initiative 114 in the November 2020 state election, the citizens-voters of Colorado mandated that the Colorado Parks and Wildlife Commission (Commission) restore the gray wolf (*Canis lupus*) to the state. This Plan describes how this will be done. The Plan must not only outline the important management considerations for the long-term persistence of wolves but must also address the challenges of having wolves in Colorado after such a long absence.

The Commission and the Division (jointly referred to as CPW) will adopt and implement management programs to complete gray wolf restoration and the establishment of a self-sustaining wolf population in Colorado. As the state wildlife agency, CPW is already engaged in activities that will facilitate wolf restoration and future management through ungulate population monitoring, research, and management; through the acquisition and designation of State Wildlife Areas, and establishment of conservation easements and other efforts to conserve and restore wildlife habitats; and by providing compensation for losses due to predation by wildlife.

As of February 10, 2022, wolves in Colorado are listed under the federal Endangered Species Act as endangered. **This Plan does not replace a federal recovery plan, nor does it outline federal recovery goals.** CPW will work in cooperation with the USFWS as this Plan is implemented.

Wolves are habitat generalists. Wolf distribution in Colorado will ultimately be defined by the interaction between ecological needs and social tolerance, as is the case for many other wildlife species such as deer (*Odocoileus* spp.), elk (*Cervus elaphus*), black bears (*Ursus americanus*), and mountain lions (*Puma concolor*) (Decker and Purdy 1988, Fritts and Carbyn 1995, Bangs et al., 1998, Riley and Decker 2000). In addition to the biological considerations, there are important human dimensions to consider for wolf management. Social acceptance of wolves eclipses the confines of geography, land ownership, or land use designations just as a wolf pack's territory boundary transcends those same delineations. People have different tolerance levels, values, and attitudes about wildlife, particularly large carnivores. Furthermore, this tolerance will change in space and time and at different spatial and temporal scales. Because of these dynamic circumstances, an adaptive approach will help CPW implement its wolf program over the range of social acceptance values now and in the future as values change.

Implementing this Plan will create logistical and financial challenges. Agency capacity, through additional personnel, will have to be increased to ensure that this plan is properly implemented. A variety of funding sources will be needed to conserve and manage this native species on equal standing with other carnivore species, such as black bears and mountain lions. Additional funding will be required to implement wolf population monitoring and management including compensation for livestock depredation.

While the best available science is used in formulating this Plan, the Plan itself is not a compendium and review of the literature on wolf biology, ecology, management, and research. There are many sources that have thoroughly and recently compiled and reviewed this literature. The reader is referred to these sources for this information: Mech and Boitani 2003, Smith et al., 2020, USFWS 2020. Further, the efforts that other western states have undertaken to draft wolf management plans for their respective states have been immensely valuable in the drafting of this Plan for Colorado (Idaho Legislative Wolf Oversight Committee 2002, Montana Fish Wildlife and Parks 2002, Washington Department of Fish and Wildlife 2011, Wyoming Fish and Game Commission 2011, California Department of Fish and Wildlife 2016, Oregon Department of Fish and Wildlife 2019).

This plan does not create regulatory changes. Those much be accomplished through rulemakings by the Commission, in accordance with state rulemaking procedures in Title 24, C.R.S. To the extent of a conflict between this Plan and any implementing regulations, such regulations shall control.

Ballot Process and Description

Beginning in the summer of 2019, the Rocky Mountain Wolf Action Fund, ~~a citizen-led group~~, circulated petitions asking Colorado voters to place the following question on the ballot: “Shall there be a change to the Colorado Revised Statutes concerning the restoration of gray wolves through their reintroduction on designated lands in Colorado located west of the continental divide, and, in connection therewith, requiring the Colorado parks and wildlife commission, after holding statewide hearings and using scientific data, to implement a plan to restore and manage gray wolves; prohibiting the commission from imposing any land, water, or resource use restrictions on private landowners to further the plan; and requiring the commission to fairly compensate owners for losses of livestock caused by gray wolves?” (Colorado Secretary of State 2020).

A total of 215,370 signatures were submitted to the Colorado Secretary of State office on 10 December 2019, and subsequently certified on 06 January 2020, indicating that this issue would appear on the ballot in November 2020. This became Proposition 114. Early polling conducted by Colorado State University estimated that 84.0 percent of Coloradans would vote for the proposition (Niemiec et al., 2020). The Proposition passed with 50.91% of votes cast (1,590,299) voting in favor, and 49.09 percent of the voters (1,533,313) opposing (Colorado Secretary of State 2020). Support for the ballot measure was inconsistent across the state and heavily influenced by the populous front range (Figures 1 and 2). The resulting state statute (CRS 33-2-105.8, Appendix A) requires the Commission to develop a plan to restore and manage gray wolves in Colorado and take steps necessary to begin reintroductions by December 31, 2023.

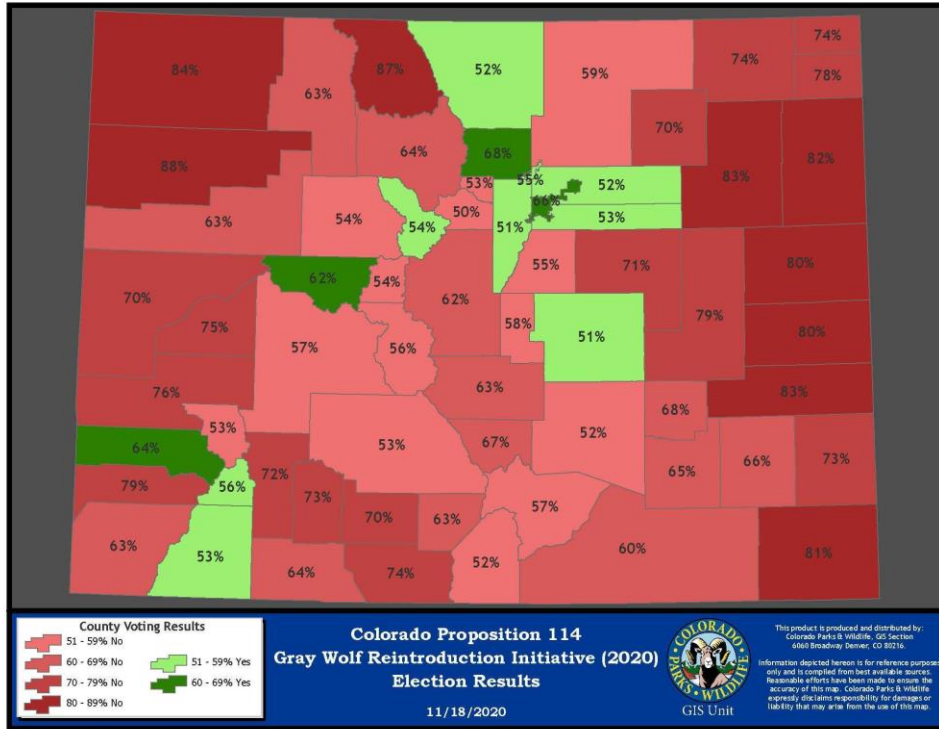


Figure 1. Proposition 114 election results by county showing percentage of each county in favor of/opposed to initiative.

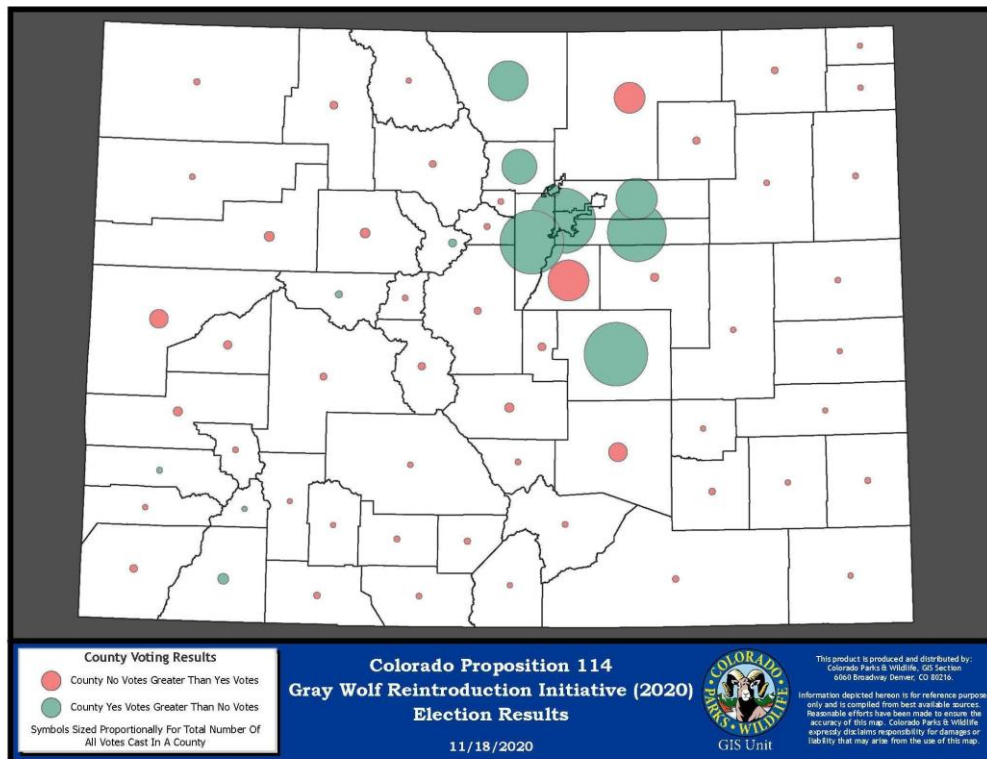


Figure 2. Proposition 114 election results by county and by relative population of the state.

Wolf Restoration and Management Plan Development

The Commission was responsible for developing the plan per state statute. The Commission served as the decision-making body responsible for approving the Plan. CPW convened a Technical Working Group (TWG) (Appendix B) and a Stakeholder Advisory Group (SAG) (Appendix C) to assist in the development of this Plan. A professional facilitator (Keystone Policy Center, hereafter Keystone) was hired to manage these processes, as well as the public comment process.

The members of the TWG were convened to review objective, science-based information as well as provide their own knowledge and experience at the state/federal/tribal level to inform the development of the Plan. The TWG was composed of members who brought experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. The TWG served in an advisory capacity to CPW, offering non-binding input into the development of Plan content. The TWG was not a decision-making body and had no authority on wolf management policy, research, or operations. The TWG operated by consensus. For purposes of the TWG, consensus referred specifically to general agreement, or lack of objection, that an option or alternative had sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views were documented (see Appendix B).

The SAG offered a broad range of perspectives and experience and provided recommendations about the social implications associated with wolf restoration and management strategies for the Plan. CPW leadership selected stakeholders to serve on the SAG. To enhance transparency and inclusiveness, SAG participants were recruited via an open application process that was available to anyone who was interested. CPW Leadership used three criteria to select stakeholders: 1) geographic representation, (2) representation of diversity of interests/perspectives/opinions, and (3) willingness to work together to accomplish the goals outlined in the ballot initiative. Using an open application process has the potential to address issues of inequity and power and increase legitimacy and transparency, all of which are described in the social science literature as best practices of stakeholder engagement (Niemic et al., 2021). The SAG was composed of 17 voting members and 3 non-voting members. The SAG served in an advisory capacity to CPW, offering non-binding input into the development of plan content. As with the TWG, the SAG was not a decision-making body and had no authority on wolf management policy, research, or operations.

Where possible, the SAG strived to make decisions based on the consensus of all voting members. Where the SAG was able to achieve consensus, its input received priority consideration by CPW. Per the SAG charter, consensus was defined as a general agreement shared by all people in a group; it reflected a recommendation, option, or idea that all participants could support or abide by, or, at a minimum, to which they did not object. Where consensus did not exist, a vote was taken, and the votes of individual members were recorded along with a summary of the rationale for supportive and dissenting views (see Appendix C).

The TWG and the SAG met monthly between June 2021 through August 2022. In that period, the TWG met 14 times and the SAG met a total of 15 times.

CPW and Keystone engaged approximately 3,400 participants through 47 meetings and an online comment form in the summer of 2021. Meetings included 16 in-person public open houses throughout the state; 17 in-person Western Colorado geographic focus groups; 10 virtual interest-based focus groups; 2 in-person Tribal consultations; and 2 virtual town halls. All meetings and the online comment form provided the same informational materials (in the form of video presentations or posters) as well as the same questions posed to the public. The report of these meetings is summarized in Keystone Policy Center (2021).

Using input from the TWG, the SAG, and the public meetings and hearings, CPW staff developed a draft Plan. The draft Plan was presented to the Commission and shared with the public in December 2022. The draft Plan was finalized and approved by the Commission on **complete when final.**

Plan Goals

This plan fulfills the statutory requirements of CRS 33-2-105.8.

The primary goal of this Plan is:

To identify the steps needed to recover and maintain a viable, self-sustaining wolf population in Colorado, while concurrently working to minimize wolf-related conflicts with domestic animals, other wildlife, and people.

Specifically, this Plan will:

- Outline and implement a methodology to restore, establish, and manage a self-sustaining population of gray wolves using the best scientific data available.
- Outline a methodology for determining when the gray wolf is sustaining itself successfully and when to remove the gray wolf from the state list of endangered or threatened species.
- Outline a program to assist owners of livestock in how to prevent and resolve conflicts between wolves and livestock, including compensation and conflict minimization programs.

Previous Planning Efforts for Wolves in Colorado

This current effort is not the first time that the State has developed recommendations for wolf management. In 2004, the Colorado Division of Wildlife (CDOW, now CPW) director convened a 14-person working group to develop recommendations on how wolves that naturally migrate into Colorado should be managed once the species was federally delisted and management authority was returned to the State (Colorado Wolf Management Working Group 2004). When that group was convened, wolves were listed as federally endangered and therefore under the management authority of the USFWS. A programmatic direction and a spectrum of management activities was needed for the CDOW to address potential wolf-livestock conflicts, to maintain viable prey species populations, to address other management issues, and to gain the support of a public with diverse interests. The final product of this effort was the 2004 Findings and Recommendations for Managing Wolves that Migrate into Colorado (Colorado Wolf Management Working Group 2004).

The 2004 Findings and Recommendations did not consider any aspect of reintroduction or recovery metrics. Rather, it simply stated that wolves that migrate into the state will be managed with a “live and let live approach.” If conflict with ungulate populations or livestock occurred, those problems would be managed using either lethal or non-lethal approaches. Importantly, the Findings and Recommendations did not preempt Colorado Wildlife Commission authority to formulate annual rules, set hunting regulations, or implement emergency actions in response to unexpected events or circumstances. It was, in essence, a suite of recommendations, nothing more.

The Colorado Wolf Management Working Group’s recommendations were adopted in their entirety by the Colorado Wildlife Commission at its May 2005 meeting and reaffirmed by the Colorado Parks and Wildlife Commission in January 2016. Where appropriate, components of this original wolf planning effort are incorporated into this Plan. To the extent there is a conflict between this Plan and the Working Group’s prior recommendations, this Plan controls.

Summary of Historical Distribution of Wolves in Colorado

The gray wolf occupied most of the North American continent at the time of European settlement. Its range was reduced dramatically and by the 1880s wolves were extirpated from the east coast to the central part of the United States. Gray wolves were still fairly common throughout most of the northwestern United States until the early 1900s (Young and Goldman 1944).

Pressure from the livestock industry and a generalized public fear led to the widespread persecution, and eventual near total extirpation of gray wolves from all western states. The gray wolf historically inhabited all counties in Colorado and was extirpated from the state in the mid-1940s (Armstrong et al., 2011). While CPW had received reports of gray wolves in the state, it was not until 2004 when a dead wolf was found on the side of Interstate 70, that there was hard evidence that this was the first wolf to have moved into Colorado from the Northern Rockies in recent history. Several reports of wolf sightings in the State have been received and confirmed since 2004 (Table 1). In June 2021, CPW biologists confirmed the first documented whelping in Colorado in approximately 80 years; wolves naturally migrated into north central Colorado, paired, and gave birth to at least six pups.

Table 1. List of confirmed wolves in Colorado 2004-2021

<i>Date</i>	<i>Location</i>	<i>Origin</i>	<i>Sex</i>	<i>Color</i>	<i>Outcome</i>
06/07/2004	Near Idaho Springs, CO	Unknown	Female	Gray	Found by the side of I-70, deceased.
02/16/2007	North Park, CO	Unknown	Unknown	Black	Video taken by Colorado Division of Wildlife (CDOW) staff.
02/2009	North of Rifle, CO	Montana, Mill Creek 314F	Female	Gray	Presumed poisoned.
04/2015	Middle and North Park, CO	Wyoming, 935M	Male	Black	Trail camera and radio collar data.
04/29/2015	Kremmling, CO	Unknown	Male	Gray	Mistakenly shot by coyote hunter.
11/12/2018	Divide, CO	Colorado Wolf and Wildlife Center	Male	Mexican Wolf	Captive raised wolf escaped from facility near Divide, CO. Animal was recaptured.
07/08/2019	North Park, CO	Wyoming, F1084, Snake River Pack	Female	Black	Wolf was photographed in North Park, CO.
01/06/2020	Moffat County	Unknown	Group of approximately six	N/A	Scavenged elk carcass and prints reported. Genetic analysis of scat was conducted. CPW staff later confirmed a group of at least six wolves.
01/19/2021	Jackson County	Unknown	Male	Gray	Visually confirmed and collared by CPW staff. Wolf now identified as 2101.
06/04/2021	Jackson County	Unknown	Male and Female	Varied	Visual confirmation of six pups with F1084 and 2101 by CPW staff.

Legal Status

Federal

The gray wolf has had a long and complex history with respect to the federal status under the Endangered Species Act. A brief history is provided below (USFWS 2020).

In 1973, the USFWS listed the subspecies, the Northern Rocky Mountain (NRM) gray wolf (*C. lupus irremotus*) (38 FR 14678, June 4, 1973), pursuant to the Endangered Species Conservation Act of 1969. In 1974, the NRM gray wolf was listed under the Endangered Species Act (ESA) (39 FR 1171, January 4, 1974). Due to questions about the validity of wolf subspecies classification at the time and issues associated with the narrow geographic scope of each subspecies, the USFWS published a rule reclassifying the gray wolf as endangered at the species level (*C. lupus*) throughout the contiguous 48 States (43 FR 9607, March 9, 1978).

This rule also provided assurance that this reclassification would not alter the USFWS’s intention to focus recovery on each population as separate entities, including the Northern Rocky Mountains (NRM)

region, which includes Idaho, Montana, Wyoming, eastern Oregon, and eastern Washington. Accordingly, a recovery plan was developed for the NRM gray wolf population in 1980 (revised in 1987) (USFWS 1980, USFWS 1987).

The 1980 NRM wolf recovery plan's objective was to re-establish and maintain viable populations of the NRM wolf in its former range where feasible (USFWS 1980), however it did not include recovery goals (i.e., delisting criteria).

The 1987 plan specified a recovery criterion of a minimum of 10 breeding pairs of wolves (defined as 2 wolves of adequate age capable of producing offspring) for a minimum of 3 successive years in each of 3 distinct recovery areas including northwestern Montana, central Idaho, and the Greater Yellowstone Ecosystem (GYE) (USFWS 1987). The 1987 recovery plan recommended that connectivity between these areas be encouraged. Critical reviews of the criteria in the 1994 EIS and in a 2001/2002 peer review each resulted in minor changes to the recovery criteria (USFWS 1994).

Wolves were reintroduced into Yellowstone National Park and central Idaho in 1995 and 1996 as non-essential, experimental populations under Section 10(j) of the ESA (Fritts et al., 1997). Wolves in the northwest Montana portion of the NRM were present when wolves were reintroduced into Yellowstone National Park and central Idaho due to natural emigration from the Canadian population to the north, thus were designated as endangered and were not part of the non-essential, experimental population.

Wolves in most of the NRM were delisted by an Act of Congress in 2011. Wolves in Wyoming were not included in 2011 law, but were later delisted by USFWS in 2017. Thus, as of the date of this Plan, wolves are not federally listed in Wyoming, or the rest of the northern Rockies, but are listed as endangered elsewhere in the western states including Colorado, most of Utah, California, and western Oregon and western Washington.

The 2009 delisting rule for NRM wolves (which was subsequently vacated and then reinstated – see USFWS 2020 at 69781) summarized the recovery criteria at that time as “thirty or more breeding pairs (an adult male and an adult female that raise at least 2 pups until December 31) comprising 300+ wolves in a metapopulation (a population that exists as partially isolated sets of subpopulations) with genetic exchange between subpopulations” (USFWS 1994). Step-down recovery targets require Montana, Idaho, and Wyoming to each maintain at least 10 breeding pairs and 100 wolves by managing for a safety margin of at least 15 breeding pairs and at least 150 wolves in mid-winter. Genetic exchange can be natural or, if necessary, agency managed. Federal recovery goals for this species have never been identified for Colorado.

Until 2021, gray wolves in Colorado were listed as endangered under the ESA and were under the management authority of the USFWS. However, the USFWS published a Final Rule to delist the species in all of the contiguous United States (USFWS 2020), effective January 4, 2021. Litigation challenging this decision was filed and the delisting was vacated by a federal district court in California (February 10, 2022), returning the species to its previous status (endangered in most of the lower 48, including Colorado, but not including the NRM). The district court decision has been appealed, and is currently under review by the Ninth Circuit Court of Appeals. Because of the uncertainty about the federal status of wolves, close coordination with USFWS has occurred throughout the Plan development process and will necessarily continue through the implementation stages. The development and implementation of permits and tools to provide regulatory assurances and management flexibility will be of high importance. To that end, at CPW's request, USFWS is undertaking the process to develop a 10(j) rule to address management of wolves throughout Colorado, concurrent with the development of this Plan.

That is a separate, but related process. The 10(j) rule provides management flexibility that is a critical component to the success of this Plan and on which other components of the Plan depend.

State

Gray wolves are currently classified as “State Endangered” within Colorado. A State Endangered Species is defined as: any species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy as determined by the commission. CRS § 33-1-102 (12). A State Threatened Species is defined as any species or subspecies of wildlife which, as determined by the commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered. CRS § 33-1-102 (44).

Under state law it is illegal for any person to hunt, take, or have in their possession any wildlife that is the property of the State unless it is specifically permitted. CRS § 33-6-109. Unauthorized take of an endangered or threatened animal is punishable by a fine of not less than two thousand dollars and not more than one hundred thousand dollars, or by imprisonment for not more than one year in the county jail, or by both such fine and such imprisonment, and an assessment of twenty points towards restrictions of hunting and fishing privileges. Upon conviction, the Colorado Parks and Wildlife Commission may suspend any or all license privileges of the person for a period of from one year to life.

All wildlife in Colorado is classified as either game or nongame. State threatened or endangered species are a subset of nongame wildlife in Colorado (see Chapter W-10, CPW Regulations). The Commission has statutory authority to add or remove species from the lists of endangered, threatened, and nongame wildlife.

Chapter 2: Background and Key Elements for Conservation and Management

Wolf Management

Overall Management Philosophy

CPW will conserve and manage wolves in concert with the rest of our State's native wildlife. Active management will be required to address conflicts between wolves, people, livestock, and other wildlife species. Conservation and management are not mutually exclusive concepts. Using a variety of management tools, our intention is to integrate and sustain wolves in suitable habitats within the complex biological, social, and economic landscapes of Colorado.

The term "management" refers to deliberate action or specific conservation activities implemented by agencies or other entities to assure the long-term presence of a wolf population and minimization of potential conflict or the resolution of conflict where and when it develops. Agency actions are selected from a spectrum of possibilities and are aimed at matching the appropriate management tools to the situation. It is important to emphasize that management is not synonymous with lethal control. Wolf population management will include the full range of tools from non-lethal to lethal (when allowed under state and federal laws) and will incorporate other agency functions such as public outreach, conservation education, law enforcement, landowner relations, and wolf conservation actions. Non-lethal techniques can include education about changing livestock husbandry practices as well as attempts to modify wolf or pack behavior through hazing.

This Plan is predicated on managing wolves in Colorado using "impact-based" management within an adaptive management framework that will allow CPW maximum flexibility to manage wolves. An adaptive management framework incorporates monitoring and evaluation components in an ongoing effort that helps participants accumulate knowledge regarding the system of concern (Walters 1986). The Colorado Wolf Management Working Group Recommendations (2004) developed a list of fundamental assumptions related to what impact-based management meant at that time. The SAG revisited those points and reaffirmed and supplemented them. These were presented to CPW. CPW further expanded some concepts to arrive at the following key tenets to define "impact-based" management which are foundational to this Plan.

Goals and Range of Impacts

- Goals of impact-based management include restoration of wolves, minimization of conflicts, minimization of lethal take, and building of trust across communities. Impact-based management should consider biological, ecological, social, agricultural, and economic dimensions of wolf management and should recognize and consider diverse perspectives on these topics.
- The presence of wolves in Colorado will have both positive and negative impacts on humans, wildlife, other animals, and local ecosystems.
- Impacts will vary in intensity and location based on a variety of factors including wolf distribution, density, and behavior; distribution, species, and density of livestock and wild ungulates; and land ownership patterns. Some impacts, such as the possibility of increased tourism, may be viewed as negative or positive by different stakeholders and communities.
- Negative impacts could include, but are not limited to, the following: depredation and harassment of livestock, herd dogs, and guard animals; loss of pets and hobby animals; concentration of wild ungulates on private lands possibly resulting in property damage; reduced ungulate hunting or viewing opportunities; reduced hunting license sales resulting in decreased revenue for wildlife management; and declines in ungulate populations or in ungulate recruitment rates. Some negative

impacts may be low on a statewide scale but can be acute on a local or individual scale, with social and economic impacts for those affected.

- Positive impacts, where they occur, should be recognized and fostered, and may include, but are not limited to: providing complementary offtake of ungulates in management units where they are overpopulated; dispersal of wild ungulates that may result in habitat improvement due to less herbivory on vegetative communities; selective removal of individual diseased animals from herds; and social, economic or non-monetary values, such as intrinsic value, existence value, and other possible values for present and future generations.

Managing Impacts

- Wolves will be left wherever they are if they are not causing problems.
- Monitoring of wolf populations, livestock conflict, wild ungulates, other wildlife species, hunter opportunity and success, and human attitudes is an essential aspect of impact-based management. Monitoring of economic and social dimensions may also be conducted by sectors beyond CPW.
- If wolves establish in places where conflict is likely (e.g., in proximity to livestock) proactive measures should be taken to avoid problems using non-lethal methods. CPW – in partnership with Tribes in the case of conflicts arising on the sovereign lands of Tribal nations – will work with livestock owners to investigate, assess the situation, and take appropriate action. Public and private organizations may also provide support for conflict minimization in consultation with CPW.
- If wolves are creating conflict, manage to resolve the problem. When negative impacts occur, they should be addressed on a case-by-case basis using a combination of appropriate management tools, including education, non-lethal conflict minimization techniques, lethal take of wolves, and damage payments. CPW will encourage use of proactive and reactive non-lethal conflict minimization techniques as a first line of defense, along with consideration of individual and community-level approaches. Lethal management should not generally be the initial response to conflicts, but there may be certain conditions, discussed in Chapter 5, under which lethal removal of wolves may be used first to support effective conflict management.
- Flexibility in the array of management tools is essential to accommodate changing circumstances over time and to allow discretion for managers to consider biological and social context on the ground.
- Management must comply with federal and state regulations. Use of management tools may be phased based on state listing status, balancing consistency across phases with specific legal considerations. While wolves are federally listed, management tools must be used in accordance with the provisions of the ESA, including any 10(j) or other rules issued pursuant to the ESA.
- Successful wildlife management includes both public and private lands, providing, where possible, consistency of management across land jurisdictions.
- As with any wildlife management program, the wolf management program will evolve through time; pragmatic, creative, and adaptive management should be applied.

Engagement, Outreach and Capacity to Support Impact-Based Management

- CPW may, at its discretion, reconvene the SAG or TWG or another advisory group(s). These groups may assist in finding resolution to unexpected or non-routine developments that may occur.
- A high degree of cooperation and coordination among management agencies within the state, among states, among state and federal partners, and between the state and Tribes, is necessary to ensure that management actions and damage payments are efficient and timely. Cooperation and coordination between management agencies and the private sector can be beneficial to support conflict minimization.

- Education and outreach to foster shared learning and understanding of issues, management actions, and consequences are key components of successful wolf management in Colorado. Effectiveness of education and outreach is impacted by coordination and agreement on messaging. It is important to provide livestock owners and their agents clarity on allowable actions, legal parameters, and required permits or verifications.
- Sufficient funding and additional CPW staff should be made available to implement all aspects of this Plan.

Key Elements

A successful restoration program for wolves in Colorado requires focus on several key elements for conservation and management. CPW identified seven key elements that are considered most significant for the future of wolf conservation and management: 1) social tolerance for wolves and economic impacts of their presence in the state; 2) wolf recovery; 3) wolf management with respect to wolf-livestock interactions; 4) wolf management with respect to wolf-ungulate interactions; 5) wolf interactions with other wildlife species; 6) wolves and human safety concerns; and 7) monitoring and research.

Detail and background are provided for each of these key elements in the remainder of this chapter. Subsequent chapters take each of these key issues and describe specific actions necessary to implement a successful conservation program for this species.

Key Element 1: Social Tolerance for Wolves and Economic Impacts

The gray wolf symbolizes the diversity of American thoughts, values, and opinions. From persecuted beast, to resourceful survivor, to the top of the food chain, the gray wolf encapsulates the full spectrum of human emotion and interests (Bangs et al., 1998). As a result, wolf management is likely to remain as complex as it is controversial (Bangs et al., 1998). Those involved in the Yellowstone National Park and Idaho wolf reintroduction processes described wolves as being the most contentious and scrutinized natural resource issue of their careers (Fritts et al., 1997).

Today, the social, cultural, and aesthetic values that Coloradans assign to gray wolves remain diverse but national and Colorado-based survey results highlight generally positive attitudes toward wolves (Pate et al., 1996; Meadow et al., 2005). However, these studies also indicated that attitudes, concerns, and perceptions are often different across stakeholder groups. As a result, social scientists and wolf experts emphasize the need for balanced and comprehensive public outreach, stakeholder engagement, and education efforts. Specifically, the most valuable managers are those that consider the breadth of stakeholder perspectives throughout the entire engagement process (Niemiec et al., 2021).

Ultimately, successful stakeholder engagement processes are inclusive, equitable, efficient, collaborative, participatory in nature, and, in the context of natural resource management, include biological/ecological as well as social goals (Blahna and Yonts-Shepard 1989; Lauber and Knuth 1999; Lord and Cheng 2006; Renn et al., 1995; Smith and McDonough 2001; Susskind and Cruikshank 1987). Additional best practices include engaging the public early and often in meaningful ways (so as to empower participants); incorporating public involvement opportunities throughout the entire planning process; obtaining data from representative stakeholders using a variety of methods; and using these data in decision making processes (Blahna and Yonts-Shepard, 1989; Chase et al., 2004, Reed 2008). When these aspects are meaningfully integrated into stakeholder engagement processes they help minimize conflict; reduce the likelihood that stakeholders or groups are marginalized; legitimize planning processes and outcomes; empower stakeholders; improve trust (especially when processes are

transparent); promote social learning; lead to higher quality decisions; and increase knowledge, awareness, and overall support for decision making (Plummer et al., et al., 2017; Okali et al., et al., 1994; Richards et al., et al., 2004; Serenari et al., et al., 2018; Smith and McDonough 2001).

CPW, in collaboration with Keystone Policy Center, engaged members of the public in a variety of ways as this Plan was developed. As the Plan is implemented, CPW and partner agencies, NGOs, and other stakeholder groups will continue to use tools to improve social tolerance. Ongoing social science research and potential future studies may explore the efficacy of CPW's reintroduction efforts as well as other aspects associated with the human dimension of wolf reintroduction.

A recovered wolf population in Colorado will bring both positive and negative economic impacts. The economic impacts associated with wolves are often difficult to predict but will be better understood through time as a sustainable wolf population is established and wolf management in Colorado evolves (Hoag 2022).

Positive economic impacts may be realized from increased tourism in gateway communities. Colorado is well known for its abundant wildlife, scenic mountains, national parks and wildlife refuges. Wildlife viewing is among the top outdoor recreation activities for visitors and residents alike. The opportunity to view wolves potentially adds to the host of viewable wildlife in the state. For example, Hoag et al., (2022) examined the economic impact of wolves in the Western United States and found that the financial benefits associated with having wolves on the landscape was many times greater than what it cost to manage them. The authors used a "willingness to pay" structure to examine these differences and, importantly, also recognized that the costs and benefits are often unevenly distributed. Additionally, they described the willingness to transfer some of the economic benefits to the minority, particularly agricultural livestock owners (who bear many of the costs) as a critical aspect to consider when developing effective and equitable policies.

Negative impacts include economic losses from livestock depredation, and possibly decreased hunter opportunity due to shifts in ungulate distribution or a reduction in ungulate license numbers to account for predation caused by wolves. If hunter opportunity decreases, CPW may see reduced license sales and associated income, and local economies may be impacted from the loss of hunters. The outfitting industry also may be negatively impacted if license sales decrease. However, outfitters may also benefit from some clientele wanting to view wolves. There may be an increased potential for game damage from ungulates if wolves shift ungulate (primarily elk) distribution from public to private lands. Agency capacity is likely to be affected as well, with many currently assigned resources being reallocated to manage wolf issues. Without additional staff and funding, existing wildlife conservation priorities may receive less attention over time.

Evaluating and calculating the economic benefit that a wolf restoration program has to the **citizens** **residents** and visitors of Colorado, including who benefits and who pays, will be an important aspect to developing support for this program.

Key Element 2: Wolf Recovery

The primary goal of this plan is to establish a self-sustaining population of wolves. Achieving this goal will be measured and compared against recovery objectives (Chapter 4). Recovery objectives for downlisting and delisting a species need to be based on adequate numbers of individuals which ensures that a self-sustaining population is reestablished. For the purposes of this Plan, a self-sustaining population is one that maintains viability over time without continuous human intervention and conservation actions. For wolves, long-term persistence of a population in Colorado will depend on

several factors, including survival and recruitment rates, disease, prey availability, predation, proximity and connectivity (e.g., vonHoldt et al., 2008) to other populations (outside and potentially within the state), competing carnivore populations, the extent of conflicts with livestock production, and, perhaps most importantly, overall social tolerance by people.

The number of individual wolves needed to maintain the long-term viability of wolf populations is widely debated. In 1994, the U.S. Fish and Wildlife Service (2008) concluded that 30 or more breeding pairs comprising 300 or more wolves in a metapopulation (a population made up of partially isolated sets of subpopulations that exchange individuals and recolonize sites in which the species has recently become extirpated) should have a high probability of long-term persistence. The geography for this analysis was the NRM states of Montana, Idaho, and Wyoming. These states each manage a minimum of 15 breeding pairs and 150 animals to meet minimum federal delisting thresholds.

A synthesis of literature (Fritts and Carbyn 1995) gave insight into minimum population size and area requirements for wolf conservation. The authors reviewed the scientific literature on minimum viable population size, examined case histories of wolf populations, and queried biologists familiar with wolves. These authors were skeptical of results from traditional population viability analyses because those mathematical models were based on insufficient theoretical models to account for the high resilience of small wolf populations. In their survey of biologists about whether recovery goals in the Northern Rocky Mountain Wolf Recovery Plan would equate to a viable wolf population, 61 percent of respondents believed that 10 breeding pairs (about 100 wolves) met the minimum standard of a viable population, whereas 70 percent agreed that three groups of 10 breeding pairs and 100 wolves in a metapopulation (about 300 wolves) for three consecutive years met the definition of viability (Fritts and Carbyn 1995). Based on this assessment, Fritts and Carbyn (1995) concluded that 100 or more wolves might be needed to maintain viability in isolation.

Low-density wolf populations can increase rapidly if they are protected and prey is abundant. Wolf populations in the greater Yellowstone area and Idaho areas exceeded all expectations for survival and reproductions after the initial reintroductions took place (Bangs et al., 1998). Within two years, populations became reestablished in both areas, rather than the predicted three to five years, and pup production and survival were high. However, as populations grew and wolf densities increased, social interactions among packs intensified, causing intraspecific conflict and increased competition for food. There is evidence that the leveling off of the wolf population in Yellowstone was driven by a combination of disease and declining prey resources. Sarcoptic mange and canine distemper both affected the population from 2007 through 2009; distemper killed a high percentage of pups and mange killed off many breeding aged adults. The population could not rebound to its size prior to the disease outbreaks. While intraspecific mortality is important on a small scale, prey availability and disease are likely much more important on a relatively larger scale (Brandell et al., 2020, DeCandia et al., 2021). These and other factors including disease eventually caused populations to level off or decline (Keith 1983, Fuller 1989).

An underlying tenet of endangered species recovery is that populations need to be functionally connected so that genetic material can be exchanged. Generally, the impact from the loss of genetic variation may pose a conservation threat to any species by causing reduced disease resistance, decreased reproductive rates, and other problems. This can result in challenges to the long-term recovery of populations regardless of other factors such as habitat and prey availability. Inbreeding depression has been suggested as the cause of reproductive problems (e.g., reduced sperm quality, decreased litter size, reduced pup survival) and other problems (e.g., congenital backbone deformities)

noted in several small wolf populations (Wayne and Vilà 2003, Liberg et al., 2005, Asa et al., 2007, Fredrickson et al., 2007, Rääkkönen et al., 2009). Nevertheless, many existing wolf populations have persisted for decades or centuries with low genetic diversity (Fritts and Carbyn 1995, Boitani 2003). Wolf populations are broadly considered to be more threatened by issues relating to excessive human-caused mortality than by genetic concerns (Boitani 2003). Current wolf populations in the northern Rocky Mountain states are characterized by high levels of genetic variability and substantial gene flow (Forbes and Boyd 1996, 1997, vonHoldt et al., 2008, 2010, Hebblewhite et al., 2010), meaning that wolves arriving in Colorado from these sources should be genetically healthy. The continued migration of wolves from the established populations in the NRM states (Table 1) will serve to supplement the genetic diversity of the population that is to be established in Colorado.

Key Element 3: Wolf Management with Respect to Wolf-Livestock Interactions

Another key element in a successful wolf reintroduction, conservation, and management effort focuses on wolf-livestock interactions. Wolves typically feed on wild ungulates. However, where wolves and domestic livestock co-occur, conflicts can arise, particularly where both livestock and wolf densities are high. Minimization of impacts to livestock owners, a required component of the Plan, will rely on a strong partnership between CPW and stakeholders working collectively to identify and implement best practices and working solutions.

Some, but not all, livestock owners experience significant direct or indirect economic impacts due to wolf presence or depredation (Bangs et al., 1998). ~~In North Park, where Colorado's only current wolf pack resides, conflict has so far been primarily associated with 1 known livestock owner.~~ Wolf impacts to livestock, including direct mortality from wolf predation, and decreased weight gain, beget costs to livestock owners. These costs are unevenly distributed and localized, with some livestock owners suffering greater losses than others. Although wolf depredation is a small economic cost to the livestock industry as a whole, the impacts to individual livestock owners can be substantial.

Proactive conflict minimization techniques can help prevent conflict. Such tools often focus on modifying wolf, livestock, or human behavior to minimize encounters. For example, physical or psychological barriers or scare tactics can be established to try to ward off wolves and other predators. These include fladry (electrified-flagging), lights, and sound devices that rely on neophobia and can be temporarily effective. These in and of themselves are not long-term fixes but are meant to reduce conflict during periods of high vulnerability.

Modifying livestock management practices, particularly during calving or lambing seasons when animals are most susceptible, may help reduce conflicts. Removal of carcasses of livestock that have died can also be useful, as carcasses can attract wolves and other predators. When possible, adaptively managing grazing allotments, when allowed by federal land managers, helps mitigate the risk of depredation – for example, grazing near known wolf dens or rendezvous sites increases the vulnerability of livestock to depredation. Thus, adjusting pasture rotations to avoid close proximity to dens during denning or rendezvous sites can reduce conflict. Such livestock management practices entail costs in terms of time, labor, and money that need to be considered if they are to be implemented by livestock owners.

Although livestock (defined in CRS 33-2-105.8) losses from wolves in Colorado are expected to occur on large ranches and public land grazing allotments, wolf-related losses may also occur on smaller parcels in rural-residential areas. Many Coloradoans reside in such areas, often located on elk and deer winter

ranges or adjacent to public land or private forest and rangelands. In addition to cattle and sheep, other livestock including horses, goats, llamas, and donkeys, may be subject to depredation events.

Domestic dogs used for livestock protection have also been killed by wolves, particularly those guarding sheep from predators in remote locations. When an adequate number of working dogs and trained herders are present with livestock, animals appear to be less at risk from wolves. Wolves also tend to avoid humans, so people accompanying livestock such as herders, range riders, or scouts, can reduce encounters and help manage herds proactively. Increased presence of range riders can also be effective in identifying timely cattle and sheep depredations for confirmation and moving livestock to areas where they are less vulnerable. However, this higher vigilance results in increased costs to livestock owners.

Livestock Loss to Wolves

Addressing gray wolf-livestock conflicts is an essential part of this Plan. The agricultural industry is a vital component of the Colorado economy and provides important open space and habitats that support a wide variety of wildlife.

Depredations on cattle, sheep, other livestock, and guarding/herding dogs has occurred during the recovery of wolves in other states. Despite significant increases in wolf populations, confirmed losses to wolves have remained small to date relative to livestock numbers (Bangs et al., 2005, USFWS 2008). Many factors influence depredation rates on livestock, including the proximity of livestock to wolf territories, dens, and rendezvous sites; pack size; abundance of natural prey and livestock; amount and type of vegetative cover; time of year; livestock husbandry methods in both the area of concern and adjacent areas; the use of conflict minimization techniques, deterrents, and lethal take; pasture size; and proximity to roads, dwellings, and other human presence (Mech et al., 1988, Fritts et al., 2003, Treves et al., 2004, Bradley and Pletscher 2005). These factors also make it difficult to predict where and when depredations by wolves will occur.

Wolves don't necessarily attack every time they encounter livestock, but at some point most wolf packs that regularly encounter livestock are more likely to depredate (Bangs and Shivik 2001, Wydeven et al., et al., 2004). Some packs show increasingly frequent depredation behavior, while others may do so once or twice a year, every other year, or even less frequently (USFWS 2011).

Sime et al., (2007) reported that among the 162 livestock owners suffering confirmed wolf depredation in Montana between 1987 and 2006, 62 percent experienced a single incident, 20 percent experienced two incidents, and 17 percent experienced three or more incidents. A similar percentage (59 percent) of livestock owners with wolf depredation in Wisconsin experienced a single incident between 1976 and 2000 (Treves et al., 2002). These affected livestock owners represented 0.4 percent of the 7,424 full-time livestock owners in the state's 19 counties. In Minnesota, the number of livestock farms with verified wolf depredations on livestock was 0.3% annually during the period when there were 1,200-1,416 wolves (Ruid et al., et al., 2009).

In the northern United States, wolf depredation on livestock occurs more frequently from March to October when livestock spend more time under open-grazing conditions, calving is taking place, and wolf litters are being raised (Fritts et al., 2003, Musiani et al., 2005, Sime et al., 2007, Edge et al., 2011). Untended livestock, particularly young calves, appear to be more vulnerable, and the presence of livestock carcasses left on a property may increase risk as well (Fritts et al., 2003, Edge et al., 2011). Adult sheep appear to be taken more frequently than lambs (Fritts et al., 2003). Depredations commonly involve multiple sheep per incident, whereas only 1-2 cattle are usually killed per incident (Muhly and Musiani 2009). Depredations occur on both open grazing sites and inside fenced pastures.

Among northern Rocky Mountain and Great Lakes states, significant variation exists in the number of cattle and sheep killed by wolves, and sometimes variation exists between years. Livestock management differs among regions as well. Great Lakes states typically manage livestock in a more localized and accessible pasture versus open range grazing in the western US, which is relatively inaccessible and poses greater challenges for livestock owners. Probable losses, in which officials are unable to verify the cause of death, represent an additional loss that cannot be definitively attributed to wolves. Additionally, it is challenging to locate all carcasses and notify authorities soon enough to obtain cause of death confirmation. Rugged and vast terrain and vegetation where livestock graze, the extent of carcass consumption by predators and scavengers, or carcass decomposition compound this difficulty.

Determination of a compensation ratio (a compensation mechanism that involves providing reimbursement for missing animals based on confirmed depredations) continues to be debated. Identifying livestock mortality attributed to wolves varies considerably according to the characteristics of each grazing site, extent of rancher supervision, and type, age, and number of livestock. Missing animal ratios of 8:1 (without range riders) and 6.3:1 (with range riders) have been reported for cattle in two studies conducted on large allotments with forested and mountainous terrain (Oakleaf et al., 2003, Sommers et al., 2010). Oakleaf et al., (2003) suggested that a ratio of about 2:1 was more realistic under less timbered or less rugged conditions. Detection ratios closer to 1:1 probably occur for many smaller operations using private lands, where livestock are more closely supervised. There has been critical review of these findings as well (Hebblewhite 2011). In general, empirical support for determining compensation ratios is scarce, and studies often suffer from small sample sizes, unmeasured/undetermined sources of livestock mortality, and unverified assumptions.

A detailed depredation compensation and conflict minimization program is described in Chapter 6.

Livestock Losses to Other Causes

While the number of livestock killed by wolves in Idaho, Montana, and Wyoming has generally increased over time as wolf numbers have grown, these are small compared to losses caused by coyotes (*Canis latrans*), mountain lions, bobcats (*Lynx rufus*), domestic dogs (*Canis familiaris*), bears, foxes (*Vulpes* spp.), eagles, and other predators. Coyotes and other predators were responsible for almost all of the losses in which the predator was identified (98.8 percent of the cattle losses and 99.4 percent of the sheep losses) during 2004 and 2005; wolves were responsible for 1.8 percent and 0.6 percent of the losses (NASS 2005). Most of these predators, such as coyotes, mountain lions, bobcats, black bears, and foxes, can be legally hunted or are subject to lethal control if depredating. Wolf depredations are also far less than combined non-predator losses (e.g., disease, weather, and birthing problems) in Idaho, Montana, and Wyoming, being less than 0.1 percent of these losses for cattle and 0.6 percent for sheep (NASS 2005, 2006). Minor losses of other livestock species by wolves in these states is also low. Nevertheless, managing to minimize and compensate for livestock losses due to wolves is a fundamental aspect of the Plan.

Management Tools

A variety of management tools will be implemented to meet restoration and management objectives for wolves in Colorado. Generally, the positive impacts from having wolves in Colorado will be recognized without a prescriptive management practice. Negative impacts, where they occur, will be addressed case-by-case.

This section describes many of the management tools that can be implemented to assist livestock owners in reducing wolf-livestock conflicts, including proactive deterrents, compensation programs for wolf-related livestock losses and proactive methods, and various hazing options and forms of limited lethal control.

Non-Lethal Methods

Non-lethal management tools are intended to avert or resolve a wolf conflict without killing the wolf or wolves in question. In many instances, non-lethal management tools effectively address the public or agency concern and are the most cost effective, least intrusive method. If successful, non-lethal methods may also alleviate the need for more intensive management actions in the future. Examples of non-lethal techniques include changes in livestock husbandry practices, range riders and herders, hazing of wolves, scare tactics, and other attempts to modify wolf behavior. Techniques specifically intended to modify wolf behaviors can be aversive or disruptive (Bangs and Shivik 2001). Aversive stimuli cause discomfort or pain to the wolf after it demonstrates certain behaviors. The repeated negative experience associated with certain behaviors may condition the wolf not to repeat that behavior. Disruptive stimuli attempt to prevent or alter behaviors by disrupting the animal when it behaves in undesirable ways. When disrupted by the stimuli, the animal is supposed to retreat. Examples are noise makers or siren devices triggered when a wolf gets too close to livestock. The National Wildlife Research Center, the research arm of APHIS, has taken a lead in investigating the utility and effectiveness of these techniques to avert wolf conflicts with livestock (Bangs and Shivik 2001, Breck et al., 2002).

The role of certain husbandry practices, such as increasing supervision, pasture choice based on habitat features, and stocking rates of different ages, have been shown to reduce livestock depredation risk (Muhly et al., 2010). Though non-lethal measures and husbandry practices may not have universal effectiveness and may not be feasible in some situations, they can be effective in reducing conflict in some situations (Sime et al., 2007). It is important that managers and livestock owners identify which measures are appropriate.

CPW has co-branded a “Hands on Resource Guide to Reduce Depredations” (https://cpw.state.co.us/Documents/Wolves/Wolf_Hands-on_Resource_Guide_Depredation_Prevention.pdf) that outlines many practices that livestock owners can implement and deploy to minimize wolf depredations. Topics described include Management Intensive Grazing, Livestock Guardian Dogs and Donkeys, Carcass Management, Range Riders and Herders, Fladry/Electrified Fladry, Scare Devices, High-risk Landscape Management, and Herd Composition.

Lethal Removal to resolve livestock conflicts

When legally employed in Colorado, lethal removal of wolves in response to depredation is considered a corrective action—its purpose is to stop presently-occurring damage by wolves in a localized area, and not necessarily to address the potential of future depredations at a regional or statewide scale.

Lethal removal of wolves to resolve wolf-livestock conflict is controversial and heavily scrutinized by the public (Musiani et al., 2005, Bangs et al., 2006, Bradley et al., 2015). It is also viewed by a majority of the TWG and the SAG as being critically important to a successful wolf management program (Appendix B and C). In evaluating the use of lethal control on a context-specific basis, CPW will consider the trade-offs among many competing factors including: the ability to target depredating wolves, being efficient and effective with conflict minimization, financial cost, wolf reproductive and recruitment success, wolf population size and listing status, impacts to livestock owners, and social/stakeholder interests when

considering lethal take options. As with all wolf management practices, lethal control will only be implemented when in compliance with all state and federal laws and regulations.

Protection of livestock by allowing the lethal removal of wolves caught in the act of attacking livestock is a tool to resolve wolf-livestock conflict (Bangs et al., 2006). This type of take is thought to empower livestock owners to protect livestock (Sime et al., 2007) and immediately targets the offending animal(s) while eliminating the need for further control by agencies (Bangs et al., 2006).

A central requirement of this Plan is that it utilize the best scientific data available. Unfortunately, the best data on the effectiveness of lethal removal are inconclusive or even contradictory. Thus, the results can be difficult to interpret. Rather than being a controlled design using random assignment of treatment and controls, they are instead observational in nature. In these circumstances, extrapolation of results from localized packs to a range wide population is problematic and should be avoided or done with caution.

That said, the general understanding is that the effectiveness of lethal removal is short-term, often lasting only for the current grazing season (Bradley 2004, Musiani et al., 2005). Lethal control has been implemented while still accommodating a growing and self-sustaining wolf population. In Montana, despite the lethal removal of 254 wolves from 1987 to 2006, the population continued to grow and expand its distribution (Sime et al., 2007). The combination of non-lethal and lethal methods (which included the ability to lethally remove wolves caught in the act of attacking livestock) was thought to have kept depredations at a lower level than was originally predicted in Montana (Sime et al., 2007).

Wielgus and Peebles (2014) found a positive relationship between lethal control at a statewide scale and subsequent-year depredations, suggesting that lethal control actually had the opposite of its intended effect. Others have refuted these findings (Poudyal et al., 2016, Kompaniyets and Evans 2017). Similarly, Harper et al., (2008) conducted a long-term, statewide analysis of lethal management of wolves in Minnesota. Their results suggested that killing a high number of wolves did not result in fewer depredations the following year (Harper et al., 2008). A study of the NRM found that lethal removal was effective at reducing further depredations, though the effectiveness was strongly related to the number of wolves removed. Entire pack removal was more effective than partial pack removal (Bradley et al., 2015). Partial pack removal reduced subsequent depredations by 29 percent, while full pack removal reduced subsequent depredations by 79 percent over a span of five years (Bradley et al., 2015).

While lethal removal has been observed in some cases to reduce subsequent depredation at the pack level over a short period, there is less evidence to support long-term reduction. Musiani et al., (2005) observed development of a cycle in which new wolves re-colonized and caused new depredations, leading to additional removals of wolves. The size of the pack of remaining wolves following lethal removal was the best predictor of recurring depredations with larger remaining packs having a higher probability of recurring depredation than smaller packs.

In situations of lethal removal of breeder wolves, the probability of pack dissolution is increased (Brainerd et al., 2008, Borg et al., 2015), though the dissolution does not appear to have significant effects on overall population dynamics due to strong compensatory mechanisms (Borg et al., 2015). Lethal removal of solitary individuals or territorial pairs in situations of chronic wolf-livestock conflict would be expected to have fewer effects on overall wolf conservation (Brainerd et al., 2008). This study also suggested that impacts to overall wolf populations are reduced when lethal removal is conducted on reproductive packs when pups are ≥ 6 months old and packs contain ≥ 6 members (including ≥ 3 adult-sized wolves) (Brainerd et al., 2008).

Human tolerance toward wolves has long been recognized as an important factor in recovery and persistence of wolf populations (Fritts and Carbyn 1995, Fritts et al., 2003, Bangs et al., 2006). The concept of removing depredating wolves is believed to improve tolerance and reduce illegal take of wolves by the public (Bangs et al., 1995). However, it's unclear whether lethal removal in situations of livestock depredations improves human tolerance for wolves. Research in Wisconsin suggested that lethal control measures in the short-term were ineffective for increasing tolerance (Browne-Nuñez et al., 2012) and may even increase illegal take (Chapron and Treves 2016). Additional research in Wisconsin, however, showed that illegal behavior toward wolves can be moderated with effective state management programs which included lethal control of depredating wolves (Olson et al., 2014). Hill et al., (2022) suggested that areas with legal harvest of wolves by hunters and trappers (a topic different than management removals) may benefit from reduced human-wolf conflicts or alternatively that areas with legal harvest have less potential for management removals (e.g., less livestock depredation). Bearing all this in mind, continued outreach, education, and effective management will be critical to increasing tolerance of wolves and ensuring long-term conservation of wolves in Colorado. Wolf management in Colorado is addressed in Chapter 5.

Key Element 4: Wolf Management with Respect to Wolf-Ungulate Interactions

Colorado has populations of elk, mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), mountain goats (*Oreamnos americanus*), and moose (*Alces alces*). These ungulates have high social, biological, economic, and recreational value in Colorado, and are also an important food source for native carnivores. Revenue generated from hunting is important to rural communities, and license sales provide funding for wildlife and conservation activities implemented by CPW. Consequently, managers are presented with the challenge of maintaining ungulate populations that will sustain both carnivore populations and recreational hunting opportunities, while also minimizing agricultural damage and other wildlife-human conflicts. (See:

<https://cpw.state.co.us/thingstodo/Pages/HerdManagementPlans.aspx>)

The effect of wolves on ungulate abundance and management decisions affecting ungulate hunting opportunities at a large scale is complex and sweeping generalizations are difficult. There is the potential for wolves, in concert with other predators and factors, to locally reduce ungulate abundance. There are a variety of factors that contribute to regional herd sizes such as Herd Management Plan (HMP) population objectives, forage quality and quantity, drought, winter severity, habitat loss or degradation, competition with other grazers, disease, vehicle collisions, other predators, and hunter harvest. Therefore, it is challenging to unequivocally determine a single factor driving herd performance.

Herd reductions could have both positive and negative impacts on local habitats and social tolerances of wolves and ungulates. Ultimately, if wolves persist in high enough numbers for enough time, they might be expected to contribute to local reductions of some ungulate herds or changes in distribution of those herds, both of which could have positive and negative impacts.

Predator-Prey Interactions

Colorado currently sustains populations of several medium and large carnivores that are known to prey upon ungulates, including black bear, mountain lion, coyote, and bobcat. The restoration of wolves to the state will undoubtedly add complexity to ungulate population dynamics. However, the effects of wolves on native ungulate populations are difficult to predict because of the complex multiple-prey/multiple-predator system observed in Colorado. A large body of literature suggests a complex suite of abiotic, bottom-up, and top-down forces including hunter harvest, predation, primary productivity,

and climatic conditions that may be limiting or regulating factors of ungulate population dynamics (Crête 1999, Vucetich et al., 2005, White and Garrott 2005a, Wright et al., 2006, Melis et al., 2009, Griffin et al., 2011, Middleton 2012, Johnson et al., 2013, Middleton et al., 2013a). Consequently, the relative effects of wolf predation in Colorado are likely to be situation-dependent and influenced by additional localized or regional factors.

Ungulates are primary prey for wolves. The best available scientific information suggests that, generally, wolves preferentially prey on elk when present, but will also prey on deer and moose (Smith et al., 2010, Orning et al., 2021). Significant effort, funding, and time has been spent to enhance elk, deer, and moose populations in Colorado; therefore, understanding the interactions between wolves and these ungulates will be important for future management of both predator and prey. Predation on mountain goats, and bighorn sheep is not anticipated to be significant. Non-native feral animals, such as wild horses (*Equus ferus*), could also be preyed upon by wolves in western Colorado.

Predators like the gray wolf may select prey compromised by diseases, which could prove useful in reducing disease prevalence in ungulate populations, primarily when pathogens are directly transmitted among hosts. The strength of a potential disease reduction depends on numerous factors, including specific disease etiology, the strength of selection for infectious individuals, and overall predation rates (Brandell et al., 2022). It is difficult to predict whether wolves will have a measurable effect on chronic wasting disease (CWD) in Colorado, where CWD is already well-established in the environment and in mule deer, white-tailed deer, elk, and moose.

The impacts of wolves on prey abundance have been, and continue to be, widely debated (see Boutin 1992). Some common conclusions on this topic have been drawn. A number of studies indicate that wolf predation can limit ungulate abundance (Bergerud and Snider 1988, Larsen et al., 1989, Ballard et al., 1990, Skogland 1991, Gasaway et al., 1992, Dale et al., 1994, Messier 1994, Van Ballenberghe and Ballard 1994, Adams et al., 1996, Boertje et al., 1996, National Research Council 1997, Hayes and Harestad 2000, Hebblewhite et al., 2002, 2006, Hayes et al., 2003, Mech and Peterson 2003, White and Garrott 2005b, Hebblewhite and Merrill 2007). Population-level effects result primarily through predation on young-of-the-year and are frequently compounded when occurring in combination with other predators (e.g., bears) (Larsen et al., 1989, Barber-Meyer et al., 2008, Boertje et al., 2009).

Several studies have detected little or no effect from wolves on ungulate abundance (Thompson and Peterson 1988, Bangs et al., 1989, Peterson et al., 1998; see Mech and Peterson 2003; DelGiudice et al., 2006, 2009). Mech and Peterson (2003) suggested three reasons why researchers have failed to reach agreement regarding the significance of wolf predation on the dynamics of prey populations. These are (1) each predator-prey system has unique ecological conditions, (2) wolf-prey systems are inherently complex, and (3) population data for wolves and their prey are imprecise and predation rates are variable.

Some research has shown that predation may influence prey populations through changes in *in situ* recruitment (Nichols and Pollock 1990), adult mortality, or a combination of both (Gasaway et al., 1992, Ballard et al., 1997, Kunkel and Pletscher 1999, National Research Council 1997, Ballard et al., 2001). Increased adult female mortality from other sources, such as hunter harvest or elevated overwinter mortality, may create conditions in which predation can limit ungulate abundance or slow population growth (Kunkel and Pletscher 1999). Some biologists reported that habitat and climate influenced deer abundance more strongly than wolf predation (Wisconsin Department of Natural Resources 1999).

Prey selection and kill rate by wolves varies greatly depending on many factors including pack size; snow conditions; the diversity, density, and vulnerability of prey; and degree of consumption of the carcasses

(Kunkel 1997). The rates at which wolves kill and consume prey are highly variable with respect to time of year and species taken. Snow depth and wolf density best explained the annual variation in kill rate in northwestern Montana (Kunkel 1997). Based on studies with the most similar species and diversity of prey (Carbyn 1983, Keith 1983, Boyce 1990, Vales and Peek 1990, Mack and Singer 1992), wolves were projected to kill about 16.5 ungulates per wolf per year in Idaho (USFWS 1994). Kill rates vary on pack size and weather conditions, but usually range from 3-16 days between kills. On an annual basis in Yellowstone National Park an individual wolf eats approximately 18-22 elk (Smith et al., 2020).

Regardless of the effects wolves have on ungulate population dynamics and abundance, some stakeholders may expect CPW to reduce antlerless licenses due to these real or perceived effects. CPW HMP (herd management plan) population objectives and license quotas are approved through a Commission process. CPW ungulate population monitoring will be critical to inform management decisions. CPW has a unique opportunity to gain understanding of the predator-prey interactions and the subsequent effects on ecological processes in Colorado following reintroduction of wolves. Monitoring of prey distributions and population dynamics pre-wolf restoration (at least 2-3 years) and post-wolf restoration will provide a valuable comparison to address measurable responses. Current investigations addressing ungulate distribution and population dynamics are ongoing and will be informative as wolves become established in the future.

Vegetation effects

The removal or restoration of apex predators can influence behavior, abundance, and population dynamics of prey species. This can result in changes to vegetative communities (Schmitz et al., 2006), which then influence other wildlife or ecosystem processes (Ripple et al., 2010). This is often referred to as a trophic cascade (Hairston et al., 1960, Beschta and Ripple 2009). To reduce predation risk, some prey will alter their behavior, movements, diet, and habitat use (Schmitz et al., 1997, Laundré et al., 2001, Hernández and Laundré 2005, Laundré et al., 2010). This could lead to changes in vegetative communities and subsequent trophic cascades (Ripple and Beschta 2004, Fortin et al., 2005).

While the role of wolves shaping trophic cascades has been widely reported and popularized, many of the conclusions that have been reached on the topic are equivocal (Garrott et al., 2005, Brice et al., 2022). For example, Hebblewhite and Smith (2010) indicated that willow in Yellowstone National Park appeared to have benefited from reduced browsing pressure from elk, but other woody browse species were not showing signs of recovery following wolf reintroduction. Kauffman et al., (2010) found that recovery of aspen in Yellowstone National Park was not occurring even in sites where elk were more vulnerable to predation, suggesting behavioral changes in elk alone were not sufficient to benefit aspen recovery. Middleton et al., (2013b) found further support that elk behavior is not heavily influenced by wolf predation. When wolves were in close proximity to elk (< 1 km), elk increased movement rates, shifted distributions, and increased vigilance; however, elk were only this close to wolves once every 9 days. This led to minimal changes in elk behavior overall, which likely limited the strength of any trophic cascades observed. Additionally, physical factors (e.g., snow depth, soil moisture) were equally important in determining willow and aspen growth in relation to browsing by elk (Tercek et al., 2010, Kauffman et al., 2010). In a decade-long study in Yellowstone National Park, Marshall et al., (2013) found that the reduction in herbivore browsing attributable to reduced elk populations did not correlate with the recovery of riparian vegetation. Rather, to restore riparian vegetation and structure, ungulate browsing would have to be completely stopped along with restoration of hydrological conditions (e.g., reconnecting historic floodplain and stream channels) (Marshall et al., 2013). The authors concluded that the effects of predation from a top carnivore alone on ungulate behavior and population size is unlikely to reverse the decades-long changes that have occurred in riparian systems due to over browsing by ungulates.

It is also important to consider that while there is evidence that trophic cascades and other ecosystem-level responses have occurred following the recolonization of wolves, they have largely been observed in national parks or other protected areas where elk densities were high and not managed with hunting. Outside of protected areas, other factors may play a relatively larger role in shaping vegetative communities. Ungulate density, behavior and habitat use, and ultimately ecosystem structure and composition are important factors to consider. Land management activities, such as fire suppression and timber harvest, influence vegetation structure and composition (Parsons and DeBenedetti 1979, Lindenmayer and Franklin 2002). Cattle grazing also influences vegetation structure and composition and may alter elk behavior and movements (Averett et al., 2017; Stewart et al., 2002). Hunting (Conner et al., 2001, Vieira et al., 2003, Proffitt et al., 2010, Cleveland et al., 2012) and disturbance from motorized vehicles (Johnson et al., 2000, Rowland et al., 2000, Naylor et al., 2009, Coe et al., 2011) can also have a large effect on behavior, movements, habitat use, densities, and distribution of elk. Further, while elk have shown changes in movements and behavior in response to both human hunting and wolves in the Greater Yellowstone Area, the observed responses to human hunting were greater than to wolves (Proffitt et al., 2009), suggesting that elk may already have altered their behavior and habitat use outside of protected areas. Finally, additional factors, including climate and habitat productivity may directly affect ecosystems (Oksanen et al., 1981, Crête 1999) and the degree to which wolves influence ecosystem structure and function (Rooney and Anderson 2009). Consequently, it is unlikely that the magnitude of ecosystem changes observed in some protected areas will occur in the more managed and multiple-use landscapes of Colorado, where livestock grazing occurs, and where ungulate populations are carefully managed through hunting.

Ungulate Management

In Colorado, Ungulate management is regulated by several processes, all of which are approved by the Commission. Herd Management Plans (HMP) establish 10-year objectives for each ungulate species and herd. This is accomplished through a public process, using the best available scientific information on populations, habitat conditions, and public input. Big Game Season Structure (BGSS) policies define a 5-year framework for achieving HMP objectives through a variety of hunting opportunities and seasons. Finally, annual harvest objectives and the resulting license recommendations for all hunts are designed to achieve the management objectives approved in the HMP. Hunting license recommendations are based on a regular evaluation of ungulate harvest, age and sex classification data, population estimates, hunter distribution, and social considerations for each ungulate herd in Colorado. Antlerless harvest is the primary population management tool for ungulate populations. When herds are below population objective ranges, the number of antlerless licenses is reduced or eliminated to allow herds to increase. When herds are above population objective ranges, antlerless licenses are increased. Colorado has abundant ungulate populations that provide for an economically significant and diverse amount of big game-related wildlife recreation. Big game hunting in Colorado is highly regulated; carefully set limited license quotas manage all female harvests, which is the primary tool for population management.

Ungulate management in Colorado attempts to balance many factors, including desired population size, habitat availability and condition, landowner tolerance, hunter opportunity, and environmental factors influence populations. Ungulate populations are managed considering both socio-economic and ecological factors. The scale with which CPW manages ungulate populations is not intended to mitigate the impacts of a single limiting factor such as wolf predation, mountain lion predation, or other mortality sources in and of themselves. Instead, ungulate populations are managed by taking into consideration a variety of factors to manage ungulate herds to their HMP objectives.

Maintaining robust ungulate populations will remain a priority for CPW, to provide Coloradans and visitors with opportunities for hunting and wildlife watching, as well as provide adequate prey for wolves. Ungulate harvest objectives in Colorado may need to be adjusted over time as a result of wolves on the landscape, which will impact hunting opportunities for resident and non-resident hunters, as well as businesses that rely on hunting, such as Outfitters. Additional regulatory restrictions, such as shortened hunting seasons to reduce hunter success rates, may need to be considered in some areas where wolves become established. Management prescriptions should be based on the most up-to-date science and data available to ungulate managers.

Scientists have noted (Creel and Winnie 2005, Mao et al., 2005, Proffitt et al., 2009), that wolves may cause some redistribution of ungulates, which could make these species less vulnerable to hunter harvest. Managers in Colorado are increasingly concerned with elk refuging on private lands or otherwise inaccessible areas, where ungulate harvest management is no longer a viable option. Furthermore, as has been reported in other western states where wolves are present, there is concern that these refuging issues may be exacerbated following wolf reintroduction, as elk seek lower predation risk environments closer to human development. However, these potential impacts would likely be restricted to the relatively few areas occupied by packs during the early to middle stages of reintroduction. Larger wolf populations could be expected to have a greater effect on ungulate distribution, abundance, and hunting opportunity. However, such impacts may become increasingly difficult to predict or measure.

Status of Elk, Deer, and Moose Populations in Colorado

Elk Summary

Colorado's statewide elk population peaked in 2001 and as of 2021 was estimated at 309,000 after hunting season. In 2004, antlerless license numbers were at their highest which helped reduce elk populations to Herd Management Plan population objectives. Since 2004, the statewide total elk population estimate has increased as a result of CPW reducing antlerless and either-sex elk licenses every subsequent year.

The sum of Colorado's post-hunt HMP population objective ranges for elk statewide is 252,000-306,000 for all 42 elk herds combined. These data indicate that Colorado's elk population is over objective. However, it is important to point out that the sum of statewide objective ranges is partially based on historic and outdated HMPs. HMPs written before 2006 were based on previous population models that underestimated elk numbers. As CPW updates plans, we expect population objectives to change, which will align better with current population estimates. Because the hunting season and license numbers are designed to use antlerless harvests to bring elk populations to herd objectives, future reductions in antlerless licenses are anticipated as more elk populations reach objectives or population objectives increase. CPW has reduced antlerless and either-sex elk licenses significantly as herds reach or approach population objectives or when calf ratios and juvenile recruitment into the population decline.

As CPW has intentionally reduced elk populations to achieve population objectives, hunters, outfitters, and even some private landowners have increasingly expressed concern that in some areas elk populations are below desired levels. Nonetheless, public opinion on the desired number of elk in Colorado varies. CPW gives serious consideration to changing population objectives in herds as HMPs are updated. It tries to balance the public interests of landowners, local communities, public land management agencies, and hunters. Long-term experience with balancing these interests has informed CPW on the upper and lower social thresholds for elk population size in many herds, which greatly benefits managers in herd management planning efforts.

In 2021, during post-hunt winter herd inventories, CPW staff used helicopter surveys to classify 108,000 elk (35 percent of the estimated total population). During these surveys over the past 20 years, CPW has documented declining calf/cow ratios in the southern half of the state. Ratios of calves to 100 cows are an index of annual calf production and survival to mid-winter, which is an indicator of the “fitness” or productivity of the herd. Elk research and continued management changes are necessary since calf production remains low in many herds. Low calf ratios reduce the number of elk licenses CPW can issue and still maintain stable populations. Northern Colorado historically has had higher calf ratios by about 10 calves per 100 cows and have remained more stable than southern Colorado.

All rifle licenses for cow elk are limited (i.e., have a set quota). The statewide total allocation for antlerless elk licenses was 64,500 in 2022, which is less than half of what it was at its peak in 2004 of 132,500 when CPW was actively trying to reduce populations. Antlerless elk license reductions are the result of a combination of herds achieving HMP population objectives through antlerless harvest, low calf/cow ratios reducing population productivity, and increases in HMP population objective ranges. This trend of reducing elk licenses, and therefore hunting opportunity, is expected to continue, which has long-term implications socially, culturally, and economically both for Colorado communities and CPW. The sale of elk licenses currently accounts for approximately 46 percent of CPW’s hunting and fishing license revenue.

Demand for Colorado limited elk licenses far exceeds quotas; in 2022 approximately 238,000 hunters applied for 123,100 limited elk licenses. Elk hunters from all over the country are interested in hunting here.

CPW has several important elk research projects underway to determine causes of calf ratio declines. For publications and more information, please visit:

<https://cpw.state.co.us/learn/Pages/ResearchMammalsPubs.aspx>

Deer Summary

Mule deer populations in western Colorado have declined precipitously since the 1970s. CPW and the public have concerns over mule deer declines in the largest herds of western Colorado. Mule deer populations face increasing threats, including loss of habitat from development, highways bisecting migration routes, human recreational disturbance, fire suppression, drought, competition from elk, disease, invasive weeds replacing preferred forage plants, and predation. Anything that lowers adult female survival will likely result in further declines in any mule deer populations.

Colorado’s statewide deer population declined from roughly 600,000 deer in 2006 to an estimated 416,000 post-hunt 2021. The statewide deer population has been more stable recently, averaging 420,000 over the last 11 years. The sum of all herd population estimates is still far below the sum of individual HMP population objective ranges of 438,000-520,000 for all 54 deer herds combined. Declines in deer populations are primarily in the largest, westernmost mule deer herds in the state. In 2021, 26 of 54 (48 percent) deer data analysis units were within their population objective ranges and 18 of 54 herds (33 percent) were below their population objective ranges. There is on-going interest from various constituents to increase mule deer populations; however, for many deer herds, population management is largely dictated by herd productivity and performance, winter severity, and Chronic Wasting Disease (CWD) prevalence.

Diverse habitat types and annual precipitation around the state create considerable geographic variability in population performance. Many deer herds in the central and northern mountains as well as the eastern plains are performing well, and population sizes and license numbers in those areas are increasing.

In 2014, CPW completed the West Slope Mule Deer Strategy, which guides management decisions to help rebuild our mule deer populations. The Strategy states: Together with the public and stakeholders, CPW will work to stabilize, sustain, and increase mule deer populations in Western Colorado and, in turn, increase hunting and wildlife-related recreational opportunities. The West Slope Mule Deer Strategy outlined 7 strategic priorities to address the many threats facing mule deer populations. To learn more, see Colorado's Mule Deer Story and Colorado's West Slope Mule Deer Strategy at: <https://cpw.state.co.us/learn/Pages/CO-WestSlopeMuleDeerStrategySummit.aspx>

Deer hunting is managed using a license quota system (totally limited licenses). Demand for deer hunting in Colorado is high. In 2022, approximately 218,000 hunters applied for 102,000 Colorado deer licenses. CPW has substantially reduced doe harvest in western Colorado because many herds are below population objective ranges. This reduction in doe harvest is intended to allow herds to increase to management objectives. CPW has recently been increasing buck deer licenses in West-slope herds to manage towards sex ratio objectives; however, total license numbers are still below mid-2000 levels as a result of the severe winter of 2007/2008, and subsequent population performance constraints. The sale of deer licenses currently accounts for approximately 9 percent of CPW's hunting and fishing license revenue.

CPW intensively monitors over 1,000 radio-collared mule deer annually to estimate annual adult doe survival and winter fawn survival in five Intensive Mule Deer Monitoring Areas. These herds include D-7 White River, D-9 Middle Park, D-16 Cripple Creek/Upper Arkansas River, D-19 Uncompahgre Plateau, and the Gunnison Basin (includes D-21, D-22, and D-25). We also monitor buck survival in D-7 and D-9. Survival rates from these herds are used in deer population models for the rest of the herds west of I-25. These monitoring areas also provide information on seasonal use, migration and movement, and cause-specific mortality.

CPW conducts winter herd classification surveys, primarily with helicopters, to estimate the sex ratios of males to 100 females and the age ratios of young to 100 females. During winter herd surveys in 2021, CPW staff classified 78,000 deer (19 percent of the estimated population). Ratios of fawns to 100 does are an index of annual fawn production and survival to December, which is an indicator of the productivity or "fitness" of an individual herd. Since the early 1970s in Colorado, the ratio of mule deer fawns to 100 does has declined (Bishop et al., 2005, Bergman et al., 2011).

Chronic Wasting Disease in deer is a concern for CPW. From the early 2000s to the present, CWD prevalence has increased significantly in some herds. In January 2019, the Commission approved the Chronic Wasting Disease Response Plan. The plan will guide future management decisions that strive to reduce or keep CWD at low levels. In 2017, CPW initiated a fifteen-year mandatory sampling program to estimate CWD prevalence in deer statewide. For more information and for prevalence estimates, visit: <https://cpw.state.co.us/learn/Pages/About-CWD-in-Colorado.aspx>

CPW has a long history of mule deer research in Western Colorado. For publications and more information, visit: <https://cpw.state.co.us/learn/Pages/ResearchMammalsPubs.aspx>

[Moose Summary](#)

CPW transplanted moose into Colorado to create hunting and wildlife viewing opportunities. The first transplant occurred in 1978–1979 into North Park. Other major transplants included the Laramie River drainage (1987), Upper Rio Grande River (1990), Grand Mesa (2000), and White River drainage (2010). As a result of these efforts, moose have become an important big game hunting and popular watchable wildlife species in Colorado. Moose populations are increasing, and they continue to pioneer into new habitats on their own. The statewide 2021 winter moose population estimate is 3,500.

Demand for moose hunting far exceeds allocation; 54,000 individuals applied for a moose license in 2022 for a total of 592 limited moose licenses. CPW manages moose hunting in 74 Game Management Units (GMUs), up from 39 GMUs in 2013. CPW has been increasing cow moose hunting licenses to manage moose populations toward objectives, to keep moose populations within the ecological carrying capacity, and to address moose conflicts in some areas. Colorado is fortunate that moose populations continue to do well because many other states are experiencing declines in their moose populations. The sale of moose licenses currently accounts for approximately 0.2 percent of CPW's hunting and fishing license revenue.

CPW has moose research projects underway. For publications and more information please visit: <https://cpw.state.co.us/learn/Pages/ResearchMammalsPubs.aspx>

Management actions regarding wolf management with respect to ungulate populations is discussed in Chapter 5 and 7.

Key Element 5: Wolf Interactions with Other Wildlife Species

The fifth key element in successful reintroduction and management of wolves involves wolf interactions with other wildlife species. As with ungulates, gray wolves in North America and elsewhere have co-existed for millennia with a variety of other carnivore species in many different habitats. In Colorado, wolves will share habitats occupied by a number of other carnivores, including mountain lions, coyotes, black bears, bobcats, Canada lynx (*L. canadensis*), red foxes (*Vulpes vulpes*), river otters (*Lontra canadensis*), mink (*Neovison vison*), martens (*Martes americana*), weasels (*Mustela* spp.), striped skunks (*Mephitis mephitis*), American badgers (*Taxidea taxus*), and raccoons (*Procyon lotor*). Direct and indirect interactions will occur as wolves begin to reoccupy portions of their historical range in Colorado and reestablish packs.

How diverse carnivores interact with wolves varies depending on the extent of dietary overlap, habitat, environmental conditions, and other factors. These interactions can be positive or negative. They can also change throughout the year and at the various stages of wolf recovery. Information regarding the interactions between other carnivores and wolves is primarily observational and therefore subject to interpretation when attempting to make predictions at the population or community level. Because wolves are wide-ranging and many carnivores are secretive in nature, collecting data on these interactions is difficult. Observations to date suggest that wolves can reduce, or, in rare cases, eliminate certain carnivores (such as coyotes) locally, but no evidence of long-term spatial partitioning of resources within an area has yet been detected (Ballard et al., 2003).

Wolf-related reductions in coyote abundance may result in population changes among other medium-sized and small carnivores, either directly through reduced predation by coyotes or indirectly through adjustments in prey availability. For example, reduced interference competition with coyotes may increase the abundance of red foxes (Mech and Boitani 2003). Similarly, wolf related reductions in coyotes or exclusion of coyotes from certain areas may result in increased survival for some prey species consumed by coyotes (e.g., pronghorn; Berger et al., 2008, Berger and Conner 2008, Barnowe-Meyer et al., 2010).

The effects of wolves on mountain lion populations are variable. Research in Yellowstone National Park did not find a population effect of wolves on mountain lions (Ruth et al., 2019). Mountain lions may display spatial or temporal avoidance of wolves, such as moving up in elevation. Wolves might displace mountain lions from their kills, and mountain lions may increase their kill rates to account for this loss.

It is doubtful that wolves will greatly affect the overall numbers or distribution of other carnivore species in Colorado. However, the presence of wolves likely will change the local distributions and behaviors of some carnivores as they attempt to avoid direct interactions with wolves or as they respond to changes in food availability. Such changes could favor some carnivore species over others. CPW has considered interactions of wolves with other wildlife and determined it is desirable to improve our understanding of the baseline conditions and relative abundances of other carnivores that wolves are considered most likely to interact with or affect. CPW has estimated density of black bears at small spatial extents across the state, as well as density of mountain lions at larger spatial extents. Bobcat estimates may be available as soon as Fall 2023. There is not, at this time, an anticipated effect of wolves on any carnivores that will require a need for management intervention.

Monitoring of wildlife communities (with an emphasis on state and federally listed species and species of concern) is needed in areas occupied by wolf populations to determine potential direct and indirect effects on species population trends, habitat conditions, and potential changes in predator communities. CPW will assess, on a case-by-case basis, effects on declining or vulnerable species should wolves expand to areas of the state occupied by these species. However, at this time it is not anticipated that there will be impacts on certain species of concern, including Canada lynx or sage grouse, as wolves are not known demonstrate extensive predation on grouse (*Centrocercus* spp.).

Key Element 6: Wolves and Human Safety Concerns

Attacks by wolves on humans are exceedingly rare. In North America, there are no documented accounts of humans killed by wild wolves between 1900-2000 (Mech et al., 1990, Linnell et al., 2002, McNay 2002). Education and outreach for recreationists and other public lands users should include best practices and guidance, including how to differentiate between wolves and coyotes. Wolves generally fear people and rarely pose a threat to human safety.

Human safety and specifically, human perceptions about wolf attacks and other concerns have been rigorously examined in the literature. Worldwide, conditions under which the majority of wolf attacks on humans (resulting in injury or death) can be summarized as follows (Linnell et al., 2021):

- Wolves afflicted with disease (principally rabies);
- Wolves suffering from starvation or other health-related conditions;
- Human guarding of livestock (typically children) where conditions have deprived wolves of wild prey (e.g., India);
- Wolf defense of territory and den sites (with pups present) typically from domestic dogs;
- Wolf habituation to humans;
- Wolves exhibiting defensive behavior associated with food sources, or when cornered or trapped.

Activities in Colorado where humans are most likely to interact with wolves include recreation (e.g., camping, hiking, hunting, fishing, wildlife viewing) and forest and rangeland work (e.g., timber harvesting, fuel reductions, livestock grazing, and rural agricultural activities). Wolves seasonally follow migrating ungulate herds, which they rely on for food, and this may bring them into closer proximity to people. In extremely rare cases, individual wolves may gradually lose their fear of people and begin associating or interacting with people or loitering near buildings, livestock, or domestic dogs. Such behavior is extremely unusual for a wild wolf; it is more typical of a released captive wolf or wolf-dog hybrid (Linnell et al., 2021). Nevertheless, CPW intends to reduce the potential for wolf-human conflicts and minimize the risks of human injury by wolves. CPW will develop and disseminate extensive outreach to inform the public, discourage habituation, and encourage conflict minimization techniques and then respond to conflicts where and when they develop.

As wolf numbers and distribution increase in Colorado, the public's concern about human safety could increase. CPW will provide information to the general public about appropriate responses during wolf encounters (do's and don'ts) and how to minimize the potential for problems near homes and rural schools as is done with black bear, mountain lions, moose, rattlesnakes, and other species in the state. This material will also include information about wolf behavior, body posture, tail position, vocalizations, etc., to help the public evaluate the situation, correctly interpret wolf behavior, and communicate the details accurately to agency personnel. An educational effort will also help the public understand the differences between wolves, mountain lions, and bears in terms of animal behaviors, appropriate human responses when threatened, and how to live and recreate outdoors in the presence of these large carnivores.

Habituation of wolves to humans can occur in locations where wolves commonly encounter people and may or may not involve conditioning to human foods (McNay 2002, NPS 2003). Instances of camp robbing by wolves have long been known (Young and Goldman 1944) and may develop from wolves finding novel or chewable items (e.g., camping equipment, clothing) on a repeated basis in a human setting. This type of conditioning does not involve the presence of food but can lead to unprovoked aggression toward humans (see Linnell et al., 2002 for examples). Wolves can quickly develop persistent aggressive approach behavior in situations where they receive food directly from people (McNay 2002). Habituated wolves can remain non-aggressive toward humans for extended periods but can quickly transition to strong aggressive or predatory behavior depending on the behavioral stimuli shown by humans (McNay 2002).

The federal Endangered Species Act provides that "...any person may take endangered wildlife in defense of his own life or the lives of others" (50 CFR 17.21(c)(2)). State regulation also makes it permissible to kill a state-listed wolf threatening human life (CPW Regulations W-10, #1002.B.1). It is important to understand that wolves passing near, watching, or otherwise behaving in a non-threatening way near humans should not necessarily be considered as dangerous. Under these circumstances, wolves could and should be hazed using non-lethal methods; use of lethal force is unnecessary and illegal.

Wolves and Domestic Dogs

Situations where wolves and domestic dogs encounter each other can result in deaths and injuries to dogs. Attacks on dogs are usually related to defense of pups at dens or rendezvous sites or defense of territories rather than acts of predation (Bangs et al., 2005a, Ruid et al., 2009). Dogs used for livestock guarding, herding, and hunting are the most vulnerable to attack, but pet dogs are also at some risk where dogs and wolves spatially overlap (McNay 2002, Treves et al., 2002, Bangs et al., 2005a, Edge et al., 2011). Most attacks on dogs occur in remote areas away from homes (Bangs et al., 2005a), but in a few cases, wolves have come close to homes and fought with dogs, even when people were present. Domestic dogs are also vulnerable to attack or killing by a variety of predators other than wolves, including coyotes, mountain lions, bears, and feral dogs.

As wolves expand their range in Colorado, dog owners will need to be aware of the potential risks to their animals if they are within wolf pack territories. Some wolves will occupy areas near human habitation and areas with heavy recreational use (e.g., national forests), which could put hunting or pet dogs at risk of attack, especially if they are running at large.

Key Element 7: Monitoring and Research

Monitoring is an essential component of any wildlife management plan; CPW collects survey and inventory data on a variety of fish and wildlife populations. Monitoring is the measurement of a feature of interest to inform future management efforts. The most immediate purpose of a post-release wolf

monitoring program is to assess and, if necessary, inform the modification of any logistical protocols to ensure the highest likelihood of restoration success. These data create the foundation upon which wildlife populations are managed and provide the basis for support of continued management.

Once wolves are established, monitoring of their demographic characteristics will inform the success and challenges that wolves face in Colorado. Short-term and long-term monitoring will aid in evaluating the efficacy, cost, and relative value of non-lethal and lethal conflict mitigation measures. Prey and other wildlife populations are already being monitored for a variety of management purposes in the state. Some of these efforts will be supplemented, expanded, or lengthened to inform future management of wolves, prey, and habitat.

Managing wolves in Colorado will require a suite of different monitoring programs. These monitoring programs will balance scientific precision with cost effectiveness. The primary wolf monitoring responsibilities will rest with CPW. However, collaboration with tribes, other state and federal agencies, colleges and universities, landowners, local government, and the public will be essential to the success of the monitoring program. This coordination will be especially important when monitoring packs near state borders or when packs are located on or near tribal lands. Ultimately, a robust monitoring program will ensure that wolf management decisions are made based on the most up-to-date science and data available.

Monitoring and Research actions are discussed in Chapter 7.

Chapter 3: Reintroduction Implementation

State statute codifying Proposition 114, as amended, requires that this Plan include: “...(I) The selection of donor populations of gray wolves; (II) the places, manner and scheduling of reintroductions of gray wolves by the division, with such reintroductions being restricted to designated lands; (III) details for the restoration and management of gray wolves, including actions necessary or beneficial for establishing and maintaining a self-sustaining population...” CRS 33-2-105.8(3)(a)(I-III). This chapter addresses those requirements.

Reintroduction Methodology

The TWG developed a detailed report on Restoration Logistics Recommendations (Appendix B). Where details are not provided in the plan, the reader is referred to the appendix where more in depth discussion and rationale is evaluated. These recommendations will guide actions taken by CPW as work to restore gray wolf populations to the state is implemented. This Plan relies heavily on the expertise and experience of this group to develop the reintroduction protocols. Further, Bangs and Fritts (1996), Fritts et al., (1997) and Fritts et al., (2001) provided a robust description of the considerations, methodologies, challenges, and successes of implementing the reintroduction of wolves into Yellowstone National Park and Central Idaho in the mid-1990’s. These sources were also invaluable in developing these protocols.

This wolf reintroduction effort will be undertaken by CPW in cooperation with Federal agencies, potentially affected Tribes, and the states of Idaho, Montana and/or Wyoming from which wild wolves will be transferred via agreement. Specific agreements regarding donor populations have been discussed with these three states but final agreements have not yet been concluded. In the event that none of these three states can serve as source sites for wolf donor populations, CPW has also begun to explore an agreement with the states of Washington and/or Oregon. Matching to the extent possible the ecological conditions at the capture and release sites (primary prey, migratory/resident behavior of prey, likely denning habitat, etc.) is important. In that sense, wolves across much of Wyoming, Montana, Idaho, eastern Oregon, and eastern Washington would very likely be well adapted for western Colorado, where the primary prey is likely to be migratory elk that generally move from intermountain valley or lower elevation winter ranges to high elevation summer ranges.

This Plan anticipates that wolf reintroduction efforts will require the transfer of about 30 to 50 wolves over a 3-to-5 year period from the NRM states, with assistance from other state wildlife management agencies. Based on the TWG recommendations, CPW will aim to capture 10-15 wild wolves annually from several different packs over the course of 3 to 5 years by trapping, darting, or net gunning in the fall and winter. These captures may be done by agency staff, contractors, or private trappers. The total number of wolves relocated in any year and in total will depend on capture success, continued participation by the cooperating states, and the degree to which relocated animals remain in Colorado and survive.

Pre-relocation animal processing will include a general health assessment by veterinarians and biologists to determine suitability for translocation. They will assess body condition, estimate age and condition of teeth, examine for injuries, and survey for ectoparasites. Criteria for rejection include excessive tooth wear, multiple missing or broken teeth, emaciation, heavy ectoparasite loads, foot anomalies, fractures, and other signs of disease or injuries of concern as determined by the veterinarian. Some tooth wear is normal and missing incisors are not uncommon or cause for rejection. Animals cleared for translocation will be treated for endo- and ectoparasites and vaccinated for canid diseases of concern. Biologic samples, including blood, feces, and genetic material, will be collected for additional health screening

and sample banking. All age classes, except young of the year, are acceptable for translocation. Equal numbers of each sex are desirable.

Wolves will be fitted with GPS collars that include supplemental VHF capability. Collars will contain a mortality sensor and will be programmed to collect at least one location per day that will transmit regularly via satellite interface. This will allow quick investigation of mortalities and could provide valuable information for improving program protocols. The collars will be the primary means for monitoring individual wolves post-release. Location data is not immediately available from these collars, it is subject to satellite download frequencies, and it should be expected that there may be several days, sometimes greater from when the animal was at the location and the data are available.

All wolves to be translocated will be transported to western Colorado release sites by vehicle or aircraft in the most expedient and efficient manner. All efforts will be made to minimize the time that animals are kept in a holding crate or temporary pen. Immediately prior to transport, wolves will receive a final visual inspection by personnel trained to evaluate animal condition. Animal condition will be evaluated periodically during transport. Signs that animals are experiencing high stress during transportation will compel review of protocol and may lead to modifications of transport crates or other aspects that could help reduce transport stress. In the case of animals that incur severe injuries or health issues during capture or transport that are likely to result in long-term pain or suffering or the inability to hunt and survive after release, the animal will be humanely euthanized under veterinary guidance (Underwood and Anthony 2020). If a licensed facility expresses interest and can demonstrate that they have the physical infrastructure and financial capacity to care for a wolf that is injured and deemed to not require humane euthanasia, this will be considered. An analysis of the challenges of taking free-ranging wildlife and placing them in captivity would be conducted to ensure that this is the best outcome. Wolves do not habituate easily, that the social aspect of wolves can be very challenging when introducing a new animal into a captive population. There should be no expectation that wolves that are placed in such a facility and become accustomed to humans would be considered for re-release.

Release Locations

A number of factors have been considered in determining the most suitable and promising release sites, beginning with the need to relocate wolves into suitable habitat. There have been many efforts at modeling suitable wolf habitat in Colorado (Carroll et al., 2003, Carroll et al., 2006, Ditmer et al., 2022). These efforts have all come to a similar conclusion: there appears to be adequate habitat in the state to support a self-sustaining population of wolves. Ditmer et al., (2022), further evaluated and compared the ecological value of the landscape for wolves in relation to the potential for conflict within the human landscape (Figure 3).

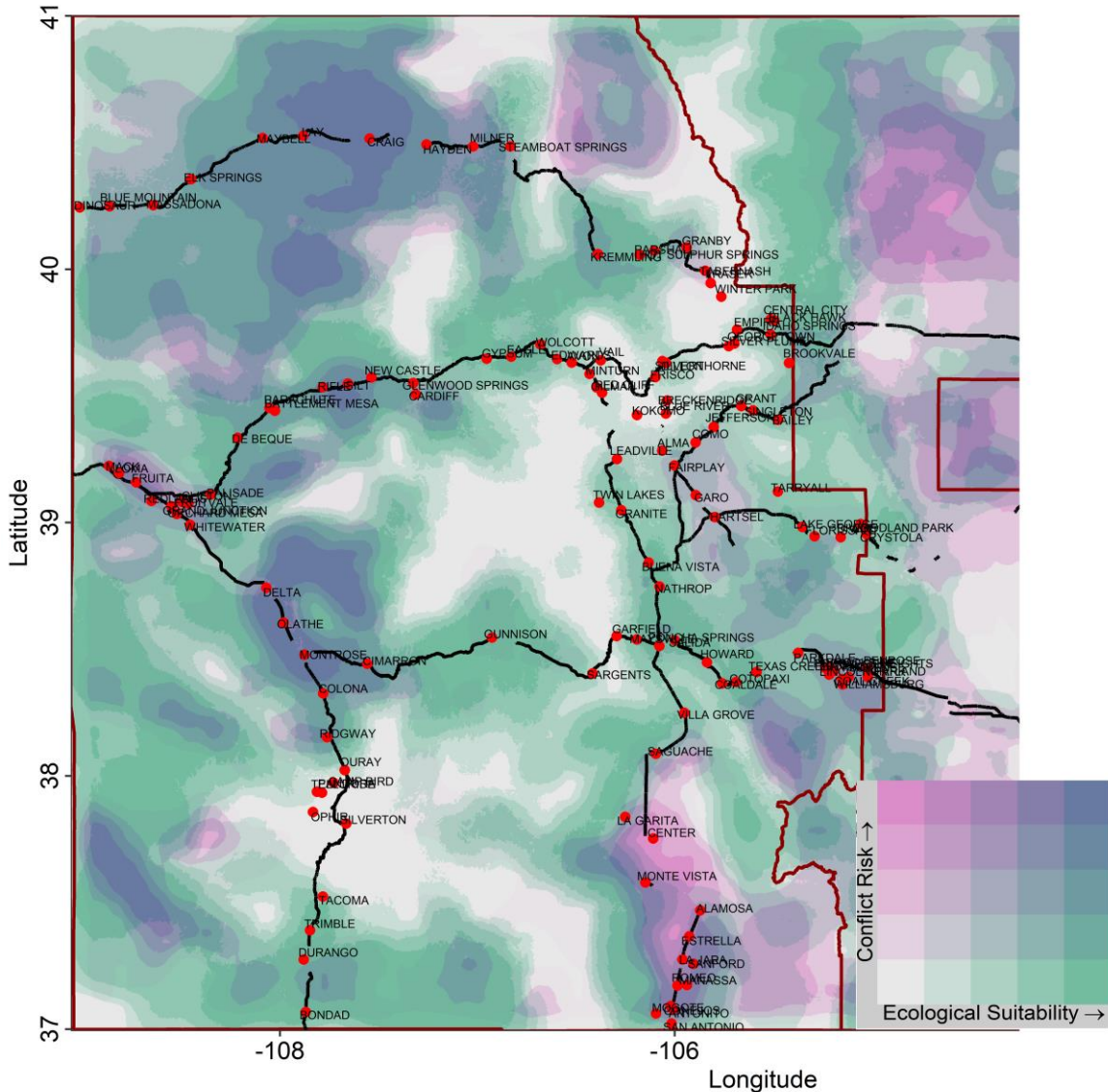


Figure 3. Ecological suitability and conflict risk of wintertime landscape for wolves in Colorado (Ditmer et al., 2022).

Within Colorado, preliminary release locations are constrained by several geographic criteria. State statute requires that wolves be released only west of the Continental Divide (CRS 33-2-105.8). Fritts et al., (2001) found that wolves released in Yellowstone and central Idaho moved substantial distances in the months immediately after release (average distance was approximately 50 miles ranging from approximately 22 to 140 miles from the release sites). Because of this, releases in Colorado will be located a minimum of 60 miles from ~~the Colorado’s northern border~~s with Wyoming, ~~the western border with~~ Utah, ~~the southern border of~~ New Mexico, as well as a similar buffer, as requested by the Tribes, of sovereign tribal lands in southwestern Colorado (Figure 4). This geography should not be interpreted as the only places in the state where wolves will be tolerated or successful – this is only to inform initial release locations. It is anticipated that wolves will expand widely over time, including to the Front Range of Colorado. Furthermore, it is unknown whether wolves will remain in proximity to initial release sites or range more widely before establishing territories within suitable habitat. CPW used the Ditmer et al., (2022) model to identify areas for consideration as release locations (Figure 4).

Described in detail in Ditmer et al., (2022), areas in green indicate high ecological suitability and low modeled conflict risk. Areas that are pink are high conflict risk and low ecological suitability. Areas that are white are low for both ecological suitability and conflict risk (these are high elevation areas as depicted in the winter time map (Figure 3)).

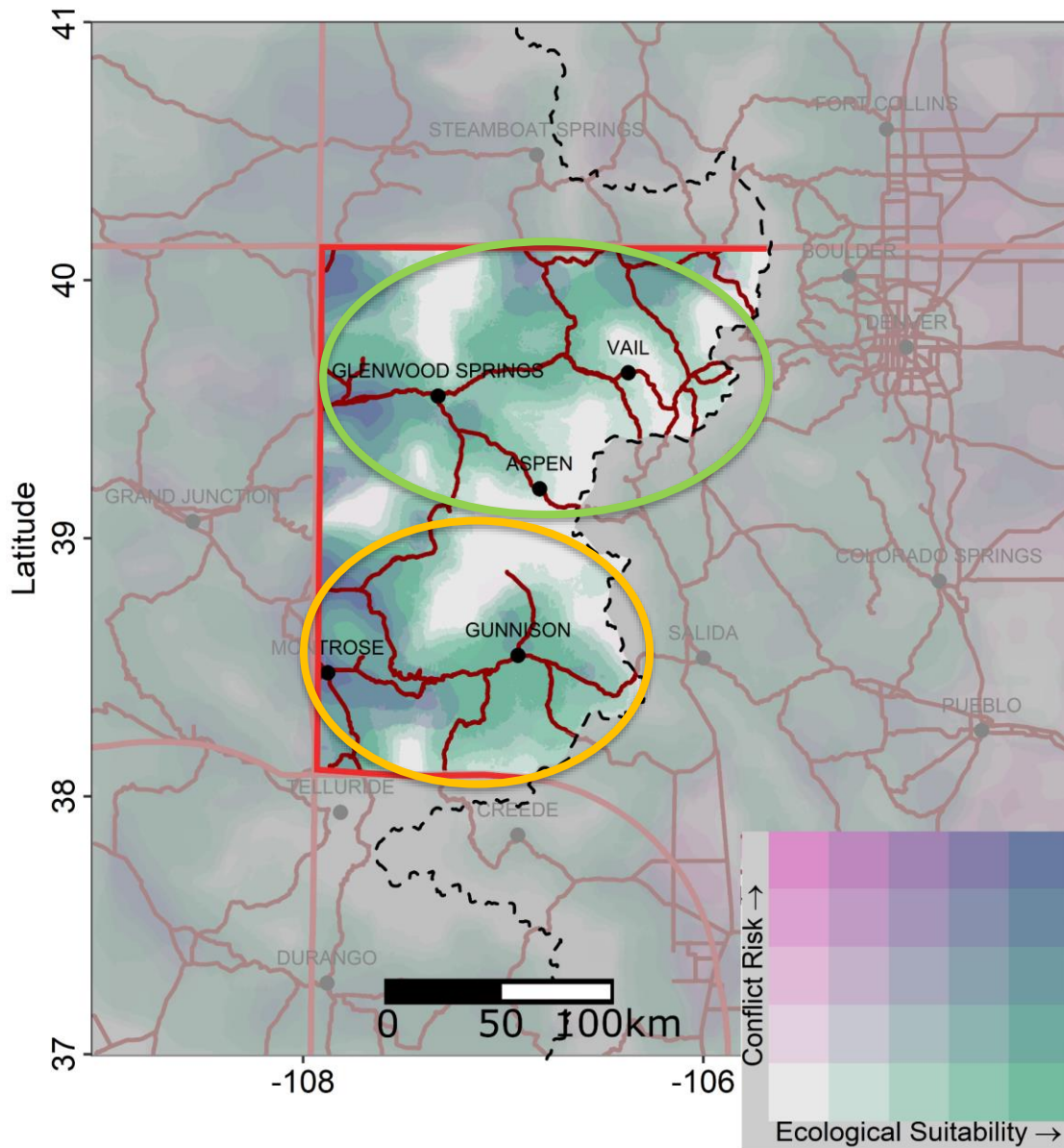


Figure 4. Area for consideration for wintertime releases of wolves. 60-mile buffers from neighboring states and tribal lands, and areas west of the Continental Divide are depicted.

With the previously stated geographic restrictions in mind, two large areas become apparent for consideration as wintertime release sites in western Colorado. The northern area (generally depicted in green) is along the I-70 corridor between Glenwood Springs and Vail, and extends down the Roaring Fork Valley. The second, southern area (generally depicted in yellow) is along the Highway 50 corridor between Monarch Pass (east of Gunnison) and Montrose. Based on the on-going evaluation of geographic mandates and constraints, relative conflict risk, and ecological suitability, and barring the

need to alter this Plan, release sites will be chosen from within these identified north and south areas. Releases in the first year will occur in the northern area only. Subsequent release sites will be considered based on the efficacy of the initial release, but will be located within or near the identified north and south areas.

Releases will occur on state or private lands. The plan does not currently contemplate releases on Federal lands because CPW does not have the staffing or financial resources to undertake the required National Environmental Policy Act (NEPA) analysis prior to any federal land management agency authorizing releases on federal lands. CPW will attempt to select release areas that are likely to promote successful wolf recolonization, while also considering the potential for livestock or human conflicts. Specific release locations will not be made public in this Plan in order to protect private landowner information and sensitive species locations, but targeted outreach will occur with potentially affected stakeholders prior to release.

Upon arrival in Colorado, animals will be immediately released in areas identified as suitable habitat west of the Continental Divide. This is commonly referred to as a “hard release,” in contrast to a “soft release,” in which wolves are kept in pens at the release site for an extended period of time. No supplemental food or care will be provided once the wolves are released.

Post-Release Monitoring

There will be an immediate, and on-going need for post-release monitoring to assess and modify reintroduction protocols if necessary. This will help to ensure the highest probability of survival for subsequently released animals. Data from the wolves’ satellite GPS collars will inform managers on survival and dispersal, as well as future release protocols. If necessary, subsequent translocation protocols will be modified, based upon information obtained during the initial year of the reintroduction effort. Information gained from the initial year of the project will contribute to an overall assessment of the success of the reintroduction over time.

Location data from satellite GPS collars will be adequate to construct annual territory maps. Such location data will be used to determine areas of settlement by males and females and show gaps where additional individuals could be released during the next round of captures and translocations. As the annual process moves forward, the data can also be useful for within-release-year decisions on what release areas to target. For example, movements or apparent settling of animals will inform subsequent release locations. The overall goal is to better discern the establishment of breeding pairs and reduce territorial conflicts with other wolves.

Evaluating Success of Reintroduction

After the release of 30-50 animals over the 3-to-5 year timeframe, active reintroduction will stop, and post-release monitoring will apprise managers if the effort to establish a self-sustaining wolf population in Colorado has been successful.

The following established set of benchmarks will be used to evaluate the short-term success of wolf reintroduction efforts:

- Reintroduced wolves demonstrate a high rate of survival in the first 6 months after release;
 - A survival rate of less than 70% would initiate protocol review (ODFW 2015).
- Released wolves demonstrate low mortality rates over the initial 2-3 years post-release;
- Wolves remain in Colorado;
- Reintroduced wolves successfully form pairs and reproduce, establishing packs;
- Wolves born in Colorado survive and also successfully reproduce.

If parameters are measured that indicate a growing population that no longer needs supplemental active reintroductions, and the wolf population demonstrates a positive growth rate from natural reproduction, the wolf population will be managed to grow naturally toward recovery levels (see Chapter 4). If the population demonstrates an unacceptable flat or negative growth rate, or a high rate of mortality is found, active augmentation would be reinitiated (after evaluating what led to the initial unsuccessful result).

Private landowners, the general public, and other federal/state agency personnel will be requested to immediately report any observation of a gray wolf to CPW. Illegal take of gray wolves by the public will be discouraged through an extensive information and education program, which will include reference to all initially transplanted animals being monitored daily through GPS satellite collars and radio telemetry. Any reports of suspicious activity will be taken seriously and investigated. The public will be encouraged to cooperate with CPW in the attempt to closely monitor the wolves and quickly resolve any conflicts.

CPW will monitor transplanted wolves that emigrate into adjacent states and assess management implications on a case-by-case basis in consultation with that state's wildlife management agency and the USFWS. Such animals may be captured and relocated back to Colorado in the most efficient and effective manner possible.

Any unexpected losses of wolves to preventable causes will immediately prompt a review of all associated factors, and, if possible, find ways to improve procedures. Unexplained losses or an unusually large number of losses during the first year of releases or following any modification to established protocols will prompt a full review of management procedures. To assure high initial post-release survival, the project may be suspended at any time until likely cause(s) of problems are identified, and acceptable solutions can be implemented to resolve the problem(s).

Monitoring will occur over a longer time frame to assess when the program has reached its benchmarks for success and completion (Chapter 7).

Chapter 4: Recovery of Wolves in Colorado

State statute requires that this Plan develop: “Methodologies for determining when the gray wolf population is sustaining itself and when to remove the gray wolf from the list of endangered or threatened species, as provided for in Section 33-2-105 (2).” CRS § 33-2-105.8 (3)(iv). This chapter addresses this responsibility.

Definitions for state endangered, threatened, and nongame species are as follows:

- Endangered Species: any species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy as determined by the commission (CRS § 33-1-102 (12));
- Threatened Species: any species or subspecies of wildlife which, as determined by the commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered. CRS § 33-1-102 (44).
- Nongame Species: all native species and subspecies of wildlife which are not classified as game wildlife by rule or regulation of the commission. CRS § 33-1-102(29).

As of February 10, 2022, wolves are listed under the federal Endangered Species Act as endangered. **This Plan does not replace a federal recovery plan, nor does it outline federal recovery goals.**

Phased Management of Wolves

Wolves will be managed within Colorado using a phased approach, based on the number of animals present in the state. See Table 2. These phases correspond with the status of the species on the Colorado Threatened and Endangered Species list, and track the definitions of “endangered species” and “threatened species” in C.R.S. §§ 33-1-102(12) and 102(44). The thresholds were developed through expert deliberation of the Technical Working Group (TWG) members and are presented in a phased framework.

A phased approach provides clarity for current and future management, while still supporting the statutory requirement of managing for a self-sustaining wolf population. A phased approach allows for increased management flexibility as the wolf population increases and provides the opportunity to manage conflict throughout all phases.

A minimum wintertime count is the metric that will be monitored in the early phases of reintroduction. This count will attempt to include all wolves in the state, whether they are wolves that have naturally migrated into the state and their progeny and those that were reintroduced and their progeny. Any wolf anywhere in the state will count towards the minimum count.

A minimum count is labor and resource intensive. Minimum population counts have been used by Wyoming, Montana, and other states during the early stages of the recovery process. As the wolf population grows, minimum population counts are more difficult to conduct and are less reliable for understanding total population size. As the wolf population status transitions to a state delisted status, CPW will use a population estimate or population models as a more reliable metric (i.e., models based on distribution, vital rates, and abundance estimates, etc.). These methods will be developed using data that are collected during the minimum population counts and other wolf monitoring/research activities.

We will apply a temporal trend threshold in the downlist and delisting criteria. This is important to ensure a trend of stable or increasing population, to account for the temporary population increases that occur through reintroduction, and to allow for temporary fluctuations in population size or

unforeseen monitoring challenges over time. The interaction between minimum population count and the length of time criteria can accommodate rapid or slow population growth. For example, rapid population growth could eliminate the need for a temporal requirement between phases.

Minimum counts for delisting are not intended to be and should not be interpreted as population objectives or maximum target populations.

Specific management direction for the phases is described in Chapter 5.

Table 2. Start and end points of Phases describing wolf recovery ~~and management~~ in Colorado.

	Phase 1^a (denotes State Endangered status)	Phase 2 (denotes State Threatened status)	Phase 3 (denotes State delisted, nongame status)	Phase 4 (denotes State delisted, game status)
Start	Current	Minimum count of 50 wolves anywhere in Colorado for four successive years.	Phase 1 and Phase 2 conclusion requirements are both met. Phase 2 requirements may be met concurrently with Phase 1 requirements. ^d	Not required under CRS 33-2-105.8.
Conclude	Minimum count ^b of 50 wolves anywhere in Colorado for four successive years. ^c	Minimum count of 150 wolves anywhere in Colorado for two successive years ^c -OR- Minimum count of 200 wolves anywhere in Colorado with no temporal requirement <u>and are not so extremely restricted throughout all or a significant portion of their range that it may become endangered.</u>	No prescribed conclusion	Not required under CRS 33-2-105.8.
Action upon conclusion	Downlist to State Threatened.	Delist from Colorado State list of threatened and endangered species	Consider reclassifying to game species.	N/A
Criteria to move back into this phase	After downlisting, a minimum count of less than 50 wolves anywhere in Colorado for two consecutive <u>successive</u> years initiates review of relisting to State Endangered status.	After delisting, a population estimate with a lower 80% confidence limit of less than 150 wolves anywhere in Colorado for two consecutive <u>consecutive-successive</u> years initiates review of relisting to State threatened status.	To be determined dependent on overall health and stability of the population	N/A

Notes on framework:

^a Phases will be dictated by numeric and temporal wolf population thresholds described in the table. While it is intended that state status will also correspond to these thresholds, there may be a time lag as the Parks and Wildlife Commission undertakes the regulatory process to change the state status based on population counts.

^b Minimum population counts in any phase include gray wolves that have been reintroduced to Colorado, those that have naturally migrated into the state, and the progeny of both groups. To reflect *in situ* recruitment most accurately, wolf population minimum counts in this table refer to counts conducted in late winter.

^c “Successive” means years in a sequence, with any number of gaps in between. Consecutive means years in a sequence with no gaps.

^d Downlisting to State Threatened status may not occur until the four-successive year requirement is met in the State Endangered status phase 1 (Phase 1). However, the two-successive year timeline for the phase 2 minimum count requirement begins when the minimum number is first met and may occur concurrently while in the Phase 1/endangered phase. Consequently, it is possible that delisting (conclusion of Phase 2) may occur immediately after Phase 1, should the Phase 2 requirements be met concurrently during Phase 1.

Phase 1 (State Endangered):

“Phase 1” refers to when the wolf is classified by Commission rule as an endangered species under state law. This first phase includes the early years of wolf reestablishment when population size is small. During this phase, the initial wolf population will be managed in accordance with state policy to conserve species listed as endangered under Colorado’s Nongame, Endangered, or Threatened Species Conservation Act (CRS § 33-2-101). All state management of wolves will comply with any superseding Federal status and associated rules or regulations. The Commission may pass regulations related to this Plan. In the event of any conflicts between the Plan and such regulations, such regulations will control.

This Plan will remain in Phase 1 until CPW biologists document a minimum wintertime count of 50 wolves anywhere in the state for four successive years. A temporal requirement of successive minimum population counts for downlisting to threatened is important to ensure a trend of a stable or increasing population, to account for the temporary population increases that occur through reintroduction, and to allow for temporary fluctuations in population or unforeseen monitoring challenges over time.

Once the criteria are met to move from Phase 1 to Phase 2, the regulatory process to downlist to state threatened will begin. The Commission will take the most time-efficient manner to conduct the downlisting processes to state threatened through the CPW Chapter 10 regulation process.

Phase 2 (State Threatened):

“Phase 2” refers to when the wolf is classified by Commission rule as a threatened species under state law. Phase 2 is characterized by subsequent periods with increased population growth and spatial expansion of packs into suitable habitat and multiple years of data to base management decisions. Phase 2 will correspond to the time when the Colorado wolf population’s growth is driven more by natural reproduction than by active reintroduction. This phase is envisioned as a period when wolves expand into and inhabit suitable areas throughout Colorado.

Phase 2 will begin after CPW confirms a minimum count of 50 wolves anywhere in Colorado for four successive years and will conclude when a minimum count of at least 150 wolves anywhere in Colorado is measured for 2 successive years, or a minimum count of at least 200 wolves anywhere in Colorado is measured, with no temporal requirement and are not so extremely restricted throughout all or a significant portion of their range that it may become endangered. This will correspond to a time when wolves will be removed (delisted) from the State Threatened and Endangered Species List. At that time their status will be “nongame wildlife.”

The transition from state endangered to state threatened cannot occur until the four-successive year requirement is met in Phase 1. However, the two-successive year time constraint to transition from Phase 2 to Phase 3 begins when the minimum count of 150 wolves is first met and may occur concurrently while in Phase 1. Consequently, it is possible that delisting (conclusion of Phase 2) may occur immediately after meeting the threshold for transition from Phase 1 to Phase 2, should the Phase 2 requirements be met concurrently during Phase 1.

Taking a conservative estimate of a pack size of 8 animals, a population of 200 wolves would have approximately 25 packs on the landscape. Assuming each pack has a conservative territory size of

180mi², there would be nearly 2.8 million acres of occupied wolf territory when the minimum population size is 200. CPW feels confident in stating that the distribution of wolves throughout Colorado would represent a secure population and that the species should no longer be considered state threatened when that numerical threshold has been met.

As in the transition from Phase 1 to Phase 2, there may be a regulatory lag moving from Phase 2 to Phase 3. This regulatory process will be completed in the most expeditious manner possible.

At the time that the Parks and Wildlife Commission is considering delisting the species, CPW will conduct a Population Viability Analysis, or similar population modeling effort. This would be done to assess the extinction probability of the wolf population in Colorado, using Colorado-specific demographic parameters gained from research and monitoring the population in the state in the years between reintroduction and recovery. An effort similar to ODFW (2015) is suggested as a model for comparison.

Phase 3 (Delisted/Nongame species status):

“Phase 3” refers to when the wolf is classified as a nongame species under state law and is no longer listed on the Commission’s list of threatened or endangered species. This phase is characterized by a sustained wolf population which continues to grow, though the rate of growth will likely decrease over time.

Phase 3 will begin after CPW confirms that there are at least 150 wolves anywhere in Colorado for two successive years, or a minimum count of at least 200 wolves anywhere in Colorado, with no temporal requirement. Once this threshold is met, the species will be reclassified to delisted, nongame status.

A wolf population of 150-200 animals is not considered a minimum or a maximum allowable number of wolves and is not a management objective. The value of 150-200 is used to determine when the gray wolf population is sustaining itself and when to remove the species from the list of endangered or threatened species because it no longer fits the definition of state endangered or state threatened.

Long Term Wolf Management: Phase 4 (Game species status):

~~“Phase 4” refers to when the wolf may potentially be classified as a game species in the future. Phase 4 is not required under CRS 33-2-105.8. There is no population objective for wolves in this Plan.~~

~~Long-term wolf management may include reclassification as a big game or furbearer species.~~

At some point in the future, the long term management of wolves in Colorado may need to be considered further than what is outlined in this plan. These discussions would only occur after wolves have successfully been recovered and removed from the State Threatened and Endangered list. The long-term management of wolves should be impact- and science-based, with consideration of biological and social science as well as economic and legal considerations.

~~Regulated public harvest of wolves by hunting during designated seasons is one tool that may help CPW manage wolf numbers and social acceptance of wolves upon delisting and reclassification as a game species. Necessarily, this phase can only be framed in general terms at this time because forecasting the details of this future is impossible using currently available information.~~ CPW will defer consideration of and development of specifics for long-term management until the beginning of Phase 3 at the earliest, when better information about wolves and their distribution in Colorado is available. Future management will be guided by the best available biological and social science data provided by CPW.

This plan takes no position as to whether the Parks and Wildlife Commission has the statutory authority to reclassify wolves as a game species or take other appropriate management actions.

Chapter 5: Wolf Management

By passing CRS 33-2-105.8, Colorado voters declared that “Restoration of the gray wolf to the state must be designed to resolve conflicts with persons engaged in ranching and farming in this state” (33-2-105.8(1) (d)).

State statute requires that this plan provide “[d]etails for the restoration and management of gray wolves, including actions necessary or beneficial for establishing and maintaining a self-sustaining population, as authorized by Section 33-2-104” (CRS 33-2-105.8 (3)(a)(III)).

Further, state statute requires that “the commission shall not impose any land, water, or resource use restrictions on private landowners in furtherance of the plan” (CRS 33-2-105.8(3) (IV) (b)).

This chapter addresses those responsibilities.

Management Limitations

Legal Considerations

The legal status of wolves at federal and state levels impacts management options and flexibility. A primary challenge for CPW in developing and implementing this Plan is that the uncertainty and longevity of federal listing of wolves as a Federally Endangered Species affects the state’s ability to manage the species using a variety of management techniques, including lethal take. As stated earlier, all management of wolves in Colorado will be done in compliance with all state and federal laws and regulations.

Concurrent with Plan development, at CPW’s request, USFWS has embarked on a rulemaking process designed to provide management flexibility by designating Colorado’s wolves as an experimental population under section 10(j) of the federal ESA. USFWS anticipates that the resulting 10(j) rule will take effect prior to the reintroduction of wolves into the state, as was done when wolves were reintroduced into the NRM in the mid-1990s. The 10(j) rule provides management flexibility that is a critical component to the success of this Plan and on which other components of the Plan depend.

Following reintroduction, some forms of aversive conditioning and lethal take to protect human safety, to reduce livestock depredation, or to mitigate risks of substantial effects on ungulates will be necessary management tools. These management options are limited, however, while the gray wolf is listed as endangered or threatened under state or federal law. If the legal status of Colorado wolves changes, including the anticipated adoption by USFWS of a 10(j) rule to direct management of wolves in the state, CPW expects to have increased management flexibility, including authority to lethally remove wolves for management purposes consistent with this plan. Additional regulatory changes will likely be necessary to provide mechanisms to resolve depredation of livestock by wolves as well as to mitigate for other possible conflicts.

It is the duty of the Commissioner of Agriculture to control depredating animals in the state of Colorado to reduce economic losses to agricultural products or resources. Colo. Rev. Stat. § 35-40-101(1). To fulfill this duty, the Commissioner may adopt rules for the control of depredating animals, in consultation with the Parks and Wildlife commission; establish lethal and nonlethal methods of controlling depredating animals; and allow state employees and owners of agricultural products or resources and their families and employees to control depredating animals. Colo. Rev. Stat. § Section 35-40-101(2).

With respect to at-risk depredating animals, the Commissioner, when adopting rules, must receive

approval from the Colorado Parks and Wildlife Commission of any proposed rules. Colo. Rev. Stat. § 35-40-101(4)(a).

Impact-Based Management

This Plan is predicated on managing wolves in Colorado using “impact-based” management within an adaptive management framework that will allow the State the maximum flexibility to manage wolves while learning how they affect Colorado’s ecosystems (see Chapter 2 for detailed discussion).

The assumptions inherent in this impact-based approach are that the presence of wolves in Colorado will have both positive and negative impacts. The positive impacts of having wolves on the landscape will be recognized and used without having to implement direct wolf management practices. Positive impacts may include, but are not limited to the following: 1) providing complementary offtake of ungulates in management units where they are overpopulated; 2) dispersal of wild ungulates that may result in habitat improvement due to less herbivory on vegetative communities; 3) selective removal of diseased animals from herds; and 4) social, economic or non-monetary values, such as intrinsic value, existence value, and other possible values for present and future generations. The negative impacts of wolves may require direct intervention. Negative impacts can include, but are not limited to the following: 1) depredation and harassment of livestock; 2) loss of pets, herd dogs and guard animals; and 3) contributing to declines below management objectives in ungulate populations or in ungulate recruitment rates. This chapter describes what interventions may be implemented to address the negative impacts of having wolves on the landscape. The management herein will comply with federal and state laws and regulations.

It must be emphasized that not all impacts can be predicted and that future management flexibility is crucial for adaptively managing impacts as they arise. With such uncertainty, the spectrum of potential management actions cannot be prescribed by this Plan.

Three primary categories of conflict and specific management considerations are defined. The three categories of impacts are: Livestock Interactions, Wildlife Species Interactions, and Other Situations. For each of these categories, the impact and management tools are described. The deployment of these tools may be affected by the Phase (see chapter 4 and Table 2) of the wolf population, which is also described.

Livestock Interactions

IMPACT: Wolves are present, but not biting, wounding, grasping or killing, and not chasing livestock, and there have been no prior depredations or attacks.

In this situation, the appropriate management tools to consider are education; non-lethal, non-injurious conflict minimization techniques (e.g., fladry, range riders, livestock guardian dogs); or non-lethal, potentially injurious conflict minimization techniques (e.g., rubber buckshot, rubber slugs, bean bag projectiles).

Non-lethal, non-injurious hazing of wolves includes scaring off an animal(s) by making loud noises (e.g., confronting the animal(s) without doing bodily harm). See CPW ~~Hazing~~ Regulation #~~1005~~1000. These tools are acceptable in all Phases of wolf management. Non-lethal potentially injurious hazing means scaring off a wolf (or wolves) without killing but with potential for minor injury to the wolf. Training for material deployment will be provided by CPW staff at the time of materials are delivered.

If a known injury or death of a wolf occurs as a result of hazing, CPW must be notified within 24 hours. Death or injury as a result of translocation of wolves and lethal management of wolves are not considered for this impact.

IMPACT: Wolves are observed in the act of biting, wounding, grasping or killing livestock, or are observed in the act of chasing livestock.

While the likelihood of observing a wolf in the act of biting, wounding, grasping, killing, or chasing is low, and the likelihood of implementing lethal control in this context is also low, this management approach provides livestock owners with tools to respond, should the situation occur.

For this impact, management options include non-injurious, conflict minimization techniques (e.g., fladry, range riders, livestock guardian dogs); or potentially injurious hazing techniques (e.g., rubber buckshot, rubber slugs). Nonlethal tools should be explored and encouraged before lethal tools are used. Lethal management should not generally be a first line of defense. A permit is required for private landowners and their agents ~~in advance~~ in Phases 1 and 2 to provide for lethal control of wolves caught in the act of biting, wounding, grasping, or killing livestock or working dogs.

Such scenarios where lethal control is implemented must be reported to CPW within 24 hours, ~~unless impractical, but in no event later than 72 hours~~, and will be expeditiously investigated. A preponderance of evidence, including dead or injured livestock or working dogs, or other physical evidence should be present, which would lead a reasonable person to believe that a depredating wolf or wolves were involved, or that a wolf attack on livestock or dogs was occurring or imminent.

In Phases 1 and 2, a limited duration permit for lethal take may be issued to a livestock owner or agent of the livestock owner on private or public land. A permit is required under state law (CRS 33-2-106.4). Non-lethal conflict mitigation measures will be considered prior to issuance of any lethal take permit.

In Phase 3, the same permitting requirements exist. Further coordination with Colorado Department of Agriculture will be required as well per Colo. Rev. Stat. § 35-40-101(4).

IMPACT: Confirmed depredations (injury or death) of livestock by wolves. Management actions following confirmed depredation by wolves include education, both non-injurious and potentially injurious hazing as described above, and lethal control. The translocation of depredating wolves to a different part of the state will not be considered, as this is viewed as translocating the problem along with the wolves.

The lethal control of chronically depredating wolves following depredation events will be conducted by state or federal agents (consistent with applicable law) if determined to be appropriate, after an evaluation of the circumstances, in all phases.

Limited duration permits for lethal take may be issued to livestock owners or agents on public or private land after evaluation of circumstances, as described above. These permits will only be issued if state or federal agencies do not have the capacity to implement on-the-ground lethal control actions themselves. This action requires reporting and an investigation that demonstrates evidence that justifies the act.

There is not a specific definition of a “chronically depredating” pack or wolf. CPW program managers will make the determination as to whether a situation is characterized as chronic depredation on a case-by-case basis. A full evaluation of the circumstances will include considerations such as: 1) documented repeated depredation and harassment in a limited geography caused ~~by wolves caused~~ by the wolf or

pack targeted; 2) previously implemented practices to reduce depredation; 3) likelihood that additional and continued wolf related mortality would continue if control is or is not implemented; and 4) unintentional or intentional use of attractants that may be luring or baiting wolves to the location.

Wildlife Species Interactions

IMPACT: Wolves are present, and there are no apparent population level impacts to other wildlife species. In this situation, there are no direct wolf management actions necessary. Education and outreach to the general public and others will continue (see Chapter 8).

IMPACT: Ungulate populations are below objectives in a geographic unit or area (i.e., DAU), and wolves are a suspected causal agent. Lethal control of wolves in this situation may be allowed by state or federal agents with considerations.

In considering an appropriate management response to wild ungulate impacts, CPW will require:

- Data or other information indicating that wolves are a known factor of ungulate herds not meeting objectives.
- CPW will consider the following:
 - Level and duration of wolf removal necessary to achieve management objectives;
 - Ability to measure ungulate response to management actions;
 - Identification of other potential major causes of an ungulate population not meeting HMP population objectives and attempts made to address them;
 - Decline in ungulate license quotas and hunting opportunities

A management response to wild ungulate impacts will not be considered until Phase 3, as it is not anticipated that wolf population sizes in Phases 1 or 2 could demonstrably be shown to have an impact on ungulate population metrics that would justify this act. Empirical data must support the conclusion that wolves are a principal cause in affected ungulate populations. In employing this management action, wolf removals must not contribute to reducing the wolf population in the state below 150 wolves (returning to Phase 2).

IMPACT: Populations of wildlife species other than ungulate prey are significantly reduced or likely to be extirpated due to the presence of wolves. This is not expected to occur, though there may be situations where, with higher wolf populations (i.e., Phase 3), there may be some yet undetermined impact on the sustainability of some wildlife species of concern at a biologically meaningful scale for recovery. Considerations similar to what is described immediately above for ungulate impacts would be evaluated to determine if management of wolves is warranted. Based on knowledge and experience in other Rocky Mountain states and input from the TWG, it is not expected that wolves will have any impact on Canada lynx or sage grouse populations.

Other Situations

IMPACT: Wolves are present and no human health or safety risks are posed. There are no wolf management actions warranted in this situation. General education and outreach is appropriate to potentially affected publics.

IMPACT: Wolves attacking or have attacked humans. Lethal control of wolves in defense of human life is allowed under both state and federal law. The lethal control of wolves that have attacked (but are not in the act of attacking) may be employed by state or federal agents in any phase of wolf management in the state.

IMPACT: Wolves attacking a pet or hunting dog. Lethal control of wolves in the act of or having recently attacked a pet or hunting dog is not allowed in any Phase. This is consistent with other game damage laws and regulations (CRS 33-3-106).

IMPACT: Wolves found to be denning within municipal boundaries or a high-density human population area. The removal of a denning pack is allowed in all phases of wolf management but must be conducted by state or federal agents. Translocation of the pack will be considered and implemented if possible.

IMPACT: Agency wolf management. Take (non-lethal and lethal) by state and federal agents is allowed for efforts related to the release, tracking, monitoring, recapture, and management of wolves in Colorado; to aid or euthanize sick, injured, or orphaned wolves or to transfer to a licensed veterinarian for care; to dispose of a dead specimen; to salvage a dead specimen that may be used for scientific study; to aid in law enforcement investigations involving wolves; or to remove wolves with abnormal physical or behavioral characteristics from passing on or teaching those traits to other wolves. ~~scientific purposes (incidental or accidental take); to avoid conflict with human activities; to relocate a wolf to enhance survival and recovery prospects; to aid or euthanize sick, injured wolves; to salvage dead specimens; to aid in law enforcement investigations involving wolves; and to manage wolves with abnormal physical or behavioral characteristics.~~

In an effort to inform future actions and wolf management related to controlled take, CPW will monitor the results and evaluate the impacts of any wolf removal. CPW anticipates that additional relevant information will continue to become available as physical and ecological conditions in Colorado continue to change, legal frameworks and authorities may change, and CPW staff gain additional experience with wolves.

Some management activities are unaffected by the legal status of wolf populations in the state. These include:

- Research on wolf/ungulate interactions that doesn't result in injury or death;
- Health and disease surveillance;
- Research on management action efficacy;
- Law enforcement;
- Public outreach and education;
- Interagency coordination;
- Annual reporting;
- Non-lethal conflict minimization techniques;
- Technical assistance to landowners and livestock owners;
- Compensation programs for confirmed livestock losses;
- No compensation programs for loss of pets or hunting dogs.

Table 3. Circumstances and associated wolf management tools

Circumstance	Management Tool
Non-injurious, nonlethal conflict minimization practices by livestock owners or their agents	Opportunistic hazing of any gray wolf in a non-injurious manner is permitted at any time. If a known injury or death occurs, CPW must be notified within 24 hours <u>unless impractical, but no later than 72 hours.</u>
Potentially injurious non-lethal hazing techniques by a livestock owner or their agent	Opportunistic hazing of any gray wolf in a non-injurious manner is permitted at any time. If a known injury or death occurs, CPW must be notified within 24 hours <u>unless impractical, but no later than 72 hours.</u>
Take in self defense	Any person may take a gray wolf in defense of the individuals life or life of another person.
Agency take of wolves determined to be a threat to human life and safety	State or Federal agent may promptly remove any wolf that is determined to be a threat to human life or safety.
Taking of wolves in the act of attacking or chasing livestock	A retroactive after issuance of a permit <u>may be issued to</u> , any landowner may immediately that takes a gray wolf in the act of attacking livestock on their private land or <u>state or federal</u> land that they are legally grazing using a federal land use permit <u>A landowner must provided the</u> landowner provides evidence of livestock, stock animals recently (less than <u>within</u> 24 hours, <u>unless impractical, but no later than 72 hours</u>) wounded harassed or killed by wolves and state or federal agents are able to confirm that the animals were attacked by wolves. The carcass of any wolf taken and the area surrounding it should not be disturbed in order to preserve physical evidence.
Agency take of chronic depredating wolves	State or federal agents may carry out hazing, non-lethal control measures, or lethal control of problem wolves. CPW or its designated agents will consider A) evidence of wounded livestock, working dogs, or other animals or remains of livestock that show that the injury or death was caused by wolves, B) the likelihood that additional wolf-caused losses or attacks may occur if no control action is taken, C) evidence of unusual attractants or artificial or intentional feeding of wolves and D) evidence that proper animal husbandry practices are implemented.
Livestock owner or their agents take of chronic depredating wolves	This will only be conducted using limited duration permits if state/federal agents do not have the resources to implement on-the-ground lethal control actions.
Agency take to reduce impacts to wild ungulates	Only considered in Phase 3. In considering an appropriate management response to wild ungulate impacts, CPW will require: <ul style="list-style-type: none"> ● Data or other information indicating that wolves are a known factor of ungulate herds not meeting objectives. ● CPW will consider the following: <ul style="list-style-type: none"> ○ Level and duration of wolf removal necessary to achieve management objectives; ○ Ability to measure ungulate response to management actions; ○ Identification of other potential major causes of an ungulate population not meeting HMP population objectives and attempts made to address them; ○ Decline in ungulate license quotas and hunting opportunities

	In employing this management action, wolf removals must not contribute to reducing the wolf population in the state below 150 wolves.
Agency take to reduce impacts to other wildlife species	Only considered in Phase 3, with similar considerations as described for wild ungulates
Additional take provisions for agency employees	Any employee or agent of CPW or USFWS or appropriate state or federal or tribal agency, who is designated in writing, when acting in the course of official duties may take a wolf from the wild if such actions is for <u>(1) take related to the release, tracking, monitoring, recapture, and management of wolves; (2) to aid or euthanize sick, injured, or orphaned wolves or transfer to a licensed veterinarian for care; (3) to dispose of a dead specimen; (4) to salvage a dead specimen that may be used for scientific study; (5) to aid in law enforcement investigations involving wolves (collection of specimens for necropsy, etc.); or (6) to remove wolves with abnormal physical or behavioral characteristics, as determined by the Service or our designated agent, from passing on or teaching those traits to other wolves.</u> A) scientific purposes; B) to avoid conflict with human activities; C) to relocate a wolf to improve is survival and recovery prospects; D) to return wolves that have wandered outside of the state; E) to aid or euthanize sick, injured, or orphaned wolves; F) to salvage a dead specimen which may be used for educational or scientific study; G) to aid in law enforcement investigations involving wolves, and H) to prevent wolves with abnormal physical or behavioral characteristics.

Wolf Specimen Disposition

Possession of gray wolf parts is regulated by the ESA (when the species is federally listed), as well as state regulations. Wolf carcasses and parts may be discovered by or otherwise become available to the general public for a variety of reasons, including natural mortality, accidental death, agency control actions, or defense of life. It is not legal to possess parts of wildlife legally classified as threatened or endangered unless there are provisions for regulated public take – i.e., special regulations written for state listed or nongame species. Any person who possesses a dead wolf or wolf parts must adhere to all federal and state laws or regulations from the state or country the animal originated from. Additionally, any part must adhere to transport and import laws and regulations.

Any wolf carcass found in the field should be left alone and reported to CPW. CPW or APHIS will conduct a field investigation and retrieve the carcass as a precautionary measure for public safety. If a wolf were to be poisoned, there are potential public health concerns. All carcasses, including those resulting from APHIS control actions or private actions through defense of life, will be transferred to CPW and remain state property.

The entire carcass of wolves killed by private individuals in defense of life will be returned to CPW and remain state property, regardless of whether the incident occurred on public or private lands. Upon confiscation, carcasses resulting from illegal killings also remain the property of CPW.

If the hide, bones, or skull are in good condition, they can be salvaged and used for educational purposes. Priorities will be for research purposes, tribal cultural use, and general wolf education. These specimens may be transferred to other government agencies, non-profit organizations, tribal authorities, or educational institutions for general public benefit. Parts unsuitable for educational uses will be destroyed.

Land Use Restrictions

State statute requires that “The commission shall not impose any land, water, or resource use restrictions on private landowners in furtherance of the plan.” CRS 33-2-105.8 (3)(b).

There will be no Commission-imposed land use restrictions placed on private landowners due to the release of or presence of wolves. Neither the presence of naturally migrating wolves nor CPW’s release of wolves constitute a land use restriction. Similarly, statutes and regulations preventing landowners from harassing, injuring, or killing wolves do not constitute land use restrictions because wildlife is owned by the state and the ability to harass, injure, or kill wildlife upon one’s own land does not implicate a private property right. Federal land management agencies have sole management discretion over their lands. CPW has no legal authority to implement restrictions or land management prescriptions on lands it does not own or lease. Therefore, it will be important for federal agencies and CPW to collaborate on land use issues as they relate to wolf management, which may include recreation, grazing management, public access, or habitat manipulation. CPW will facilitate on-going collaboration with Federal land managers in instances where wolf presence or behavior may warrant temporary public land access restrictions.

Managing for landscape scale movement

Safe passage within and between habitat areas is vital for allowing wolves to recolonize unoccupied habitat and for promoting genetic and demographic exchange between subpopulations, as it is for many wildlife species in Colorado.

In Colorado, areas of greatest importance for restoring or maintaining connectivity between regions of suitable wolf habitat currently include various areas through western Colorado, primarily connecting areas that would likely have minimal interaction with livestock.

Other areas may be recognized in the future. Mechanisms to conserve lands and maintain working landscapes include conservation easements, agreements or land acquisitions with willing landowners, and other methods. Where appropriate, working with the Colorado Department of Transportation to create wildlife crossing structures for assisting wolf movement across highways that act as barriers can be a beneficial and productive effort towards wolf management and conservation.

Chapter 6: Wolf-Livestock Interactions

State statute requires that the Plan: “(I) Assist owners of livestock in preventing and resolving conflicts between gray wolves and livestock; and (II) Pay fair compensation to owners of livestock for any losses of livestock caused by gray wolves, as verified pursuant to the claim procedures authorized by sections 33-3-107 to 33-3-110.” CRS 33-2-105.8 (2)(e)(I, II). This chapter addresses those responsibilities. Providing fair compensation to livestock owners for economic losses when livestock are injured or killed by wolves is a necessary and critically important part of the Plan.

Ever since wolves naturally migrated into Colorado (Table 1), despite the lack of statutory and regulatory codification, CPW has been investigating reported livestock depredation by wolves in the same thorough and professional manner the agency has been investigating black bear or mountain lion damage to livestock.

CPW will continue to respond to and investigate wolf-livestock depredations in a timely and accurate manner, implement conflict minimization and other management actions to minimize damage from recurring, and provide monetary compensation to livestock owners for confirmed wolf depredations.

Compensation programs vary greatly across the U.S. and are typically complex and often misunderstood. This is partly attributed to differences in how each state funds and administers their respective programs and the mechanisms by which livestock owners are compensated for damages. CPW’s existing big game damage program is authorized in Article 3 of CRS Title 33 and codified in CPW Chapter 17 Regulations and does not include wolves since they are not a big game species. Since its inception over ninety years ago, this program has changed very little and is funded entirely through annual appropriations from the wildlife cash fund, which includes hunting and fishing license revenue. CPW’s wolf-livestock compensation and conflict minimization plan is independent of the big game damage and prevention program and the statutes and regulations pertaining to damage by big game wildlife. Wolf-specific conflict minimization and compensation procedures will be codified through CPW regulation. The Commission may pass regulations related to this Plan. In the event of any conflicts between the Plan and such regulations, such regulations will control.

Pursuant to CRS 33-2-105.8 (4.5), CPW’s wolf-livestock damage program shall be appropriated by sources other than the sale of hunting and fishing licenses or from associated federal grants. CPW will pursue a variety of funding sources for wolf-livestock compensation and conflict minimization to develop sustainable and robust wolf-livestock compensation and conflict minimization programs.

It is difficult to anticipate the amount of wolf-livestock conflict that will occur as wolf numbers increase in Colorado. The Conflict Minimization and Compensation sections establish a process and framework for how CPW will address these issues. However, it will be important to periodically evaluate this program in the future to ensure that it is meeting the intent of Proposition 114, as recited at § 33-2-105.8, and evolving as needed.

Wolf-livestock Compensation and Conflict Minimization Planning Process

Throughout 2021 and 2022, CPW, the SAG, and the TWG discussed the technical and social considerations of a wolf-livestock compensation and conflict minimization plan to ensure livestock owners are fairly compensated and to assist livestock owners in preventing and resolving wolf-livestock conflicts. During these meetings, the SAG developed wolf-livestock conflict minimization and compensation recommendations (Appendix C).

CPW staff developed the conflict minimization plan based on technical and social considerations from the TWG and SAG as well as input from other state and federal wildlife management agencies.

CPW Conflict Minimization Program

To better assist livestock owners in preventing and resolving conflicts between wolves and livestock, CPW hired a Wolf Conflict Coordinator to serve as the statewide subject matter expert on wolf-livestock conflicts. This position works proactively with CPW staff, internal workgroups, NGOs, livestock stakeholder groups, and state and federal agencies to identify, coordinate, implement and evaluate a variety of conflict minimization techniques and methods to minimize wolf-livestock conflicts. This position also develops and implements education, outreach, and training to livestock owners, CPW staff, and the general public on conflict minimization technique use, application, and maintenance. The coordinator will continually monitor and evaluate effectiveness at the local, community, and statewide level to ensure success of the conflict minimization program.

To meet the intent of CRS 33-2-105.8, CPW will provide the following temporary conflict minimization materials including:

- Turbo fladry: electrified fencing with flagging designed to prevent wolves from entering an area.
- Scare devices: shell-crackers, propane cannons, and fox-lights.

CPW will also determine if novel techniques that are developed after this plan is implemented may be useful and practical for livestock owners and CPW. Conflict minimization hazing techniques must comply with state and federal regulations and must be authorized by the USFWS while wolves are federally listed.

These temporary conflict minimization materials will be provided to livestock owners on a case-by-case basis. When providing these materials, CPW may evaluate the risks to livestock, including, but not limited to, proximity of wolves to livestock based on monitoring data; previous depredating/non-depredating behavior of wolf pack; whether there has been a confirmed wolf-livestock depredation, etc. Temporary conflict minimization materials will be loaned to livestock owners only by written request on a form furnished by CPW staff and such materials will be delivered by CPW with instructions on their use and installation. If available, CPW staff may assist with deploying materials like fladry and fox lights.

CPW will also provide education to livestock owners on other conflict minimization techniques (e.g., carcass management, herders/range riders, herd composition, etc.) that are identified and recommended in CPW's Wolf Resource Guide

(https://cpw.state.co.us/Documents/Wolves/Wolf_Hands-on_Resource_Guide_Depredation_Prevention.pdf).

CPW's conflict minimization plan funding will be separate from funding used for wolf-livestock compensation. This will allow members of the public and NGOs to help contribute funding to CPW knowing that their contributions will be used for specific elements of the wolf management program. Further, CPW will develop specific procedures for providing conflict minimization materials, support, and training to livestock owners through establishment of CPW regulation. This plan relies heavily on the SAG-developed conflict minimization elements, principles and funding and capacity recommendations referenced in the SAG Recommendations for preventative, non-lethal, wolf-livestock conflict minimization report (Appendix C). CPW will also seek external funding to support projects and materials and coordinate the efforts of NGOs, and agencies to effectively minimize wolf-livestock conflicts. Secure, long-term funding will be critical for the success of the Conflict Minimization Program.

CPW Compensation Program

Pursuant to CRS 33-2-105.8, CPW shall pay fair compensation to livestock owners for any losses of livestock caused by gray wolves, as verified pursuant to the claim procedures authorized by sections CRS 33-3-107 to 33-3-110. Therefore, CPW's wolf-livestock compensation plan incorporates the damage claim procedures statutes enumerated in CRS 33-3-107 to 33-3-110.

CPW's wolf-livestock compensation program provides 100 percent fair market value (FMV) compensation, up to a maximum of ~~\$815,000~~ per animal, for the confirmed death of livestock (cattle, horses, mules, burros, sheep, lambs, swine, llama, alpaca, and goats pursuant to CRS 33-2-105.8(5)(c)), as well as guard/herding animals. Conflict minimization techniques are not required to be eligible for compensation; however, CPW will work with livestock producers to implement such techniques to reduce the risk of further depredations. Veterinarian costs for the treatment of livestock and guard/herding animals that have been injured as a result of wolves will be compensated up to the FMV of the animal not to exceed \$15,000. If the animal receiving veterinarian care dies due to ~~an injury~~ injury inflicted by wolves, compensation will be limited to the animal's FMV, not to exceed the ~~\$815,000 per head-animal~~ limit and additionally veterinarian expenses up to the FMV of the animal not to exceed \$15,000.

CPW will base all wolf-livestock depredation confirmations on a preponderance of the evidence standard, which is currently the same standard used for big game damage investigations. Preponderance of the evidence means it is more probable than not that ~~livestock depredation damage~~ was caused by wolves. Determination of 100 percent FMV for livestock, will be based on the same standard as CPW regulation W17, Article 4, #1742 (<https://cpw.state.co.us/Documents/RulesRegs/Regulations/Ch17.pdf>) used for big game damage to livestock and personal property used in the production of raw agricultural products (guard/herding dogs). Compensation for wolf damages by CPW shall be reduced by the amount of other financial support, including payments/claims awarded by an insurance company for the same damages.

CPW conducted an extensive review of published, peer-reviewed wolf-livestock compensation literature and other sources (Bangs and Shivak 2001; Switalski et al., 2002, Montag 2003; Nyhus et al., 2003, Oakleaf et al., 2003; Bradley et al., 2005; Bradley and Pletscher 2005; Wydeven and Park Falls 2007; Collinge 2008; Muhly and Musani 2009; Agarwala et al., 2010; Laporte et al., 2010; Sommers et al., 2010; Breck et al., 2011; Hebblewhite 2011; Steele et al., 2013; Rambler et al., 2014; Wiegulus and Peebles 2014; Clark et al., 2017; Morehouse et al., 2018; Harris 2020; Macon 2020; Nickerson 2021; USFWS 2021; Valerio et al., 2021).

Many of the studies listed above indicated that it can be difficult in open range settings to find calves and all age classes of sheep that are depredated by wolves since those animals are more likely to be entirely consumed or missing, whereas larger livestock were not. Additionally, livestock owners could incur economic losses (hereafter referred to as production losses) other than the direct loss of an animal, that can lead to decreased weights, increased stress, decreased conception rates, and other related impacts (Steele et al., 2013, Rambler et al., 2014).

Because of the challenges of running livestock with wolves on the landscape, CPW has developed the additional compensatory mechanisms to address missing livestock or production losses.

Once a confirmed livestock depredation event occurs (injury or death), which is compensated at 100 percent FMV up to ~~\$815,000~~, livestock owners may *EITHER* apply for missing *calf, yearling, or sheep* losses through a basic *compensation ratio* (i.e., number of calves, *yearlings*, or sheep compensated per confirmed depredation as defined by Commission regulation) *OR* apply for *itemized production losses* by

providing specific baseline documentation, to claim missing calves, yearlings, or ~~or~~ sheep losses, decreased cattle and sheep-weights, decreased cattle and sheep conception rates and additional losses. Such claims will be decided on a case-by-case basis. This allows livestock owners to choose whether to pursue a more simplified process (basic compensation ratio) versus one that will require additional documentation to support their claim (itemized production losses). Based on documentation they provide as part of the claim, it also allows livestock owners who sustain damage amounts greater than what is covered by the simple compensation ratio to seek production loss compensation. For each claim submitted, the livestock owner has the option to choose between the simple compensation ratio OR itemization, but may not do both.

Base Compensation:

For each confirmed wolf depredation that occurs to any livestock enumerated in CRS 33-2-105.8(5)(c), that livestock owner will be eligible for 100 percent FMV compensation consistent with CPW Chapter 17 Regulation #1742.B. After a confirmed depredation of cattle or sheep, the livestock owner can choose between options 1 or 2, detailed below, but cannot do both.

Option 1, Basic Compensation Ratio:

Due to the nature of wolf-livestock depredations in areas where topography and vegetation would create difficulties in finding livestock carcasses, CPW's compensation plan will allow livestock owners to be compensated for missing calves, yearlings, and all classes of sheep via a simple compensation ratio after or concurrent with a confirmed wolf-livestock interaction resulting in livestock injury or death. In this plan, a compensation ratio recognizes that for every confirmed wolf depredation, it is possible that up to 7 additional calves or sheep could be missing as a result of wolves and not be found by a livestock owner. Additionally, the Parks and Wildlife Commission directed that yearling cattle would also be eligible for a compensation ratio.

For livestock owners who choose the basic compensation ratio option (this option is only applicable for calves, yearlings, and all classes of sheep) the following apply:

- Missing livestock claimed for compensation ratio must be ~~sheep or~~ calves, yearlings, or sheep; other livestock (enumerated in CRS 33-2-105.8(5)(c)), herding, and guard animals do not qualify for compensation ratio.
- Missing calves, yearlings, and sheep can be claimed if two conditions are met:
 - 1) Livestock owners must have a confirmed depredation event (injury or death) due to wolves to qualify for the compensation ratio.
 - Missing animals must be from the same band or flock of sheep, herd of cattle, or same private parcel of land where the confirmed depredation event occurred.
 - For each damage claim submitted, a livestock owner must have at least one confirmed depredation event.
 - 2) The livestock owner must reasonably believe that livestock reported as missing were lost to wolves and not to other predators (i.e., bears, lions, or coyotes), disease, or other factors.
 - Example: CPW confirms one calf was depredated by wolves and the livestock owner reasonably believes three additional calves are missing (and can be documented as missing by the livestock owner).
- Livestock owner is eligible to receive 100 percent FMV compensation for the confirmed calf that was depredated and 100 percent FMV compensation for the three claimed missing calves.
- 100 percent FMV X 4 = compensation amount.
- Under no circumstances can the number of missing calves, yearlings or ~~or~~ sheep claimed for compensation exceed the actual number of documented livestock missing.

- CPW investigators will consider the role of topography/vegetation in determining eligibility for missing livestock. In general, the compensation ratios will only apply in larger, open range grazing situations where locating carcasses is more difficult due to geographic and topographic factors.
- Conflict minimization techniques are not a requirement for damage compensation, however:-
However:-
 - A two-tiered compensation ratio for missing calves, yearlings, and sheep incentivizes the use of conflict minimization, with the higher tier (up to seven missing ~~animals-calves or sheep~~ may be claimed for every one confirmed wolf depredation: a 7:1 ratio, or up to 1.25 missing yearlings may be claimed for every one confirmed wolf depredation: a 1.25:1 ratio) applied when a livestock owner uses conflict minimization techniques and the lower tier (up to five missing ~~animals-calves or sheep~~ may be claimed for every one confirmed wolf depredation: a 5:1 ratio, or up to 1 missing yearling may be claimed for every one confirmed wolf depredation: a 1:1 ratio) if conflict minimization techniques/methods are not used.
 - Any livestock owner claiming eligibility for the 7:1 ratio (calves or sheep) or 1.25:1 ratio (yearlings) will bear the burden of proving that conflict minimization techniques are implemented.
 - Example: CPW confirms one calf was depredated by wolves and the livestock owner reasonably believes seven additional calves are missing (and can be documented as missing by the livestock owner).
 - If the landowner *does use* conflict minimization techniques:
 - Eligible for the confirmed calf, plus the seven missing calves
 - 100 percent FMV X 8 = compensation amount.
 - If the landowner *does not use* conflict minimization techniques:
 - Eligible for the confirmed calf plus five of the seven missing calves.
 - 100 percent FMV X 6 = compensation amount.
 - Conflict minimization techniques/methods include, but are not limited to guard/herding dogs, shepherders/range riders, fladry, carcass management, and other lawful gray wolf hazing techniques enumerated in Commission regulation W10.
 - Compensation ratios described above are also designed to account for some indirect production losses that could be incurred.

Option 2, Itemized Production Losses:

Economic losses other than direct loss of animals and missing livestock can impact livestock owners. These production losses could include decreased weight gains (i.e., weaning weights), decreased conception rates and other indirect losses. For livestock owners who have had a confirmed wolf-livestock interaction resulting in livestock injury or death, and choose to itemize production losses, the following apply:

- Livestock owners must have a confirmed depredation event (death or injury) due to wolves to qualify for itemized production losses and missing livestock.
 - Missing ~~animals-calves, yearlings, or sheep claimed as missing~~ must be from the same band, ~~or~~ flock ~~of sheep~~, ~~or~~ herd ~~of cattle~~, or same private parcel of land where the confirmed depredation event occurred.
 - For each damage claim submitted, a livestock owner must have at least one confirmed depredation event.
- Livestock (enumerated in CRS 33-2-105.8(5)(c) C.R.S.), herding, and guard animals are eligible for compensation at 100 percent FMV after confirmation.

- Eligibility for missing livestock is limited to calves, yearlings, and all classes of sheep ~~and calves~~. The livestock owner must reasonably believe that missing livestock reported were lost to wolves and not to other predators (i.e., bears, lions, or coyotes), disease, or other factors (and can be documented as missing by the livestock owner).
- Under no circumstances can the number of missing livestock claimed for compensation exceed the actual number of documented livestock missing.
- CPW staff will consider the role of topography/vegetation in determining eligibility for missing calves, yearlings, and sheep. In general, missing livestock can only be claimed in larger, open range grazing situations where locating carcasses is more difficult due to environmental factors.
- Conflict minimization techniques are not a requirement for missing livestock or itemized production losses. However, CPW will encourage livestock owners to employ conflict minimization techniques to reduce further depredation.
- Conflict minimization techniques include, but are not limited to guard/herding dogs, sheepherders/range riders, fladry, carcass management, and other lawful gray wolf hazing techniques enumerated in CPW Chapter W-10 regulations.

For livestock owners who choose to itemize production losses claiming missing livestock the following apply (this option is only applicable for calves, yearlings, and all classes of sheep ~~and calves~~):

- Missing calves, yearlings, and sheep can be claimed if two conditions are met:
 - 1) Livestock owners must have a confirmed depredation event (injury or death) due to wolves to qualify for the itemized production losses.
 - 2) The livestock owner must reasonably believe that livestock reported as missing were lost to wolves and not to other predators (i.e., bears, lions, or coyotes), disease, or other factors.
- For missing calves, yearlings, and all classes of sheep, a livestock owner must submit the following information, included but not limited to:
 - Tangible evidence (photos, scat, tracks, etc.) that wolves were present in the area where livestock are missing.
 - Baseline death loss (predators, poisoning, disease, etc.) with percentages over a minimum of 3 years (preceding wolf presence in the area) using production records.
 - A self-certification or documentation (e.g., ranch R records) for the current year that demonstrate vaccination status.
 - Written records to justify current year losses will be provided to CPW with the following information:
 - The number of livestock (head counts) at the beginning of the grazing season and at the end of the grazing season.
 - The number of animals that died as a result of other predators (bears, lions, or coyotes), disease, or other factors during the grazing season.
- Eligibility for missing ~~sheep and~~ calves, yearlings, and all age classes of sheep is limited to losses above the previous 3-year baseline death loss and cannot exceed the actual number of documented livestock missing.
- Livestock owners who cannot provide this written documentation described above are not eligible to claim missing animals under Option 2.

For decreased weight gains (only applicable for sheep and cattle), a livestock owner must submit the following information, including, but not limited to:

- Baseline weights over a minimum of 3 years (pre-wolf presence) along with current year weights (i.e., weight tickets, production records, or sales records).
- To qualify, documentation must show that weights of cattle or sheep have decreased below the pre-wolf 3-year average weights.
- Livestock owners must provide documentation for average 3-year (pre-wolves) weights to qualify for decreased weight gains.

For decreased conception rates, a livestock owner must submit the following information, including, but not limited to:

- Baseline conception rates over a minimum of 3 years (pre-wolf presence) along with current year rates (i.e., production records ~~and vet records~~);
- ~~A written report/statement from a certified veterinarian~~ A self-certification or ranch records with body condition scores and pregnancy rate information of livestock and a statement from the livestock owner affirming no known issues existed;
- Documentation must show a decrease in annual conception rates below the pre-wolf average 3-year rate to qualify for decreased conception rate compensation;
- Livestock owners must provide documentation for average 3-year (pre-wolves) conception rates to qualify for conception rate losses.

Additional losses can be considered on a case-by-case basis by CPW and CPW will consider the role of drought and other environmental factors when evaluating context specific eligibility.

The following flow chart provides a visual representation of options available under this compensation program:

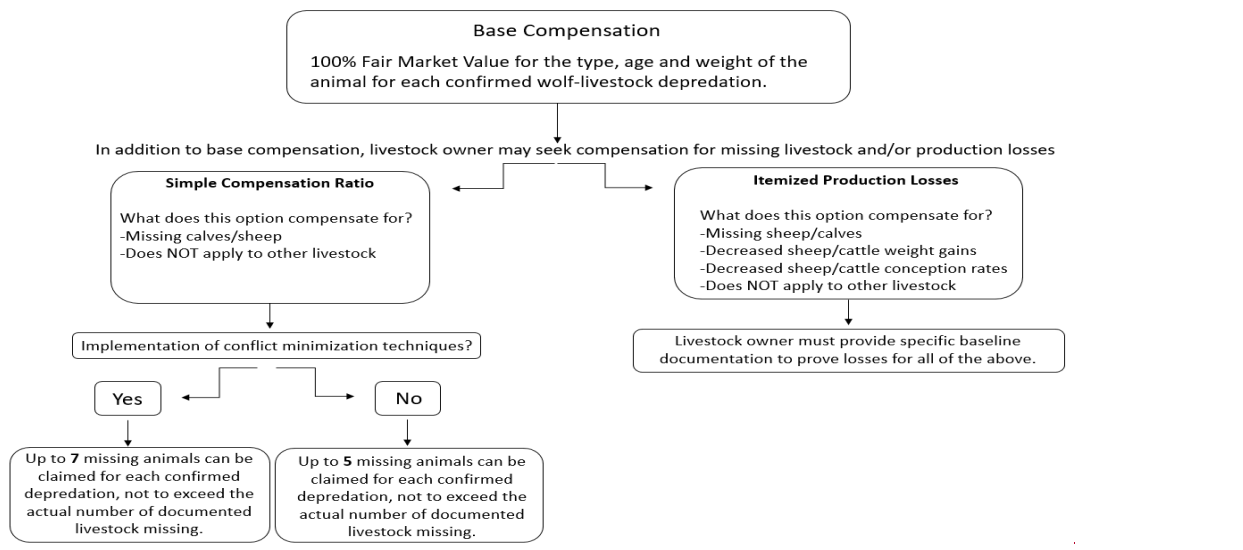
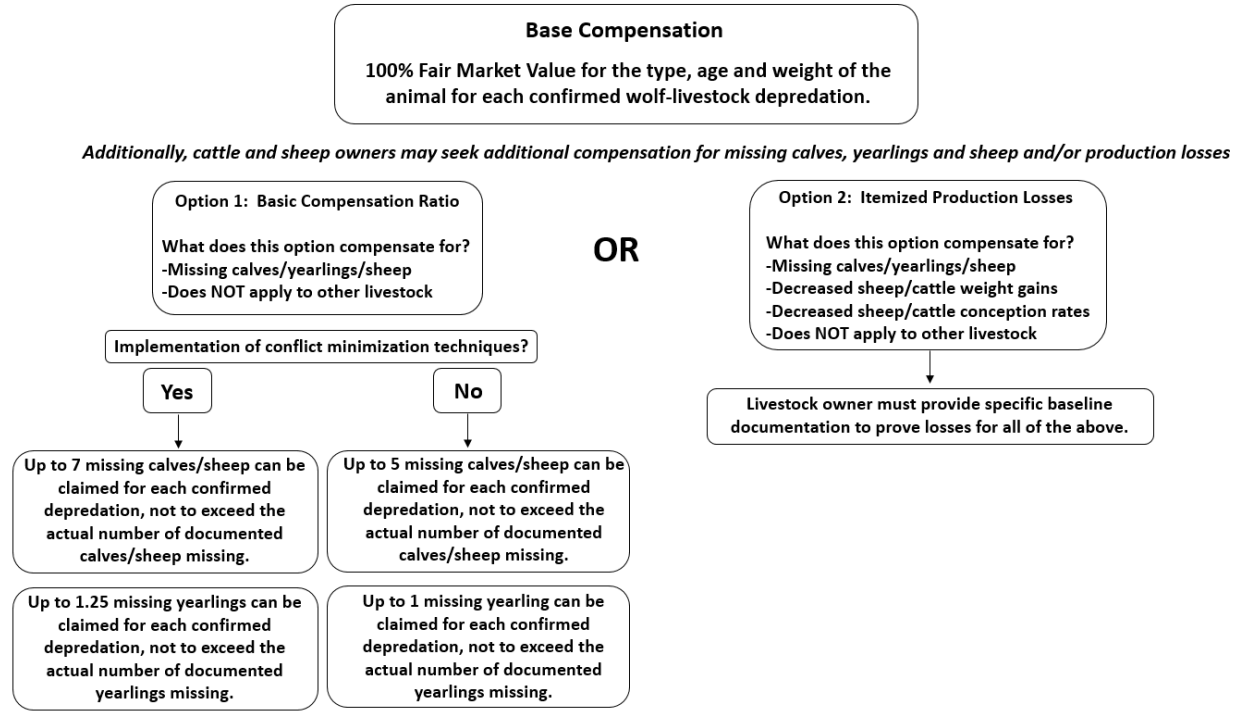


Figure 5. Flowchart ~~demonstrating~~ illustrating livestock deprecation compensation alternatives.

Chapter 7: Monitoring, Ungulate Management, Research, and Reporting

State statute requires that this plan “must comply with 33-2-105.7 (2), (3), and (4)” (CRS 33-2-105.8 (3)(a)). The reference to 33-2-105.7 compels CPW to provide in a report (this Plan) information on the economic impact of a reintroduction (see Chapter 2), the probable survival rates of the introduced animals, impacts should the introduction not take place, and an assessment on the impairment of private land or beneficial use of water (see Chapter 5). Annual reporting requirements are also specified in 33-2-105.7 (4).

This chapter addresses those remaining responsibilities.

A comprehensive population monitoring program is an essential part of the wolf conservation and management program and will be conducted throughout the implementation of this Plan. CPW will have primary responsibility for monitoring wolves, but collaboration with tribes, other state, and federal agencies, colleges and universities, landowners, local governments, and the public will be necessary for a successful monitoring program. This coordination will be especially important when monitoring animals located on or near federal, tribal, and private lands, and along state borders. CPW will work with USFWS to coordinate monitoring activities while the species remains federally listed as threatened or endangered under the ESA.

Whereas monitoring is an effort of systematic observation/measurement to assess population status and trends, research is an effort to test theory and use data to examine the efficacy of wildlife management techniques (or tools). Both are important for wolf management. Wolf research in Colorado will provide data that can be interpreted and used to inform management decisions. Research pertinent to wolf management in Colorado takes both socio-political and ecological environments into consideration.

Wolf Population Monitoring

Following reintroduction, wolf populations will be monitored to estimate annual population size and trends. All wolves that are released as part of the reintroduction will be equipped with GPS collars with VHF capability. As packs establish, CPW intends to collar at least one member of each pack with emphasis on breeding adults. In Phases 1 and 2, the number of wolves collared will be determined by budgetary or logistical constraints and wolf health/safety. As the wolf population grows, it will not be possible to have a collar on every wolf.

Our monitoring goal is to maintain two functional collars in each pack, although this may not be possible in all scenarios. Other pack members may be collared to the extent feasible and depending on circumstances or pack-specific monitoring needs. As the population grows and disperses, it will become increasingly challenging to maintain one collar in every pack. While not all packs will be expected to have collared wolves, managers will consider the proximity to livestock and history of wolf-livestock conflict when prioritizing collaring efforts.

In addition to standard annual capture and collaring efforts, collars may be deployed in certain locations for specific monitoring or research purposes (e.g., colonization of vacant territories). Further, radio telemetry will also be employed in situations not specifically related to population monitoring, such as select situations of livestock depredation or other wolf-human conflict. Information from radio tracking and other survey methods will be used to determine ecological and biological characteristics of each

pack, such as habitat use, prey selection, locations of den sites and rendezvous sites, *in situ* recruitment, survival, and mortality.

Besides collars, a variety of other monitoring tools are at the disposal of CPW biologists. Each is suited for different purposes and the deployment of these techniques will be done in a manner that will efficiently and effectively address the monitoring questions being posed. Non-invasive techniques such as winter track counts, aerial surveys, hair sampling, scat collection, howling surveys, trail cameras, and observations by field personnel and the general public may be used for basic population and distribution data collection (Fuller and Sampson 1988; Boitani 2003; Patterson et al., 2004; Ausband et al., 2009; Ausband et al., 2010, Stenglein et al., 2010a; Stenglein et al., 2010b; Ausband et al., 2011).

In addition to these tools, CPW will also use other scientifically accepted methods for estimating the number of wolves in Colorado, particularly as the population grows (e.g., Conroy et al., 2008; Mitchell et al., 2008, 2010; Stauffer et al., 2021).

Public reports of suspected wolf observations are also valuable. In fact, it was an anonymous member of the public that informed CPW of the presence of the female wolf featured on the cover of this report and known now as F1084. The public will continue to be encouraged to submit reports of wolf activity and sightings. Outreach will be conducted to encourage the public to provide credible wolf sighting reports. Information on wolf identification and where to report sightings will be included in CPW publications and on the agency's webpage (<https://cpw.state.co.us/learn/Pages/Wolf-Sighting-Form.aspx>).

Each monitoring protocol has its own advantages and disadvantages. No single method will be suited to all packs. CPW will consider any and all population monitoring methods, including new methods as they are developed.

As wolf populations have grown in other states, monitoring costs have increased. Consequently, rather than trying to count every wolf, western states are turning to methods for statistically estimating populations. CPW will adopt this same paradigm as the Colorado wolf population grows in size and distribution. In Phase 3, the wolf population will generally be monitored through a statistically derived estimate of population size, although minimum counts will continue to be enumerated as a necessary component of the statistical methodology. Biologists will begin the transition from minimum counts to statistically derived population estimates during Phase 2.

Wolf Mortality Monitoring

Because CPW will be required to institute and maintain an active program of wolf population monitoring statewide, it is imperative the agency be promptly notified of all forms of mortality, regardless of location and legal status of wolves. Infectious disease, starvation, and intraspecific strife are the primary causes of wolf mortality in unexploited populations. Intensive monitoring and research activities will be the primary means of identifying both human-related and natural mortality factors for wolves. An important component of Colorado's wolf management program will be to adequately monitor and manage human-caused mortality. Research suggests that annual mortality rates of 22 to >50 percent may suppress wolf population growth (Keith 1983, Ballard et al., 1987, Fuller 1989, Fuller et al., 2003, Creel and Rotella 2010). All forms of wolf mortality will be considered when making management decisions.

Although lethal control is a necessary tool for reducing wolf depredation on livestock, excessive levels of lethal removal can inhibit the recovery of wolf populations. CPW will therefore monitor and, if

necessary, adjust the extent of lethal removals (including mortalities from lethal take of wolves “in the act” of attacking livestock) to meet both conservation and management needs. Consideration should also be given to minimizing lethal control around or between any core recovery areas that are identified, especially during the denning and pup rearing periods (April to September).

Education and regulation will be implemented to minimize the unintentional take of wolves by coyote hunters, or trappers using live traps. Information and education efforts will be needed to inform hunters about the presence of wolves in occupied areas of the state. CPW will use hunting and fishing regulation pamphlets and other means to provide educational messages and identification materials about wolves, including how to avoid accidental take during legal hunting seasons for other species. These programs will assist hunters in becoming proficient at distinguishing wolves from coyotes, and trappers in learning methods for avoiding accidental capture of wolves and what to do if a wolf is inadvertently caught. Incidental trapping of wolves is not expected to occur frequently because trappers in Colorado are only allowed to use box and cage traps. Education materials will be presented to individuals who are provided 30-day exemption permits.

The illegal take of wolves will be expeditiously and thoroughly investigated. While wolves are federally listed as threatened or endangered in Colorado, the USFWS Office of Law Enforcement is the lead investigative agency; when they are federally delisted, CPW will be the lead, unless otherwise outlined in an MOU between the agencies.

Wolves that were reintroduced to Idaho and Yellowstone National Park had relatively high survival rates. In Idaho, 30 of the 35 animals survived through the second year of reintroductions (Bangs and Fritts 1996). In Yellowstone, 22 of the 31 animals survived through the second year of reintroductions (Bangs and Fritts 1996). Causes of mortality included interspecific conflict, illegally shot, wolf control action, struck by vehicle. Idaho had 85 percent survival and Yellowstone releases had 70 percent survival. It is anticipated that the survival rates will be within that range for the first years of reintroduction in Colorado.

Wolf Health Monitoring

Wolf health monitoring will follow established CPW wildlife health monitoring practices including both active and passive disease surveillance. During live capture operations, animals will undergo a brief physical exam to assess body condition, estimate age, and survey for external parasites. Blood, feces, and other biological samples will be collected from live-captured animals and submitted to the CPW Wildlife Health Laboratory. Disease diagnostics will be tailored to the individual based on known health concerns in the population, research objectives, and disease surveillance priorities. The CPW Wildlife Health Laboratory will maintain banked serum, tissue, and other biological samples.

Carcasses from wolf mortalities that are retrieved will be submitted to the CPW Wildlife Health Laboratory. CPW pathologists and veterinarians will tailor post-mortem diagnostics to the individual based on animal history, gross necropsy findings, research objectives, and disease surveillance priorities. As baseline data accumulate, the value of routine necropsies may diminish, and the submission of carcasses will be reduced to special forensics or disease-related cases.

In the unlikely event of human injury or death during a wolf-human encounter, the wolf or wolves will be destroyed and the carcasses forwarded to the CPW Wildlife Health Laboratory. Testing for zoonotic diseases of concern will be coordinated with the Colorado Department of Public Health and Environment (CDPHE). If a wolf bites a person during a capture and handling incident, CPW will follow recommendations from CDPHE to protect human health.

Ungulate Population Monitoring

The effects of predators on prey populations were one of the greatest concerns expressed by the public about wolf recovery in the northern Rockies (USFWS 1987, 1994a, b). Recent community engagement in Colorado suggests that those same concerns occur across much of the state, particularly on the Western Slope (Keystone 2021).

CPW conducts surveys of annual production, survival, and harvest of ungulate populations. These data are used to estimate population abundance and trends, and to make recommendations for hunting seasons and other management actions as described in Chapter 2. Intensive ungulate monitoring has already begun prior to reintroduction and may expand into additional areas as wolf populations grow and distribution expands.

Elk Monitoring

In addition to elk inventory and monitoring described in Chapter 2, in 2022 CPW initiated three Elk Monitoring Areas. This is a sentinel herd approach, modeled after the five Intensive Mule Deer Monitoring Areas CPW has maintained for 22 years to inform mule deer management. These study areas are designed to increase the amount of data on elk survival, movement, habitat use, and causes of mortality prior to, and after, wolf reintroduction.

These three new Elk Monitoring Areas will complement the existing three elk research study areas resulting in six elk sentinel herds representing different elk habitat types, calf/cow ratios, and geographic locations. Research study areas were selected to investigate causes of low elk calf/cow ratios by comparing low elk calf/cow ratio areas with high elk calf/cow ratio reference areas. The Elk Monitoring Areas will add herds with average elk calf ratios (40-55 calves/100 cows) to the sample and will be located in the center of the state. Having pre-wolf reintroduction survival and cause of mortality information will be important when estimating the effects wolves have on elk population dynamics and distribution.

The purpose and information objectives of Elk Monitoring Areas are as follows:

- Estimate factors affecting elk survival rates, including wolves, other predators, harvest, habitat quality, etc.
- Document cause-specific mortality on elk pre- and post-wolf colonization.
- Evaluate the behavioral responses of elk to wolves by monitoring elk distribution and movements. For example, do elk use refuge areas either more or less with wolves on the landscape? Do elk move to refuge areas earlier or later in the year, and do they use the same seasonal ranges as they did prior to wolf reestablishment?
- Improve modeled elk population estimates. In order to estimate population size, elk population models rely heavily on annual survival rates of adults, winter calf survival rates, and appropriately delineated DAU boundaries. CPW will need more accurate and precise elk population estimates to answer questions and manage both elk and wolves. CPW will use individual marks on elk collars for mark-resight population estimation to directly assess abundance and improve modeled population estimates.

Deer Monitoring

Deer populations will continue to be monitored as described in Chapter 2.

Moose Monitoring

Moose are notoriously difficult to enumerate because they exist at lower density, don't form large groups in the open in the winter, and don't flee from helicopters as much as deer and elk. Only North

Park has consistent moose inventory flights and population models using similar methods described for deer and elk.

CPW initiated two new moose projects in 2022. A project on Grand Mesa will use GPS collars in conjunction with infrared aerial technology to estimate moose detection probability, density, and population size. In Steamboat Springs, a camera grid project will estimate moose density to aid in determining moose distribution and population estimation.

Research Needs

Research and monitoring efforts are dependent upon the ability to secure future funding and adequate staffing. CPW anticipates that some of these activities will be conducted in collaboration with other state and federal agencies, colleges and universities, and other relevant entities.

Future research priorities for CPW will examine both social and ecological responses from having wolves in the state. As with all CPW research, studies will be designed to provide meaningful data and information to inform future management.

Social tolerance for wolves in Colorado. Social science (or human dimensions) research can provide important insights about people's perceptions regarding wolves and wolf reintroduction in Colorado. These data can help inform wildlife managers, stakeholder groups, and the public about people's attitudes about wolves and perceptions about the efficacy and acceptance of management practices, preventative tools, compensation efforts, and the overall successes or challenges associated with outreach and education efforts. Additionally, human dimensions data can provide insights about ways to minimize conflict and create opportunities for humans and wolves to cohabitate in Colorado.

In particular, the following major topics are likely to provide valuable insight to ongoing management efforts:

- Stakeholder/public values and attitudes about wolves, wolf management, and human-wolf interaction, e.g., social acceptability and how it changes over time;
- Satisfaction with wolf compensation and preventative measures programs, e.g., tracking implementation/use of preventative tools and measuring perceptions about efficacy over time (across stakeholder groups);
- Economic research, e.g., examining impacts of wolves on tourism, the outdoor recreation industry, and outfitters/guides/livestock owners' quality of life;
- Evaluation of CPW's education/outreach efforts, e.g., examining the efficacy of messaging and trust in communication efforts (e.g., "messenger matters");
- Social-ecological research, e.g., potential impact of wolves on ungulate populations, license sales, and stakeholder perceptions about these relationships.

Wolf ecology in Colorado. Important research topics for CPW staff and partner research entities may include habitat colonization and use, population dynamics, and social structure of wolves and wolf packs in Colorado. In terms of overall conservation of wolves, one key need is validation of habitat suitability models in Colorado using empirical data. CPW has applied existing habitat models for wolves in the state, but the results are speculative in the absence of actual Colorado data.

Wolf-livestock interactions. The effects of wolves on livestock and methods to reduce wolf-livestock conflict are important areas of research throughout the West. Ongoing research aims to determine the efficacy of existing practices to reduce wolf-livestock conflict such as livestock husbandry practices, non-lethal deterrents, and lethal control. Research on indirect effects of wolves on livestock is largely

inconclusive and highly specific to study sites. Compensation programs benefit from research focusing on direct mortality rates of livestock due to predators, detection of predator-killed livestock carcasses, and quantification of losses from indirect effects on livestock production. All of these may be considered for research in Colorado.

Efforts in Colorado will require funding and a coordinated approach among livestock owners, resource agencies, researchers, and NGOs to design, deploy, and maintain research projects. As more is learned about wolf-livestock interactions in Colorado, collaboration will be needed to make necessary changes to reduce wolf-livestock conflicts and share this information with affected publics.

Wolf-ungulate interactions. Ungulate monitoring is a priority independent of this Plan, but in relation to understanding wolf effects, efforts will need to be expanded to include information such as moose, deer, and elk abundance and distribution, habitat use and selection, fertility, and birth rates, juvenile/adult female ratios, and cause-specific mortality rates in relation to the presence of wolves. Additionally, if and how wolves impact ungulate disease dynamics will be of research and management interest.

Wolf interactions with other wildlife and vegetation. Surveys and monitoring to assess distribution and abundance of existing predators in Colorado will need to be gathered to determine what effect wolves have on the dynamics or behavior of these species. Generating abundance estimates for many species is challenging and expensive, and therefore may not be realistic for all predator species. Understanding the effects of multiple predators on ungulate populations, including rates of additive and compensatory mortality, may be important for predator and ungulate management. Further, assessments of habitat change post-reintroduction may also be of interest.

Reporting

CPW is required to produce an annual report for a reintroduced species as described in CRS 33-2-105.7. The report will be prepared annually for each of the 5 years post-reintroduction. The first report will be written after the first year of reintroductions. Preliminary research results will not be reported on until peer review and publication has been completed.

Annual wolf reports will address the statutory requirements and include information on the status of the reintroduction effort, a report on the estimated survival rates of the reintroduced wolves and their progeny; an assessment of the survival rates with respect to initial expectations, plus the recovery goals and anticipated timelines of the wolf recovery program. The annual reports will be available to the public on the CPW agency website and provided to the Commission and Colorado General Assembly. Upon request, the Commission, Legislature, and other partners will be briefed and updated regarding the Plan's implementation.

CPW expects to publish the annual report covering the biological year from April 1-March 31. This corresponds with the "biological year" of the wolf, and will allow reporting on wolf production, dispersals, pack formation, etc.

Following the conclusion of the initial release, CPW staff will provide updates on the plan at least annually to the Commission on the plan's progress, but staff can be asked to provide an update at any time interval as there are new developments. A formal review of the progress of the plan will be scheduled five years after the completion of the reintroduction efforts.

Chapter 8: Education, Outreach and Agency Coordination

A well-informed public is essential to gray wolf conservation and some authorities consider outreach efforts to be the highest priority in restoring the species (Fritts et al., 1995, 2003). It is crucial that wolves and wolf management issues be portrayed in an objective and unbiased manner, and that the public receives accurate information on the species. Conflicts with wolves and the solutions and compromises needed to resolve those conflicts must be discussed fairly (Fritts et al., 2003).

Extensive public outreach was conducted before and during wolf recovery in Montana, Idaho, and Wyoming, using a broad mix of approaches (Fritts et al., 1995). These efforts conveyed a factual and balanced view of wolves, stressed the differences between wolves and other canids, described the legal and biological rationale for recovery, pointed out that some wolf control must accompany recovery, and emphasized that very few restrictions on use of public lands are necessary for wolf recovery. The success of wolf recovery in these states is, at least in part, due to these information and education efforts.

The Commission will periodically obtain public input to update this plan, when circumstances dictate that that would be necessary and beneficial.

Education and Outreach

Colorado's ~~citizens~~ residents need access to factual information about wolves and wolf management from wildlife managers; and wildlife managers need information from the public on sightings, depredation events, wolf behavior, and public opinions to effectively manage wolves in the state. With this two-way communication, implementation of the Plan will have a higher probability of success and both managers and the public will have the necessary information to make conservation and management decisions to achieve Plan objectives. Two-way communication depends on a public that is informed about wolves and ongoing management activities and agency staff who are well informed and willing to listen to the real and perceived concerns of residents about wolves. Strengthening internal knowledge about wolves among agency staff will lead to more effective external communication efforts. This will include regular updates to staff on significant wolf activity, Plan implementation, field activities, research findings, and management responses using Director's messages, internal newsletter, and annual training days.

As CPW assumes management of wolves, it will be necessary to identify and address a broad array of questions concerning wolf biology, ecology, and management. CPW has published information on its website (<https://cpw.state.co.us/learn/Pages/Wolves-Stay-Informed.aspx>~~https://cpw.state.co.us/learn/Pages/CON-Wolf-Management.aspx~~) that answers many of these questions. Because wolf management will be closely scrutinized, CPW will seek a balanced management approach that acknowledges the complexity of the political, social, and environmental factors associated with wolves and their management.

The objectives of the information and education section of this Plan include:

- Increase public awareness of wolves, their recovery, and state management authority after federal delisting;
- Increase awareness of wolf status in Colorado, the state delisting process, and state downlisting and delisting milestones;
- Increase awareness of the array of wolf management tools CPW will employ as situations arise;
- Increase awareness of wolf biology and ecology, impacts to prey populations, livestock depredation, and public safety;

- Assist the agricultural community in informing their stakeholders of the importance of assisting CPW with data collection.

CPW staff will lead education and outreach initiatives, providing information to the public about ongoing wolf conservation and management activities through a wolf communication and outreach plan for Colorado. The program will include programs and materials appropriate for key audiences. Subject matter experts will provide information on wolf status, biology, habitat use, ecological role, and place as a part of Colorado's natural heritage.

Through the print and electronic media, the appropriate sections of the Information and Education Branch will produce news releases, video productions, and ~~radio programs~~ local and mass media articles for statewide distribution. These products will be used to convey factual information regarding wolf management, policy, actions, and issues of public concern, as well as answers to questions most likely to be asked about wolf management. The Plan will also be posted on CPW's website for the public to read.

Informative articles will continue to be published in CPW's various ~~media-communications~~ outlets. These articles focus on wolf biology, identification, behavior, population status, and management as it relates to the audience of these publications.

Wolves will be integrated into CPW's ongoing education and outreach. Six "target audiences" will be a high priority:

- General public
- Agricultural community
- Sportspeople and outfitters
- Wolf advocates
- Outdoor recreationists
- Local and Municipal ~~d~~Decision makers

Information and education materials will be developed for target audiences to:

- Address concerns over wolf-livestock conflicts, including training methods to prevent wolf-livestock conflicts, response options to protect livestock, how to report suspected wolf depredations, and, as appropriate, provide ongoing wolf monitoring information to livestock owners;
- Educate hunters, people viewing ungulates, and others and addressing concerns over wolf-ungulate interactions;
- Educate and inform K-12 classrooms, environmental learning centers, and other appropriate outlets.

Coordination with Other Governments, Agencies, and Organizations

CPW will continue to coordinate with other agencies and organizations to achieve wolf conservation and management objectives. This will be accomplished by continuing to use the expertise of the U.S. Fish and Wildlife Service (USFWS), the U.S. Department of Agriculture's Wildlife Services Program Animal Plant Inspection Service (APHIS), U.S. Forest Service (USFS), Bureau of Land Management (BLM), Colorado Department of Agriculture (CDA), Colorado Department of Education (CDE), and other state agencies, tribal governments, and private sector professionals. Coordination with other state land management agencies, such as the State Land Board, Colorado State Forest Service, and others, will occur as needed. Further, CPW will engage non-governmental stakeholder organizations for input regarding wolf management in Colorado. CPW will inform public and private land managers of general wolf presence on their respective lands as needed to facilitate informed management decisions. This

information will not be “real-time” information or even necessarily recent location information (especially on private land where data sharing is restricted). As resources permit CPW staff will inform county boards of government of wolf-related activities as needed and requested.

Chapter 9: Funding

Within this Plan, CPW presents strategies to implement conservation and management actions for wolves in Colorado. This Plan proposes programs that do not currently exist; a restoration program to reestablish wolves to the state, monitoring programs to monitor both wolf and prey populations, and a mitigation and compensation program to mitigate impacts of wolf depredation on livestock. Successful implementation of the Plan will require additional staff, financial resources, and possibly legislative and regulatory updates to support those programs. It is recognized that current resources available to CPW for management of nongame wildlife such as wolves are limited; however, taking on the additional responsibilities for conserving and managing wolves is an agency priority based on the mandates in CRS 33-2-105.8. At the same time, CPW must also be mindful that existing programs, funding, staffing, and resources are not sufficient to take on the new and significant responsibilities of reintroducing and managing wolves without sacrificing some other important threatened and endangered species efforts as well as other wildlife management responsibilities the agency currently conducts.

To adequately manage wolves, it has been necessary to augment resources for state wildlife agencies in every other western state where wolves have been reestablished. To fully implement the elements and strategies of the Plan, a formal wolf conservation program consisting of staff, budget, equipment and other resources will need to be developed within CPW as funding and additional staffing are made available. Throughout all aspects of wolf restoration and management (preventative measures, monitoring, research, education, outreach) it will be critical to evaluate staffing needs and associated budget considerations. Further, development of a funding stream that seeks legislative, NGO, and partner financial support as necessary will be critical for this program to be successful. The establishment of mechanisms to comprehensively track wolf program expenditures, including staff time, will be important for reporting and budgeting purposes.

Funding for a wolf conservation program will be developed in accordance with these basic tenets:

- Long-term funding will be necessary for a variety of needs related to wolf restoration and management, including but not limited to: staff capacity, reintroduction logistics, management and conflict minimization materials and activities, depredation compensation, monitoring and research, and education and outreach.
- Encouragement of external funding contributions early or prior to reintroduction while interest is high, so that it is available when needed in both the short- and long-term.
- Consider opportunities for collaborative funding strategies, with prioritization of funds for CPW complemented by additional, independent funding opportunities.
- Funding sources should ideally be additive to existing funding streams, and provide longevity.
- While there are many potential opportunities, funding sources can be complex and challenging to secure, with competition for a variety of priorities.
- Consider all sources and opportunities for funding, including annual and multiyear public sources, grants, and NGOs and private organizations.
- Consider development of a capital campaign and endowment fund or funds. If an external fund is established, provide clarity and assurance on what funds will be provided to CPW over time and for what purposes.
- Consider flexible funding needs as well as program-specific opportunities.
 - Unrestricted funding provides CPW with the greatest flexibility to provide for adaptability of the program over time to assess and address needs.

- Separate funds for compensation and conflict minimization (nonlethal or lethal) can provide opportunities for specific kinds of funding sources. For example, federal livestock demonstration funds can be used for livestock loss compensation, and APHIS nonlethal funding as well as private donations could support conflict minimization.

Conclusion

This Plan describes an adaptive management system for wolves in Colorado. CPW views the adaptive management approach as an important underpinning of the monitoring and evaluation of the Plan. By definition, an adaptive system incorporates monitoring and evaluation components as an ongoing effort within the management program. Management is thus refined and improved through time as information and experience accumulate. CPW will evaluate new information as it becomes available and incorporate it into wolf management.

An adaptive system will help address and evaluate the wolf-specific components of this Plan. For example, is a viable population of wolves being maintained? Are the monitoring protocols adequate to assess wolf population trends or other biological parameters of interest? Are adequate populations of prey species being maintained to sustain a wolf population and provide ~~citizens-sportspeople~~ with the opportunity to hunt a wide variety of species under a wide variety of circumstances in a sustainable manner? The advantage of managing adaptively is that, by definition, it provides a framework and a process for decision-making, as well as the mechanism to monitor and evaluate the outcomes.

Equally important components of any wolf management program are the social factors that shape public tolerance for wolves and their satisfaction with how conflicts are resolved. For example, is the management program adequately and efficiently addressing wolf-livestock conflicts? Is public safety assured? Has the presence of wolves resulted in beneficial ecosystem responses? These are important management program components for which ongoing evaluation is critical. CPW anticipates that Colorado ~~citizens-residents~~ will readily identify real or perceived problems or shortcomings of the wolf management program on these topics and others.

The challenge for CPW will be to discern between earnest differences of opinion in preferred management direction and substantive shortcomings of the program. Wolf management in Colorado will take place within a complex biological, social, economic, and political environment. Difficult decisions will have to be made and will sometimes be called into question by various interests. However, the ensuing public dialogue will also help evaluate the management program and may lead to revisions. CPW, after reviewing input from the public, wildlife professionals, coordinating states, other state and federal agencies, etc., will modify and adapt the wolf management program in the future to maintain a viable wolf population within a complex environment.

Glossary

10(j) Rule – Under Section 10(j) of the Federal Endangered Species Act, the United States Fish and Wildlife Service may designate a population of a listed species as experimental if it will be released into suitable natural habitat outside the species’ current range. Treating a species as experimental allows the USFWS to devise management programs and special regulations for that population.

Adaptive management – This framework incorporates monitoring and evaluation components in an ongoing effort to accumulate knowledge and change management as appropriate regarding the system of concern.

Baseline Death Loss - Refers to the average proportion of sheep or calves lost by the claimant annually relative to the number of such animals the claimant had under management at the time of loss for the 3 years preceding the presence of wolves in the area. Losses due to big game depredation as determined by the Division, disease, poisoning or any other causes are included.

Colorado Parks and Wildlife (CPW) – refers to the Colorado Division of Parks and Wildlife and the Colorado Parks and Wildlife Commission.

Carnivore – An animal that derives its energy requirements through the consumption of animal tissue.

Chronic Wasting Disease – A prion disease known to affect deer, elk and moose.

Colorado Division of Parks and Wildlife – State agency responsible for management of wildlife species in the state.

Colorado Parks and Wildlife Commission - A board, appointed by the Governor, which sets regulations and policies for Colorado’s state parks and wildlife programs (CRS 33-9-101).

Confirmed Wolf Depredation - Where the Division determines that physical trauma resulting in injury or death of livestock defined in 33-2-105.8 or injury or death to livestock guard or herding animals was the result of gray wolves.

Conflict minimization – Lawful, nonlethal materials and techniques used by owners of livestock for purposes of avoiding, minimizing or mitigating gray wolf damage to livestock and include hazing techniques authorized in CPW Chapter 10 regulations and carcass management.

Consensus – For the purposes of the Technical Working Group: agreement, or lack of objection that an option or alternative had sufficient technical support to be recommended for consideration. For the purposes of the Stakeholder Advisory Group: general agreement shared by *all* people in a group; it reflected a recommendation, option, or idea that all participants could support or abide by, or, at a minimum, to which they did not object.

Conservation – Protection of resources so that they can persist for future generations.

Data Analysis Unit- A geographic area that represents year-around range of a big-game herd and includes all of the seasonal ranges of a specific herd.

Down listing – Transitioning a species from the status of State Endangered to State Threatened.

Delisting – Removing a species from the State list of Endangered Species.

Extirpated – A species no longer exists within a particular geographic location.

Fair Market Value – Value of livestock as determined by the market.

Federal Recovery Goals – Objective, measurable criteria as stated in a Federal recovery plan for a species to be delisted from the Federal Endangered Species Act.

Fladry – Fencing that includes flags that are intended to deter wolves. When combined with electric fencing, it is referred to as ‘turbo fladry’.

GPS (Global Positioning System) – A navigational system utilizing orbiting satellites to provide specific and precise location information.

Game Species – A species, as outlined in Colorado Parks and Wildlife Regulations Chapter W-02, as being a wildlife species which may be lawfully hunted or taken for food, sport, or profit and which are classified as game wildlife by the commission.

Hard Release – A methodology for releasing animals in a reintroduction paradigm without the use of an acclimation pen. Animals are released from a transport crate directly into the environment.

Herd Management Plan – A CPW derived geographically explicit document that describes plans and intentions of Colorado Parks and Wildlife to determine how a big game herd in a Data Analysis Unit should be managed.

Indirect Losses – Economic losses other than direct injury or death of livestock defined in 33-2-105.8 and includes decreased weight gains and decreased conception rates.

Impact-based Management – Impact-based management recognizes that there are both positive and negative impacts to having wolves on the landscape. If wolves are creating an impact (typically a negative impact), managers will work to resolve the problem using a variety of management tools.

Intraspecific – Occurring within a species or between individuals of the same species.

Itemized production losses - Decreased weight gains and decreased conception rates.

Lethal Management – Techniques that cause or are closely associated with the death of animals.

Livestock – As defined in CRS 33-2-105.8: cattle, horses, mules, burros, sheep, lambs, swine, llama, alpaca, and goats.

Livestock guard animal – animals whose primary purpose is attempting to protect livestock defined in CRS 33-2-105.8.

Livestock herding animal – animals whose primary purpose is herding livestock defined in CRS 33-2-105.8.

Management - Cooperating agencies and entities are actively engaged in activities that assure the long term welfare of the wildlife populations and also minimize the potential for conflict or resolve conflict where and when it develops.

Monitoring – Process by which repeated measurements or observations are conducted to assess the status of a population or project.

National Environmental Policy Act (NEPA) – Act that requires federal agencies to assess the environmental effect of their proposed actions prior to making decisions.

Nongame species – All native species and subspecies of wildlife which are not classified as game wildlife by rule or regulation of the commission (CRS 33-1-102 (29)).

Non-invasive – Type of monitoring that does not include the handling of an animal. Trail cameras, track surveys, howling surveys are examples of non-invasive monitoring.

Non-lethal Management – Techniques to influence the behavior of wildlife species that do not result in the death of animals.

Non-injurious – Management techniques that are implemented to influence the behavior of a wildlife species that are not going to cause bodily injury.

Northern Rocky Mountain (NRM) – Geography described as the states of Montana, Idaho, Wyoming, the eastern one-third of Washington and Oregon, and a small portion of north-central Utah.

Outfitter – A person soliciting to provide or providing, for compensation, outfitting services for the purpose of hunting or fishing on land that the person does not own (CRS 12-145-103).

Phase – Refers to the status of the wolf population. Phase 1 corresponds to State Endangered; Phase 2 to State Threatened; Phase 3 to Delisted, nongame.

Pre-wolf Presence - As used in the Chapter 6, pre-wolf presence refers to the three years preceding the first confirmed wolf depredation experienced by the livestock owner for a particular band or flock of sheep or herd of cattle. Pre-wolf presence does not mean wolves were merely in proximity to a particular band of flock of sheep or herd of cattle.

Preponderance of evidence – means that it is more probable than not that damage was caused by wolves.

Proposition 114 – A proposition that led to a question appearing on the Colorado 2020 Ballot asking voters if the Colorado Parks and Wildlife Commission shall develop a plan to reintroduce wolves to the state.

Range rider – Individual or group of individuals who actively manage and herd livestock to prevent livestock depredations.

Recovery – Management of a species so that protection under a state or federal list of endangered or threatened species is no longer warranted.

Research – Systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.

Restore/Restoration – Returning a wildlife community to its original composition. Can be used synonymously with reintroduction.

Reintroduce/Reintroduction – Act of releasing animals to areas where they had been previously extirpated within native range.

Scare devices – Shell-crackers, propane canons and fox lights or any other lawful hazing technique in CPW chapter W-10 regulation.

Self-sustaining – A population that maintains viability over time without continuous human intervention and conservation actions.

Stakeholder – A person with an interest in or a concern about something.

Stakeholder Advisory Group – Diverse group convened by CPW to provide recommendations regarding social implications on wolf restoration and management for consideration by the commission.

State Endangered Species (CO) - Any species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy as determined by the commission (CRS 33-2-101 (12))

State Threatened Species (CO) - Any species or subspecies of wildlife which, as determined by the commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered (CRS 33-2-101(44)).

Species – A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding. The species is the principal natural taxonomic unit, ranking below genus.

Subspecies – A taxonomic category that ranks below species, usually a fairly permanent geographically isolated race.

Technical Working Group – Group convened by CPW to review objective, science-based information as well as provide their own knowledge and experience at the state/federal/tribal level to inform the development of the Plan.

Temporary Conflict Minimization Materials - Materials loaned to livestock owners on a case by case basis through a written agreement. These materials include turbo fladry, shell-crackers, propane canons and fox lights.

Ungulate – Native mammalian wildlife with hooves. Generally used to refer to elk, deer and moose in this plan.

Very High Frequency (VHF) – Range of radio frequency electromagnetic waves used to indicate location of radio collars placed on wildlife species.

Literature Cited

- Adams, L. G., B. W. Dale, and L. D. Mech. 1996. Wolf predation of caribou calves in Denali National Park, Alaska. Pages 245-260 in L. N. Carbyn, S. H. Fritts, and D. R. Seip, eds. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta.
- Agarwala, M., S. Kumar, A. Treves, and L. Naughton-Treves. 2010. Paying for wolves in Solapur, India and Wisconsin, USA: Comparing compensation rules and practice to understand the goals and politics of wolf conservation. *Biological Conservation*, 143(12), 2945–2955.
- Armstrong, D.M., J. P. Fitzgerald, and C.A. Meaney. 2011. *Mammals of Colorado*. 2nd Edition. University Press of Colorado. 620pp.
- Asa, C., P. Miller, M. Agnew, J. A. R. Rebolledo, S. L. Lindsey, M. Callahan, and K. Bauman. 2007. Relationship of inbreeding with sperm quality and reproductive success in Mexican gray wolves. *Animal Conservation* 10:326-331.
- Ausband, D. M. Mitchell, A. Mynsberge, C. Mack, J. Stenglein and L. Waits. 2009. 2009 Progress Report for Developing Wolf Population Monitoring Techniques. TWG Funding Final Report, February 2009.
- Ausband, D.E., M. S. Mitchell, K. Doherty, P. Zager, C. M. Mack, and J. Holyan. 2010. Surveying predicted rendezvous sites to monitor gray wolf populations. *Journal of Wildlife Management* 74:1043-1049.
- Ausband, D. E., J. Young, B. Fannin, M.S. Mitchel, J.L. Stenglein, L.P. Waits, and J.A. Shivik. 2011. Hair of the dog: obtaining samples from coyotes and wolves noninvasively. *Wildlife Society Bulletin*, 35(2), 105-111.
- Averett, J. P., B. A. Endress, M. M. Rowland, B. J. Naylor, and M. J. Wisdom. 2017. Wild ungulate herbivory suppresses deciduous woody plant establishment following salmonid stream restoration. *Forest Ecology and Management* 391:135-144.
- Ballard, W.B., J.S. Whitman, and C.L. Gardner. 1987. Ecology of an exploited wolf population in south-central Alaska. *Wildlife Monographs* No. 98. 54pp.
- Ballard, W. B., J. S. Whitman, and D. J. Reed. 1990. Population dynamics of moose in south-central Alaska. *Wildlife Monographs* 114:1-49.
- Ballard, W.B., Ayres, L.A., Krausman, P.R., Reed, D.J. and Fancy, S.G., 1997. Ecology of wolves in relation to a migratory caribou herd in northwest Alaska. *Wildlife monographs*, pp.3-47.
- Ballard, W. B., D. W. Lutz, T. W. Keegan, L. H. Carpenter, and J. C. deVos, Jr. 2001. Deer-predator relationships: a review of recent North American studies with emphasis on mule and black-tailed deer. *Wildlife Society Bulletin* 29(1):99-115.
- Ballard, W. B., L. N. Carbyn, and D. W. Smith. 2003. Wolf interactions with non-prey. Pages 259- 271 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois.
- Bangs, E. E., T. N. Bailey, and M. F. Portner. 1989. Survival rates of adult female moose on the Kenai Peninsula, Alaska. *Journal of Wildlife Management*. 53:557-563.
- Bangs, E., S. Fritts, D. Harms, J. Fontaine, M. Jimenez, W. Brewster, and C. Niemeyer. 1995. Control of endangered gray wolves in Montana. Pages 127-134 in L. N. Carbyn, S. H. Fritts, and D. Seip, editors. *Ecology and conservation of wolves in a changing world* Canadian Circumpolar Institute, Edmonton, Alberta.
- Bangs, E.E., and S. H. Fritts. 1996. Reintroducing the gray wolf to central Idaho and Yellowstone National Park. *Wildlife Society Bulletin*. 24(3): 402-413.

- 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(4):785-798.
- Bangs, E. E. and J. Shivik. 2001. Managing wolf conflict with livestock in the northwestern United States. *Carnivore Damage Prevention News*. No. 3/July: 2-5.
- Bangs, E., M. Jimenez, C. Niemeyer, T. Meier, V. Asher, J. Fontaine, M. Collinge, L. Handegard, R. Krischke, D. Smith, and C. Mack. 2005a. Livestock guarding dogs and wolves in the northern Rocky Mountains of the United States. *Carnivore Damage Prevention News* 8:32-39.
- Bangs, E. 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. 2005b. 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, United Kingdom.
- Bangs, E., M. Jimenez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krischke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D. Smith, V. Asher, and S. Stone. 2006. Non-lethal and lethal tools to manage wolf-livestock conflict in the northwestern United States. *Proceedings of the Vertebrate Pest Conference* 22:7-16.
- Barber-Meyer, S. M., L. D. Mech, and P. J. White. 2008. Elk calf survival and mortality following wolf restoration to Yellowstone National Park. *Wildlife Monographs* 169:1-30.
- Barnowe-Meyer, K. K., P. J. White, T. L. Davis, D. W. Smith, R. L. Crabtree, and J. A. Byers. 2010. Influence of wolves and high-elevation dispersion on reproductive success of pronghorn (*Antilocapra americana*). *Journal of Mammalogy* 91:712-721.
- Berger, K. M., E. M. Gese, and J. Berger. 2008. Indirect effects and traditional trophic cascades: a test involving wolves, coyotes, and pronghorn. *Ecology* 89:818-828.
- Berger, K. M. and M. M. Conner. 2008. Recolonizing wolves and mesopredator suppression of coyotes: impacts on pronghorn population dynamics. *Ecological Applications* 18:599-612.
- Bergman, E. J., B.E. Watkins, C. J. Bishop, P. M. Lukacs, and M. Lloyd. 2011. Biological and socio-economic effects of statewide limitation of deer licenses in Colorado. *The Journal of Wildlife Management* 75(6): 1443-1452.
- Bergerud, A. T. and J. B. Snider. 1988. Predation in the dynamics of moose populations: a reply. *Journal of Wildlife Management* 52:559-564.
- Beschta, R.L. and W.J. Ripple. 2009. Large predators and trophic cascades in terrestrial ecosystems of the western United States. *Biological Conservation* 142:2401-2414.
- Bishop, C. J., G. G. White, D. J. Freddy, and B.E. Watkins. 2005. Effect of limited antlered harvest on mule deer sex and age ratios. *Wildlife Society Bulletin* 33:662-668.
- Blahna, D.J., and Yonts-Shepard, S. 1989. Public involvement in resource planning: Toward bridging the gap between policy and implementation, *Society and Natural Resources*, 2:1, 209-227, DOI: 10.1080/08941928909380686.
- Boertje, R. D., P. Valkenburg, and M. E. McNay. 1996. Increases in moose, caribou, and wolves following wolf control in Alaska. *Journal of Wildlife Management* 60:474-489.
- Boertje, R. D., M. A. Keech, D. D. Young, K. A. Kellie, and C. T. Seaton. 2009. Managing for elevated yield of moose in interior Alaska. *Journal of Wildlife Management* 73:314-327.
- Boitani, L. 2003. Wolf conservation and recovery. Pages 317-340 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois.
- Borg, B. L., S. M. Brainerd, T. J. Meier, and L. R. Prugh. 2015. Impacts of breeder loss on social structure, reproduction and population growth in a social canid. *Journal of Animal Ecology* 84:177-187.
- Boutin, S. 1992. Predation and moose population dynamics: a critique. *Journal of Wildlife Management* 56:116-127.

- Boyce, M.S. 1990. Wolf recovery for Yellowstone National Park: A Simulation Model. In *Wolves for Yellowstone? A report to the United States Congress. Volume II Research and analysis*
- Bradley, E. H. 2004. An evaluation of wolf-livestock conflicts and management in the northeastern United States. Thesis, University of Montana Missoula, USA.
- Bradley, E., H. S. Robinson, E. Bangs, K. Kunkel, M. D. Jimenez, J. A. Gude, and T. Grimm. 2015. Effects of Wolf Removal on Livestock Depredation Recurrence and Wolf Recovery in Montana, Idaho, and Wyoming. *Journal of Wildlife Management* 79:1337-1346.
- 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.
- Bradley, E. H., D. H. Pletscher, E. E. Bangs, K. E. Kunkel, D. W. Smith, C. M. Mack, T. J. Meier, J. A. Fontaine, C. C. Niemeyer, and M. D. Jimenez. 2005. Evaluating wolf translocation as a non-lethal method to reduce livestock conflicts in the northwestern United States. *Conservation Biology* 19:1498-1508.
- Brandell, E.E., E.S. Almborg, P. Cross, A.P. Dobson, D.W. Smith, and P.J. Hudson. 2020. Infectious diseases in Yellowstone's Wolves. *Yellowstone Wolves: Science and Discovery in the World's First National Park*, pp.121-133.
- Brandell, E.E., P.C. Cross, D.W. Smith, W. Rogers, N. L. Galloway, D. R. MacNulty, D. R. Stahler, J. Treanor, and P.J. Hudson. 2022. Examination of the interaction between age-specific predation and chronic disease in the Greater Yellowstone Ecosystem. *Journal of Animal Ecology*.
- Brainerd, S. M., H. Andrén, E. E. Bangs, E. H. Bradley, J. A. Fontaine, W. Hall, Y. Iliopoulos, M. D. Jimenez, E. A. Jozwiak, O. Liberg, C. M. Mack, T. J. Meier, C. C. Niemeyer, H. C. Pedersen, H. Sand, R. N. Schultz, D. W. Smith, P. Wabakken, and A. P. Wydeven. 2008. The effects of breeder loss in wolves. *Journal of Wildlife Management* 72:89-98.
- Breck, S.W., R. Williamson, C. Niemeyer, and J.A. Shivik. 2002. Non-lethal radio activated guard for deterring wolf depredation in Idaho: summary and call for research. <https://doi.org/10.5070/V420110182>
- Breck, S. W., B.M. Kluever, M. Panasci, J. Oakleaf, T. Johnson, W. Ballard, L. Howery, and D.L. Bergman. 2011. Domestic calf mortality and producer detection rates in the Mexican wolf recovery area: Implications for livestock management and carnivore compensation schemes. *Biological Conservation*, 144(2), 930–936.
- Brice, E.M., E.J. Larsen, D. R. Macnulty. 2022. Sampling bias exaggerates a textbook example of a trophic cascade. *Ecology Letters*. 25: 177-188.
- Browne-Nuñez, C., A. Treves, D. MacFarland, and Z. Voyles. 2012. The influence of official lethal control on illegal take, social tolerance, and subsequent depredations? The case of Wisconsin gray wolves (*Canis lupus*). A Report Findings. www.nelson.wisc.edu/people/treves/wolves/wolfhuman.php
- California Department of Fish and Wildlife. 2016. Conservation Plan for Gray Wolves in California, Parts 1 and 2. 338 pp total.
- Carbyn, L.N. 1983: Wolf predation on elk in Riding Mountain National Park, Manitoba. *Journal of Wildlife Management* 47: 963–976.
- Carroll, C., M.K. Phillips, N.H. Schumaker, and D.W. Smith. 2003. Impacts of landscape change on wolf restoration success: planning a reintroduction program based on static and dynamic spatial models. *Conservation Biology*, 17(2), pp.536-548.
- Carroll, C., M.K. Phillips, C.A. Lopez-Gonzalez, and N.H. Schumaker. 2006. Defining recovery goals and strategies for endangered species: the wolf as a case study. *BioScience*, 56(1), pp.25-37.
- Chapron, G. and A. Treves, A., 2016. Blood does not buy goodwill: allowing culling increases poaching of a large carnivore. *Proceedings of the Royal Society B: Biological Sciences*, 283(1830).

- Clark, P. E., Johnson, D. E., Larson, L. L., Louhaichi, M., Roland, T., and Williams, J. 2017. Effects of Wolf Presence on Daily Travel Distance of Range Cattle. *Rangeland Ecology and Management*, 70(6), 657–665.
- Cleveland, S. M., M. Hebblewhite, M. Thompson, and R. Henderson. 2012. Linking Elk movement and resource selection to hunting pressure in a heterogeneous landscape. *Wildlife Society Bulletin* 36:658-668.
- Coe, P. K., B. K. Johnson, M. J. Wisdom, J. G. Cook, M. Vavra, and R. M. Nielson. 2011. Validation of Elk Resource Selection Models With Spatially Independent Data. *Journal of Wildlife Management* 75:159-170.
- Collinge, M. 2008. Relative Risks of Predation on Livestock Posed by Individual Wolves, Black Bears, Mountain Lions, and Coyotes in Idaho. *Proceedings of the Vertebrate Pest Conference*, 23(23).
- Colorado Secretary of State. 2020. 2020 Abstract of Votes Cast. Elections Division. 166 pp. <https://www.sos.state.co.us/pubs/elections/Results/Abstract/2020/2020BiennialAbstractBooklet.pdf>
- Colorado Wolf Management Working Group. 2004. Findings and Recommendations for managing wolves that migrate into Colorado. 66 pp. <https://cpw.state.co.us/Documents/WildlifeSpecies/SpeciesOfConcern/Wolf/recomendations.pdf>
- Conner, M. M., G. C. White, and D. J. Freddy. 2001. Elk movement in response to early-season hunting in northwest Colorado. *Journal of Wildlife Management* 65:926-940.
- Conroy, M. C., J. P. Runge, R. J. Barker, M. R. Schofield, and C. J. Fonnesebeck. 2008. Efficient estimation of abundance for patchily distributed populations. *Ecology* 89:3362-3370.
- Creel, S. and J. A. Winnie. 2005. Responses of elk herd size to fine-scale spatial and temporal variation in the risk of predation by wolves. *Animal Behavior* 69:1181-1189.
- Creel, S. and J. Rotella. 2010. Meta-analysis of relationships between human offtake, total mortality and population dynamics of gray wolves (*Canis lupus*). *PLoS ONE* 5(9): e12918. doi:10.1371/journal.pone.0012918
- Crête, M. 1999. The distribution of deer biomass in North America supports the hypothesis of exploitation ecosystems. *Ecology Letters* 2:223-227.
- Dale, B. W., L. G. Adams, and R. T. Bowyer. 1994. Functional response of wolves preying on barren-ground caribou in a multiple-prey ecosystem. *Journal of Animal Ecology* 63:644-652.
- DeCandia, A.L., E.C. Schrom, E.E Brandell, D.R. Stahler, and B.M. vonHoldt. 2021. Sarcoptic mange severity is associated with reduced genomic variation and evidence of selection in Yellowstone National Park wolves (*Canis lupus*). *Evolutionary Applications*, 14(2), 429-445.
- Decker, D. J. and K. G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. *Wildlife Society Bulletin* 16(1):53-57.
- DelGiudice, G. D., J. Fieberg, M. R. Riggs, M. Carstensen Powell, and W. Pan. 2006. A long-term age-specific survival analysis of female white-tailed deer. *Journal of Wildlife Management* 70:1556-1568.
- DelGiudice, G. D., K. R. McCaffery, D. E. Beyer, Jr., and M. E. Nelson. 2009. Prey of wolves in the Great Lakes region. Pages 155-173 in A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. *Recovery of gray wolves in the Great Lakes region of the United States: an endangered species success story*. Springer, New York, New York.
- Ditmer, M.A., G. Wittemyer, S.W. Breck, K.R. Crooks. 2022. Defining ecological and socially suitable habitat for the reintroduction of an apex predator. *Global Ecology and Conservation*. <https://doi.org/10.1016/j.gecco.2022.e02192>

- Edge, J. L., D. E. Beyer, Jr., J. L. Belant, M. J. Jordan, and B. J. Roell. 2011. Livestock and domestic dog predations by wolves in Michigan. *Human-Wildlife Interactions* 5:66-78.
- Forbes, S. H. and D. K. Boyd. 1996. Genetic variation of naturally colonizing wolves in the central Rocky Mountains. *Conservation Biology* 10:1082-1090.
- Forbes, S. H. and D. K. Boyd. 1997. Genetic structure and migration in native and reintroduced Rocky Mountain wolf populations. *Conservation Biology* 11:1226-1234.
- Fortin, D., H.L. Beyer, M.S. Boyce, D.W. Smith, T. Duchesne, and J.S. Mao. 2005. Wolves influence elk movements: behavior shapes a trophic cascade in Yellowstone National Park. *Ecology*, 86(5), 1320-1330.
- Fredrickson, R. J., P. Siminski, M. Wolf, and P. H. Hedrick. 2007. Genetic rescue and inbreeding depression in Mexican wolves. *Proceedings of the Royal Society, Series B* 274:2365-2371.
- Fritts, S. H., E. E. Bangs, J. A. Fontaine, W. G. Brewster, and J. F. Gore. 1995. Restoring wolves to the northern Rocky Mountains of the United States. Pages 107-125 in L. Carbyn, S. Fritts, and D. Seip, editors. *Ecology and management of wolves in a changing world*. Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta.
- Fritts, S. H. and L. N. Carbyn. 1995. Population viability, nature reserves, and the outlook for gray wolf conservation in North America. *Restoration Ecology* 3:26-28.
- Fritts, S. H., E.E. Bangs, J.A. Fontaine, M.R. Johnson, M.K. Phillips, E.D. Koch, and J.R. Gunson. 1997. Planning and implementing a reintroduction of wolves to Yellowstone National Park and central Idaho. *Restoration ecology*, 5(1), 7-27.
- Fritts, S.H., C.M. Mack, D.W. Smith, K.M. Murphy, M.K. Phillips, M.D. Jimenez, E.E. Bangs, J.A. Fontaine, C.C Niemeyer, W.G. Brewster, and T.J. Kaminski. 2001. Outcomes of hard and soft releases of reintroduced wolves in central Idaho and the Greater Yellowstone Area. *Maehr, DS, Noss, RF and Larkin, JL (Eds.)*, pp.125-148.
- Fritts, S.H., R.O. Stephenson, R.D. Hayes, L. Boitani. 2003. Wolves and Humans. Pages 298-317 in *Wolves: Behavior, Ecology, and Conservation*. L.D. Mech and L. Boitani, eds. University of Chicago Press, Chicago.
- Fuller, T. K., and B.A. Sampson. 1988. Evaluation of a simulated howling survey for wolves. *The Journal of Wildlife Management*, 60-63.
- Fuller, T.K. 1989. Population dynamics of wolves in north-central Minnesota. *Wildlife Monographs* No. 105: 1-41.
- Fuller, T.K., L.D. Mech, and J.F. Cochrane. 2003. Wolf population dynamics. Pages 161-191 in *Wolves: Behavior, Ecology, and Conservation*. L.D. Mech and L. Boitani, eds. University of Chicago Press, Chicago.
- Garrott, R. A., J. A. Gude, E. J. Bergman, C. Gower, P. J. White, and K. L. Hamlin. 2005. Generalizing wolf effects across the Greater Yellowstone Area: a cautionary note. *Wildlife Society Bulletin* 33:1245-1255.
- Gasaway, W. C., R. D. Boertje, D. V. Grangaard, D. G. Kellyhouse, R. O. Stephenson, and D. G. Larsen. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. *Wildl. Monogr.* 120. 59pp.
- Griffin, K.A., M. Hebblewhite, H.S. Robinson, P. Zager, S.M. Barber-Meyer, D. Christianson, S. Creel, N.C. Harris, M.A. Hurley, D.H. Jackson, B.K. Johnson, W.L. Myers, J.D. Raitzel, M. Schlegel, B.L. Smith, C. White, and P.J. White. 2011. Neonatal mortality of elk driven by climate, predator phenology and predator community composition. *Journal of Animal Ecology*, 80: 1246-1257.
- Hairston, N.G., F.W. Smith, and L.B. Slobodkin. 1960. Community structure, population control, and competition. *The American Naturalist* 44:421-425.
- Harper, E. K., W. J. Paul, L. D. Mech, and S. Weisberg. 2008. Effectiveness of Lethal, Directed Wolf-Depredation Control in Minnesota. *The Journal of Wildlife Management* 72:778-784.

- Harris, R. B. 2020. Background discussion paper literature review of livestock compensation programs: Considering ways to assist livestock producers with grizzly bear conservation efforts in Montana. Montana Fish, Wildlife, and Parks. Montana, USA.
- Hayes, R. D. and A. S. Harestad. 2000. Wolf functional response and regulation of moose in the Yukon. *Canadian Journal of Zoology* 78:60-66.
- Hayes, R. D., R. Farnell, R. M. P. Ward, J. Carey, M. Dehn, G. W. Kuzyk, A. M. Baer, C. L. Gardner, and M. O'Donoghue. 2003. Experimental reduction of wolves in the Yukon: Ungulate responses and management implications. *Wildlife Monographs* 152:1-35.
- Hebblewhite, M., D. H. Pletscher, and P. C. Paquet. 2002. Elk predation dynamics in areas with and without predation by recolonizing wolves in Banff National Park, Alberta. *Canadian Journal of Zoology* 80:789-799.
- Hebblewhite, M., E. H. Merrill, L. E. Morgantini, C. A. White, J. R. Allen, E. Bruns, L. Thurston, and T.E. Hurd. 2006. Is migratory behavior of montane elk herds in peril? The case of Alberta's Ya Ha Tinda elk herd. *Wildlife Society Bulletin* 34:1280-1294.
- Hebblewhite, M. and E. H. Merrill. 2007. Multiscale wolf predation risk: does migration reduce risk? *Oecologia* 152:377-387.
- Hebblewhite, M., and Smith, D. W. 2010. Wolf community ecology: ecosystem effects of recovering wolves in Banff and Yellowstone National Parks. *The wolves of the world: new perspectives on ecology, behavior, and policy*. University of Calgary Press, Calgary, Alberta, 69-120.
- Hebblewhite, M. 2011. Unreliable knowledge about economic impacts of large carnivores on bovine calves. *The Journal of Wildlife Management*, 75(8), pp.1724-1730.
- Hernández, L., and J.W. Laundré. 2005. Foraging in the 'landscape of fear' and its implications for habitat use and diet quality of elk *Cervus elaphus* and bison (*Bison bison*). *Wildlife Biology*, 11(3), 215-220.
- Hill, J.E., H.M. Boone, M.G. Gantchoff, T.M. Kautz, K.F. Kellner, E.K. Orning, J. Parchizadeh, T.R. Petroelje, N.H. Wehr, S.P. Finnegan, and N.L. Fowler. 2022. Quantifying anthropogenic wolf mortality in relation to hunting regulations and landscape attributes across North America. *Ecology and Evolution*, 12(5).
- Hoag, D., S. Breck, K. Crooks, and B. Niemiec. 2022. Economic consequences of the wolf comeback in the western United States. *Western Economic Forum*. 20:1: 61-70.
- Idaho Legislative Wolf Oversight Committee. 2002. Idaho Wolf Conservation and Management Plan. 32 pp.
- Johnson, B. K., J. W. Kern, M. J. Wisdom, S. L. Findholt, and J. G. Kie. 2000. Resource selection and spatial separation of mule deer and elk during spring. *Journal of Wildlife Management* 64:685-697.
- Johnson, B. K., P. K. Coe, and R. L. Green. 2013. Abiotic, bottom-up, and top-down influences on recruitment of Rocky Mountain elk in Oregon: A retrospective analysis. *Journal of Wildlife Management* 77:102-116.
- Kauffman, M. J., J.F. Brodie, and E.S. Jules. 2010. Are wolves saving Yellowstone's aspen? A landscape-level test of a behaviorally mediated trophic cascade. *Ecology*, 91(9), 2742-2755.
- Keith, L.B. 1983. Population dynamics of wolves. Pages 66-77 in L. N. Carbyn, ed. *Wolves in Canada and Alaska: their status, biology, and management*. Canadian Wildlife Service Report Series No. 45, Ottawa, Ontario, Canada. 135 pp.
- Keystone Policy Center. 2021. Summer 2021 Public Engagement Report. 97pp.
- Kompaniyets, L. and M. A. Evans. 2017. Modeling the relationship between wolf control and cattle depredation. *Plos One*. 12:1-13.
- Kunkel, K. E. 1997. Predation by wolves and other large carnivores in northwestern Montana and southeastern British Columbia. Ph.D. dissertation, University of Montana, Missoula. 272pp.

- Kunkel, K.E. and D.H. Pletscher. 1999. Species-specific population dynamics of cervids in a multipredator ecosystem. *Journal of Wildlife Management* 63: 1082-1093.
- Laporte, I., T.B. Muhly, J.A. Pitt, M. Alexander, and M. Musiani. 2010. Effects of wolves on elk and cattle behaviors: implications for livestock production and wolf conservation. *PloS One*, 5(8), e11954.
- Larsen, D. G., D. A. Gauthier, and R. L. Markel. 1989. Causes and rate of moose mortality in the southwest Yukon. *Journal of Wildlife Management* 53:548-557.
- Lauber, B.T, and Knuth, B.A. 1999. Measuring fairness in citizen participation: A case study of moose management. *Society and Natural Resources*, 12, 19-37.
- Laundré, J.W., L. Hernandez, Lucina and K. B. Allendorf. 2001. Wolves, elk, and bison reestablishing the landscape of fear in Yellowstone National Park, USA. *Canadian Journal of Zoology* 79:1401-1409.
- Laundré, J.W., L. Hernández, and W.J. Ripple, 2010. The landscape of fear: ecological implications of being afraid. *The Open Ecology Journal*, 3(1).
- Liberg, O., H. Andren, H.-C. Pedersen, H. Sand, D. Sejberg, P. Wabakken, M. Åkesson, and S. Bensch. 2005. Severe inbreeding depression in a wild wolf (*Canis lupus*) population. *Biology Letters* 1:17-20.
- Lindenmayer, D. B., and A. B. Franklin. 2002. Conserving forest biodiversity: a comprehensive multiscaled approach. Island Press, Washington D.C.
- Linnell, J. D. C., R. Anderson, Z. Andersone, L. Balciauskas, J. C. Blanco, L. Boitani, S. Brainderd, U. Breitenmoser, I. Kojola, O. Liberg, J. Loe, H. Okarma, H. C. Pedersen, C. Promberger, H. Sand, E. J. Solberg, H. Valdmann, and P. Wabakken. 2002. The fear of wolves: a review of wolf attacks on humans. NINA Oppdragsmelding 731:1-65.
- Linnell, J. D. C., E. Kovtun, and I. Rouart. 2021. Wolf attacks on humans: an update for 2002–2020. NINA Report 1944 Norwegian Institute for Nature Research.
- Lord, J.K., and A.S. Cheng. 2006. Public involvement in state fish and wildlife agencies in the U.S.: A thumbnail sketch of techniques and barriers. *Human Dimensions of Wildlife*, 11(1), 55-69.
- Mack J. A., and F. Singer. 1992. Population models for elk, mule deer, and moose on Yellowstone's northern winter range. Pages. 4-3-4-31. in Varley JD Brewster WG, eds. *Wolves for Yellowstone? A Report to the United States Congress, Vol. 4: Research and Analysis* Yellowstone National Park (WY): National Park Service
- Macon, D. 2020. Paying for the Presence of Predators: An Evolving Approach to Compensating Ranchers. *Rangelands*, 42(2), 43–52.
- Mao, J. S., M. S. Boyce, D. W. Smith, F. J. Singer, D. J. Vales, J. M. Vore, and E. H. Merrill. 2005. Habitat selection by elk before and after wolf reintroduction in Yellowstone National Park. *Journal of Wildlife Management* 69:1691-1707.
- Marshall, K. N., N. T. Hobbs, and D. J. Cooper. 2013. Stream hydrology limits recovery of riparian ecosystems after wolf reintroduction. *Proceedings of the Royal Society B: Biological Sciences* 280.
- McNay, M. E. 2002. Wolf-human interactions in Alaska and Canada: a review of the case history. *Wildlife Society Bulletin* 30:831-843.
- Meadow, R., R. P. Reading, M.K. 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(1), 154-163.
- Mech, L. D., S. H. Fritts, G. L. Radde, and W. J. Paul. 1988. Wolf distribution and road density in Minnesota. *Wildlife Society Bulletin* 16:85-87.
- Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1990. Who's afraid of the big bad wolf? *Audubon*, 92(2), pp.82-85.
- Mech, L.D., and L. Boitani, editors. 2003. *Wolves: Behavior, Ecology, and Conservation*. University of Chicago Press. 448pp.

- Mech, L. D. and R. O. Peterson. 2003. Wolf-prey relations. Pages 131-160 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois.
- Melis, C., B. Jędrzejewska, M. Apollonio, K. A. Bartoń, W. Jędrzejewski, J. D. C. Linnell, I. Kojola, J. Kusak, M. Adamic, S. Ciuti, I. Delehan, I. Dykyy, K. Krapinec, L. Mattioli, A. Sagaydak, N. Samchuk, K. Schmidt, M. Shkvryra, V. E. Sidorovich, B. Zawadzka, and S. Zhyla. 2009. Predation has a greater impact in less productive environments: variation in roe deer, *Capreolus*, population density across Europe. *Global Ecology and Biogeography* 18:724-734.
- Messier, F. 1994. Ungulate population models with predation: a case study with the North American moose. *Ecology* 75:478-488.
- Middleton, A. 2012. The influence of large carnivore recovery and summer conditions on the migratory elk of Wyoming's Absaroka Mountains. Dissertation, University of Wyoming, Laramie, Wyoming, USA.
- Middleton, A. D., M. J. Kauffman, D. E. McWhirter, J. G. Cook, R. C. Cook, A. A. Nelson, M. D. Jimenez, and R. W. Klaver. 2013a. Animal migration amid shifting patterns of phenology and predation: lessons from a Yellowstone elk herd. *Ecology* 94:1245-1256.
- Middleton, A. D., M. J. Kauffman, D. E. McWhirter, M. D. Jimenez, R. C. Cook, J. G. Cook, S. E. Albeke, H. Sawyer, and P. J. White. 2013b. Linking anti-predator behaviour to prey demography reveals limited risk effects of an actively hunting large carnivore. *Ecology Letters* 16:1023-1030.
- Mitchell, M.S., D.E. Ausband, C.A. Sime, E.E. Bangs, J.A. Gude, M.D. Jimenez, C.M. Mack, T.J. Meier, M.S. Nadeau, and D.W. Smith. 2008. Estimation of successful breeding pairs for wolves in the Northern Rocky Mountains, USA. *Journal of Wildlife Management* 72:881-891.
- Mitchell, M.S., J.A. Gude, D.E. Ausband, C.A. Sime, E.E. Bangs, M.D. Jimenez, C.M. Mack, T.J. Meier, M.S. Nadeau, and D.W. Smith. 2010. Temporal validation of an estimator for successful breeding pairs of wolves *Canis lupus* in the U.S. northern Rocky Mountains. *Wildlife Biology* 16:101-106.
- Montag, Patterson, and Sutton. 2003. Political and social viability of predator compensation programs in the West. University of Montana School of Forestry.
- Montana Fish Wildlife and Parks. 2002. Montana Wolf Conservation and Management Planning Document. 131 pp.
- Morehouse, A.T., J. Tigner, and M.S. Boyce. 2018. Coexistence with large carnivores supported by a predator-compensation program. *Environmental Management*, 61(5), pp.719-731.
- Muhly, T.B. and Musiani, M., 2009. Livestock depredation by wolves and the ranching economy in the Northwestern US. *Ecological Economics*, 68(8-9), pp.2439-2450.
- Muhly, T. B., M. Alexander, M.S. Boyce, R. Creasey, M. Hebblewhite, D. Paton, J.A. Pitt, and M. Musiani. 2010. Differential risk effects of wolves on wild versus domestic prey have consequences for conservation. *Oikos*, 119(8), 1243-1254.
- Musiani, M., T. Muhly, C. C. Gates, C. Callaghan, M. E. Smith, and E. Tosoni. 2005. Seasonality and reoccurrence of depredation and wolf control in western North America. *Wildlife Society Bulletin* 33:876-887.
- National Research Council. 1997. *Wolves, bears, and their prey in Alaska: biological and social challenges of wildlife management*. National Academy Press, Washington, D.C. USA.
- NASS (National Agricultural Statistical Service). 2005. Sheep and goats death loss. National Agricultural Statistics Service, U.S. Department of Agriculture, Washington, D.C.
<<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1628>>
- NASS (National Agricultural Statistical Service). 2006. Cattle death loss. National Agricultural Statistics Service, U.S. Department of Agriculture, Washington, D.C.
<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1625>

- Naylor, L. M., M. J. Wisdom, and R. G. Anthony. 2009. Behavioral Responses of North American Elk to Recreational Activity. *The Journal of Wildlife Management* 73:328-338.
- Nichols J. D. and K. H. Pollock. 1990. Estimation of recruitment from immigration versus in situ reproduction using Pollock's robust design. *Ecology* 71:21-6.
- Nickerson, R. 2021. Exploring compensation programs and depredation reporting for wolf-livestock conflict across the North American west. Doctoral dissertation, Colorado State University.
- Niemiec, R., Berl, R.E., Gonzalez, M., Teel, T., Camara, C., Collins, M., Salerno, J., Crooks, K., Schultz, C., Breck, S. and Hoag, D., 2020. Public perspectives and media reporting of wolf reintroduction in Colorado. *PeerJ*, 8, p.e9074.
- Niemiec, R.M., R. Gruby, M. Quartuch, C.T. Cavaliere, T.L. Teel, K. Crooks, J. Salerno, J.N. Solomon, K.W. Jones, M. Gavin, and A. Lavoie. 2021. Integrating social science into conservation planning. *Biological Conservation*, 262.
- NPS (National Park Service). 2003. Management of habituated wolves in Yellowstone National Park. National Park Service, Yellowstone National Park, Wyoming.
- Nyhus, P. J., S. A. Osofsky, P. Ferraro, F. Madden, and H. Fischer. 2005. Bearing the cost of human-wildlife conflict: The challenges of compensation schemes. In R. Woodroffe, S. Thirgood and A. Rabinowitz (Eds.). *People and wildlife: Conflict or coexistence?* pp. 107–121. Cambridge University Press, Cambridge, UK.
- 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.
- Okali, C., J. Sumberg, and, J. Farrington. 1994. *Farmer participatory research: rhetoric and reality.* Intermediate Technology Publications Ltd.
- Oksanen, L., S. D. Fretwell, J. Arruda, and P. Niemela. 1981. Exploitation Ecosystems in Gradients of Primary Productivity. *The American Naturalist* 118:240-261.
- Olson, E. R., J. L. Stenglein, V. Shelley, A. R. Rissman, C. Browne-Nuñez, Z. Voyles, A. P. Wydeven, and T. Van Deelen. 2014. Pendulum swings in wolf management led to conflict, illegal kills, and a legislated wolf hunt. *Conservation Letters*.
- Oregon Department of Fish and Wildlife. 2019. Oregon Wolf Conservation and Management Plan. 162 pp.
- [Oregon Department of Fish and Wildlife. 2015. Appendix B: Assessment of Population Viability of Wolves in Oregon.](https://www.dfw.state.or.us/agency/commission/minutes/15/11_november/Exhibit%20B_Attachment%203_Appx%20B.pdf)
https://www.dfw.state.or.us/agency/commission/minutes/15/11_november/Exhibit%20B_Attachment%203_Appx%20B.pdf
- Orning, E. K., K. M. Dugger, and D. A. Clark. 2021. Gray wolf (*Canis lupus*) predation patterns following recent recolonization in a multi-predator, multi-prey system. *Canadian Journal of Zoology* 99:902-911.
- Parsons, D. J., and S. H. DeBenedetti. 1979. Impact of fire suppression on a mixed-conifer forest. *Forest Ecology and Management* 2:21-33.
- Pate, J., Manfredo, M. J., Bright, A. D., and Tischbein, G. 1996. Coloradans' attitudes toward reintroducing the gray wolf into Colorado. *Wildlife Society Bulletin*, 421-428.
- Patterson, B. R., N.W. Quinn, E.F. Becker, and D.B. Meier. 2004. Estimating wolf densities in forested areas using network sampling of tracks in snow. *Wildlife Society Bulletin*, 32(3), 938-947.
- Peterson, R. O., N. J. Thomas, J. M. Thurber, J. A. Vucetich, and T. A. Waite. 1998. Population limitation and the wolves of Isle Royale. *Journal of Mammalogy* 79:828-841.
- Plummer, R., A. Dzyundzyak, J. Baird, O. Bodin, D. Armitage, and L. Schultz. 2017. How do environmental governance processes shape evaluation of outcomes by stakeholders? A causal pathways approach. *PLoS ONE*, 12(9), 1-13.

- Poudyal, N., N. Baral, and S. T. Asah. 2016. Wolf lethal control and depredations: counter-evidence from respecified models. *PloS one* 11(2):e0148743.
- Proffitt, K. M., J. L. Grigg, K. L. Hamlin, and R. A. Garrott. 2009. Contrasting effects of wolves and human hunters on elk behavioral responses to predation risk. *Journal of Wildlife Management* 73:345-356.
- Proffitt, K. M., J. L. Grigg, R. A. Garrott, K. L. Hamlin, J. Cunningham, J. A. Gude, and C. Jourdonnais. 2010. Changes in elk resource selection and distributions associated with a late-season elk hunt. *Journal of Wildlife Management* 74:210-218.
- Räikkönen, J., J. A. Vucetich, R. O. Peterson, and M. P. Nelson. 2009. Congenital bone deformities and the inbred wolves (*Canis lupus*) of Isle Royale. *Biological Conservation* 142:1025-1031.
- Rambler, J.P., Hebblewhite, M., Kellenberg, D., and Sime, C. 2014. Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*, 96(3), 631-656.
- Reed, M.S. 2008. Stakeholder participation for environmental management: A literature review. *Biological Conservation*, 141(10), 2417-2431.
- Renn, O., T. Webler, and P. Wiedemann. 1995. The Pursuit of Fair and Competent Citizen Participation. In *Fairness and Competence in Citizen Participation* (pp. 339–367). Springer Netherlands. <https://doi.org/10.1177/016224390002500101>
- Richards, C., K.L. Blackstock, and C.E. Carter. 2004. Practical approaches to participation. Macaulay Land Use Research Institute, Aberdeen.
- Riley, S. J. and D. J. Decker. 2000. Wildlife stakeholder acceptance capacity for cougars in Montana. *Wildlife Society Bulletin*. 28(4): 931-939.
- Ripple, W. J., and R.L. Beschta. 2004. Wolves, elk, willows, and trophic cascades in the upper Gallatin Range of Southwestern Montana, USA. *Forest Ecology and management*, 200(1-3), 161-181.
- Ripple, W.J., T.P. Rooney, and R.L. Beschta. 2010. Large predators, deer, and trophic cascades in boreal and temperate ecosystems. *Trophic cascades: predators, prey, and the changing dynamics of nature*, pp.141-161.
- Rooney, T. P., and D. P. Anderson. 2009. Are wolf mediated trophic cascades boosting biodiversity in the Great Lakes region? Pages 205-215 in A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. *Recovery of gray wolves in the Great Lakes region of the United States: an endangered species success story*. Springer, New York, New York.
- Rowland, M. M., M. J. Wisdom, B. K. Johnson, and J. G. Kie. 2000. Elk distribution and modeling in relation to roads. *Journal of Wildlife Management* 64:672-684.
- Ruid, D. B., W. J. Paul, B. J. Roell, A. P. Wydeven, R. C. Willging, R. L. Jurewicz, and D. H. Lonsway. 2009. Wolf-human conflicts and management in Minnesota, Wisconsin, and Michigan. Pages 279-295 in A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. *Recovery of gray wolves in the Great Lakes region of the United States: an endangered species success story*. Springer, New York, New York.
- Ruth, T.K., P.C. Buotte, and M.G. Hornocker. 2019. *Yellowstone Cougars: Ecology before and during wolf reestablishment*. Boulder: University Press of Colorado.
- Schmitz, O. J., Beckerman, A. P., and O'Brien, K. M. 1997. Behaviorally mediated trophic cascades: effects of predation risk on food web interactions. *Ecology*, 78(5), 1388-1399.
- Schmitz, O.J., Kalies, E.L. and Booth, M.G. 2006. Alternative Dynamic Regimes and Trophic Control of Plant Succession. *Ecosystems* 9, 659–672.
- Serenari, C., Cobb, D.T., and Peroff, D.M. 2018. Using policy goals to evaluate red wolf reintroduction in eastern North Carolina. *Human Dimensions of Wildlife*, 23(4), 359-374.

- Sime, C. A., E. Bangs, E. Bradley, J. E. Steuber, K. Glazier, P. J. Hoover, V. Asher, K. Laudon, M. Ross, and J. Trapp. 2007. Gray wolves and livestock in Montana: A recent history of damage management. National Wildlife Research Center, 34.
- Skogland, T. 1991. What are the effects of predators on large ungulate populations? *Oikos* 61:401- 411.
- Smith, D.W., E.E. Bangs, J.K. Oakleaf, C. Mack, J. Fontaine, D. Boyd, J. Jimenez, D.H. Pletscher, C.C. Niemeyer, T.J. Meier, D.R. Stahler, J. Holyan, V.J. Asher, and D.L. Murray. 2010. Survival of colonizing wolves in the Northern Rocky Mountains of the United States, 1982-2004. *Journal of Wildlife Management* 74:620-634.
- Smith, D. W., D. R. Stahler, and D. MacNulty, editors. 2020. *Yellowstone Wolves*. University of Chicago Press. 339 pp.
- Smith, P.D., and M.H. McDonough. 2001. Beyond public participation: Fairness in natural resource decision making. *Society and Natural Resources*, 14, 239-249.
- Sommers, A. P., C. C. Price, C. D. Urbigkit, and E. M. Peterson. 2010. Quantifying economic impacts of large-carnivore depredation on bovine calves. *Journal of Wildlife Management* 74:1425-1434.
- Stauffer, G.E., N.M. Roberts, D.M. Macfarland, and T.R. Van Deelen. 2021. Scaling occupancy estimates up to abundance for Wolves. *The Journal of Wildlife Management*, 85(7), pp.1410-1422.
- Steele, J. R., B.S. Rashford, T.K. Foulke, J.A. Tanaka, and D.T. Taylor. 2013. *Wolf (Canis lupus) Predation Impacts on Livestock Production: Direct Effects, Indirect Effects, and Implications for Compensation Ratios*. *Rangeland Ecology and Management* 66:539–544.
- Stenglein, J.L., L.P. Waits, D.E. Ausband, P. Zager, and C.M. Mack. 2010a. Efficient, noninvasive genetic sampling for monitoring reintroduced wolves. *Journal of Wildlife Management* 74:1050-1058.
- Stenglein, J.L., M. De Barba, D.E. Ausband, and L.P. Waits. 2010b. Impacts of sampling location within a faeces on DNA quality in two carnivore species. *Molecular Ecology Resources* 10:109-114.
- Stewart, K. M., R. T. Bowyer, J. G. Kie, N. J. Cimon, and B. K. Johnson. 2002. Temporospatial distributions of elk, mule deer, and cattle: Resource partitioning and competitive displacement. *Journal of Mammalogy* 83:229-244.
- Susskind, L., and J. Cruikshank. 1987. *Breaking the impasse: Consensual approaches to resolving public disputes*. New York: Basic Books, Inc.
- Switalski, T.A., T. Simmons, S.L. Duncan, A.S. Chavez, and R.H. Schmidt. 2002. Economic aspects of wolf recolonization in Utah. *Natural Resources and Environmental Issues*, 10(1), p.6.
- Tercek, M.T., R. Stottlemeyer, and R. Renkin. 2010. Bottom-up factors influencing riparian willow recovery in Yellowstone national park. *Western North American Naturalist* 70:387-399.
- Thompson, I. D. and R. O. Peterson. 1988. Does wolf predation alone limit the moose population in Pukaskwa Park?: a comment. *Journal of Wildlife Management* 52:556-559.
- Treves, A., R. R. Jurewicz, L. Naughton-Treves, R. A. Rose, R. C. Willging, and A. P. Wydeven. 2002. Wolf depredation on domestic animals in Wisconsin, 1976-2000. *Wildlife Society Bulletin* 30:231-241.
- Treves, A., L. Naughton-Treves, E. K. Harper, D. J. Mladenoff, R. A. Rose, T. A. Sickley, and A. P. Wydeven. 2004. Predicting human-carnivore conflict: a spatial model derived from 25 years of data on wolf predation on livestock. *Conservation Biology* 18:114-125.
- Underwood, W. and R. Anthony. 2020. *AVMA guidelines for the euthanasia of animals: 2020 edition*.
- USFWS. 1980. *Northern Rocky Mountain Wolf Recovery Plan*. USFWS, Denver, Colorado.
- USFWS. 1987. *Northern Rocky Mountain Wolf Recovery Plan*. USFWS, Denver, CO.
- USFWS. 1994. *The reintroduction of gray wolves to Yellowstone National Park and Central Idaho. Final Environmental Impact Statement*. U.S. Fish and Wildlife Service, Denver, Colorado, USA.
- USFWS. 2008. *Endangered and threatened wildlife and plants; final rule designating the northern Rocky Mountain population of gray wolf as a distinct population segment and removing this distinct*

- population segment from the federal list of endangered and threatened wildlife. Federal Register 73(39):10514-10560.
- USFWS, Montana Fish, Wildlife and Parks, Nez Perce Tribe, National Park Service, Blackfeet Nation, Confederated Salish and Kootenai Tribes, Wind River Tribes, Washington Department of Wildlife, Oregon Department of Wildlife, Utah Department of Natural Resources, and U.S.D.A. Wildlife Services. 2011. Rocky Mountain wolf recovery 2010 interagency annual report. C. A. Sime and E. E. Bangs, editors. U.S. Fish and Wildlife Service, Helena, Montana.
- USFWS. 2020. Final Rule to remove the Gray Wolf (*Canis lupus*) from the list of endangered and threatened Wildlife. Federal Register Volume 85, No 213. 3 November 2020. 118pp.
- USFWS. 2021. Draft Supplemental Environmental Impact Statement for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf (*Canis lupus baileyi*).
- Valerio, A., C.S. Borrego, L. Boitani, L. Casadei, A. Giuliani, R.B. Wielgus, S.L. Simek, and M. Valerio. 2021. Detecting the effects of predator-induced stress on the global metabolism of an ungulate prey using fecal metabolomic fingerprinting. *Scientific Reports*, 11(1), 6129.
- Vales D. J. and J.M. Peek. 1990. Estimates of the potential interactions between hunter harvest and wolf predation on the Sand Creek, Idaho, and Gallatin, Montana, elk populations. Pages. 3-93-3-167 in *Yellowstone National Park, US Fish and Wildlife Service, University of Wyoming, University of Idaho, Interagency Grizzly Bear Study Team, University of Minnesota Cooperative Park Studies Unit. Wolves for Yellowstone? A Report to the United States Congress, Vol. 2: Research and Analysis*. Yellowstone National Park (WY): National Park Service.
- Van Ballenberghe, V. and W. B. Ballard. 1994. Limitation and regulation of moose populations: the role of predation. *Canadian Journal of Zoology* 72:2071-2077.
- Vieira, M. E. P., M. M. Conner, G. C. White, and D. J. Freddy. 2003. Effects of archery hunter numbers and opening dates on elk movement. *Journal of Wildlife Management* 67:717-728.
- vonHoldt, B.M., D.R. Stahler, D.W. Smith, D.A. Earl, J.P. Pollinger, and R.K. Wayne. 2008. The geneology and genetic viability of reintroduced Yellowstone grey wolves. *Molecular Ecology* 17:252-274.
- vonHoldt, B.M., D.R. Stahler, E.E. Bangs, D.W. Smith, M.D. Jimenez, C.M. Mack, C.C. Niemeyer, J.P. Pollinger, and R.K. Wayne. 2010. A novel assessment of population structure and gene flow in grey wolf populations of the Northern Rocky Mountains of the United States. *Molecular Ecology* 19:4412-4427.
- Vucetich, J. A., D. W. Smith, and D. R. Stahler. 2005. Influence of harvest, climate and wolf predation on Yellowstone elk, 1961-2004. *OIKOS* 111:259-270.
- Walters C. J. 1986. *Adaptive management of renewable resources*. Macmillan Publishers Ltd. 374 pp.
- Washington Department of Fish and Wildlife. 2011. *Wolf Conservation and Management Plan*. 301 pp.
- Wayne, R. K. and C. Vilà. 2003. Molecular genetic studies of wolves. Pages 218-238 in L. D. Mech and L. Boitani, editors. *Wolves: behavior, ecology, and conservation*. University of Chicago Press, Chicago, Illinois.
- White, P. J. and R. A. Garrott. 2005a. Yellowstone's ungulates after wolves – expectations, realizations, and predictions. *Biological Conservation* 125:141-152.
- White, P. J., and R. A. Garrott. 2005b. Northern Yellowstone elk after wolf restoration. *Wildlife Society Bulletin* 33:942-955.
- Wielgus, R. B., and K. A. Peebles. 2014. Effects of Wolf Mortality on Livestock Depredations. *PloS one* 9:e113505
- WDNR (Wisconsin Dept. of Natural Resources). 1999. *Wisconsin Wolf Management Plan*. Wisconsin Dept. of Natural Resources, Madison Wisconsin.
- Wright, G. J., R. O. Peterson, D. W. Smith, and T. O. Lemke. 2006. Selection of northern Yellowstone elk by gray wolves and hunters. *Journal of Wildlife Management* 70:1070-1078.

- Wydeven, A. P., A. Treves, B. Brost, and J. E. Wiedenhoeft. 2004. Characteristics of wolf packs in Wisconsin: Identification of traits influencing depredation. Pages 28-50 *in* N. Fascione, A. Delach, and M. E. Smith, editors. People and predators: from conflict to coexistence. Island Press, Washington, D.C.
- Wydeven, A. and Park Falls, W.I., 2007. Effects of Wolves and Other Predators on Farms in Wisconsin: Beyond Verified Losses May 2007 Pub-ER-658 2007.
- Wyoming Game and Fish Commission. 2011. Wyoming Gray Wolf Management Plan. 64 pp.
- Young, S. P. and E. A. Goldman. 1944. The wolves of North America. American Wildlife Institute, Washington, D.C.

Appendices

Appendix A. Colorado Revised Statute 33-2-105.8.

Reintroduction of gray wolves on designated lands west of the Continental Divide - public input in commission development of restoration plan - compensation to owners of livestock - definitions

- 1) The voters of Colorado find and declare that:
 - a) Historically, wolves were an essential part of the wild habitat of Colorado but were exterminated and have been functionally extinct for seventy-five years in the state;
 - b) The gray wolf is listed as an endangered species on the commission's list of endangered or threatened species;
 - c) Once restored to Colorado, gray wolves will help restore a critical balance in nature; and
 - d) Restoration of the gray wolf to the state must be designed to resolve conflicts with persons engaged in ranching and farming in this state.

- 2) Notwithstanding any provision of state law to the contrary, including section 33-2-105.5 (2), and in order to restore gray wolves to the state, the commission shall:
 - a) Develop a plan to restore and manage gray wolves in Colorado, using the best scientific data available;
 - b) Hold statewide hearings to acquire information to be considered in developing such plan, including scientific, economic, and social considerations pertaining to such restoration;
 - c) Periodically obtain public input to update such plan;
 - d) Take the steps necessary to begin reintroductions of gray wolves by December 31, 2023, only on designated lands; and
 - e) Oversee gray wolf restoration and management, including the distribution of state funds that are made available to:
 - i) Assist owners of livestock in preventing and resolving conflicts between gray wolves and livestock; and
 - ii) Pay fair compensation to owners of livestock for any losses of livestock caused by gray wolves, as verified pursuant to the claim procedures authorized by sections 33-3-107 to 33-3-110.

- 3)
 - a) The commission's plan must comply with section 33-2-105.7 (2), (3), and (4) and must include:
 - i) The selection of donor populations of gray wolves;
 - ii) The places, manner, and scheduling of reintroductions of gray wolves by the division, with such reintroductions being restricted to designated lands;
 - iii) Details for the restoration and management of gray wolves, including actions necessary or beneficial for establishing and maintaining a self-sustaining population, as authorized by section 33-2-104; and
 - iv) Methodologies for determining when the gray wolf population is sustaining itself successfully and when to remove the gray wolf from the list of endangered or threatened species, as provided for in section 33-2-105 (2).
 - b) The commission shall not impose any land, water, or resource use restrictions on private landowners in furtherance of the plan.

- 4) In furtherance of this section and the expressed intent of voters, the general assembly:

- a) Shall make such appropriations as are necessary to fund the programs authorized and obligations imposed by this section, including fair compensation for livestock losses that are authorized by this section; and
- b) May adopt such other legislation as will facilitate the implementation of the restoration of gray wolves to Colorado.

4.5)

- a) For purposes of implementing and administering this section, the general assembly shall appropriate money to the division or otherwise authorize the division to expend money from one or more of the following funds:
 - i) The general fund;
 - ii) The species conservation trust fund created in section 24-33-111 (2)(a);
 - iii) The Colorado nongame conservation and wildlife restoration cash fund created in section 33-1-125; or
 - iv) The wildlife cash fund created in section 33-1-112 (1), except that any money within the wildlife cash fund that is generated from the sale of hunting and fishing licenses or from associated federal grants is not available for appropriation under this section.
- b) The lack of an appropriation from the general fund shall not halt reintroduction of gray wolves as required under subsection (2)(d) of this section.
- c) The division may solicit, accept, and expend any grants, gifts, sponsorships, contributions, donations, and bequests, including federal funds, for the purpose of implementing and administering this section.

5) As used in this section, unless the context otherwise requires:

- a) "Designated lands" means those lands west of the Continental Divide in Colorado that the commission determines are consistent with its plan to restore and manage gray wolves.
- b) "Gray wolf" means nongame wildlife of the species *Canis lupus*.
- c) "Livestock" means cattle, horses, mules, burros, sheep, lambs, swine, llama, alpaca, and goats.
- d) "Restore" or "restoration" means any reintroduction, as provided for in section 33-2-105.7 (1)(a), as well as post-release management of the gray wolf in a manner that fosters the species' capacity to sustain itself successfully.

Appendix B. Technical Working Group Synthesis Report.



TECHNICAL WORKING GROUP

FINAL SUMMARY OF RECOMMENDATIONS
FOR THE COLORADO WOLF RESTORATION
AND MANAGEMENT PLAN

**Technical Working Group (TWG)
to Colorado Parks and
Wildlife (CPW)**

August 2022

Introduction

This is a final summary and compilation of considerations and recommendations provided by the Technical Working Group (TWG) for the Colorado Wolf Restoration and Management Plan process. The report synthesizes key takeaways from the TWG’s reports on restoration logistics; livestock compensation; state recovery metrics and delisting and down-listing thresholds; and wolf management, as well as cross-cutting themes for all topics. The full-length reports for each topic are included in appendices.

Contents

Introduction	2
About the Technical Working Group (TWG)	3
Cross-Cutting Themes	3
Summary of Recommendations on Wolf Restoration Logistics	4
Summary of Technical Considerations on Compensation for Wolf Damage to Livestock	6
Summary of TWG Recommendations on State Listing and Delisting Thresholds	7
Summary of TWG Technical and Experiential Feedback on Wolf Management Considerations	9
Appendix A: Technical Working Group Members	11
Appendix B: Technical Working Group Member Biographies	12
Appendix C: Technical Working Group Meeting Dates	17
Appendix D: Technical Working Group Charter	18
Appendix E: Final Report on Wolf Restoration Logistics Recommendations	23
Appendix F: Final Report on Technical Considerations on Compensation for Wolf Damage to Livestock	50
Appendix G: Final Report on Technical Recommendations for Colorado State Listing/Delisting Thresholds and Phasing	62
Appendix H: Final Report on Technical and Experiential Feedback on Wolf Management Considerations	71

The Technical Working Group was convened by Colorado Parks and Wildlife and supported with third party facilitation from Keystone Policy Center.



About the Technical Working Group (TWG)

Colorado Parks and Wildlife (CPW) invited technical experts to serve on the Technical Working Group (TWG) to provide and review objective, science-based information as well as provide their own knowledge and experience at the state/federal/Tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics.

Colorado Parks and Wildlife (CPW) is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations.

TWG considerations and recommendations are based upon members' knowledge and experience in biological science and wolf management. The TWG was not charged with conducting literature reviews but rather drew from its in-depth knowledge of literature in offering insights to inform the plan.

The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views are documented to characterize the range of views and/or the range of science, experience, and uncertainties on specific topics. (See Appendix D for the TWG Charter).

The TWG met once monthly via Zoom from June 2021 to August 2022, except for May 2022 and in a joint meeting with the Stakeholder Advisory Group (SAG) December 2021. A total of 14 meetings were held with the TWG, inclusive of the SAG-TWG joint meeting. Meeting summaries were developed and published for each meeting.

Cross-Cutting Themes

The following themes emerged recurrently and consistently throughout the TWG's discussion of restoration logistics; livestock compensation; recovery metrics and delisting and down-listing thresholds; and management considerations.

- Building trust, maintaining relationships, setting expectations, emphasizing transparent and meaningful outreach with stakeholders and the public, and having a consistent, frequent, and determined presence in the field by CPW staff to establish and maintain trust are critical to achieve success in reintroduction and management.
- Both biological/ecological and social/economic dimensions are important to inform Colorado's wolf reintroduction and management plan.
- Allowance of flexibility and adaptation of management both spatially and temporally is important for successful implementation.
- Availability of a full array of management tools to minimize and respond to conflict is critical for working with, addressing impacts to, and assisting affected communities and for providing compensation to individual producers.
- Availability of funding and resources to implement the plan is critical.

- Research and monitoring are important tools to support other aspects of reintroduction and management.
- Wolf reintroduction and management planning is inherently controversial and complex; there is no one solution or silver bullet to meet all goals of all interested groups.
- Colorado has the opportunity to learn and build from past experiences with wolf introduction in other states as well as from its own experiences in wildlife management in developing and implementing a plan to meet Colorado’s specific needs and context.

Summary of Recommendations on Wolf Restoration Logistics

Key takeaways are presented below. See **Appendix E: Final Report on Restoration Logistics** for additional details on these topics as well as for TWG recommendations on: *capture methods at source; what to do with injured animals at source site; age ratios; color ratios; sex ratios; disease issues at sources site; what to feed during a period of captivity; immobilization drugs to be used; where and how to hold animals prior to shipping and upon initial arrival in Colorado; samples collected from animals; veterinarian care in captivity; disease testing and vaccine treatment;* and more details on all topics.

Capture considerations

- **Donor populations:** The alternatives Idaho; Montana; Wyoming; Mix of Northern Rocky Mountain States; Washington; Oregon; Great Lakes; and Mexican Wolves all have technical merit. Idaho, Montana, Wyoming, and a Mix of these Northern Rocky Mountain (NRM) states are recommended as the preferred donor populations, as logistical, source site jurisdiction, and other considerations allow. Planning for all three states and keeping options open and flexible is also recommended both for the initial donor population and for subsequent donor populations as needed. Some TWG members recommend Wyoming as slightly preferred. If these sources are not available, Washington and Oregon are next in preference.
- **Genetic considerations:** The alternatives related pack members; unrelated, dispersing age animals; and mix of packs and unrelated individuals all have technical merit, with highest preference for unrelated, dispersing age animals; followed by preference for a mix of packs and unrelated individuals; and least preference for selecting only related pack members.
- **Animal reputation:** The alternatives “not known to be a depredator,” “wolves that have been around livestock without conflict,” and “wolves that have not been present around livestock at all” all have technical merit as factors for sourcing donors; “known depredator” has technical merit as a criterion for exclusion from sourcing. Sourcing donor populations not known to be depredators (whether present around livestock or not) was preferential to sourcing populations not exposed to livestock, if possible. However, it is important to consider that most wolves overlap areas with livestock, and there is not a way to know the degree of interaction they have had with humans. No wolf should be translocated that has a known history of chronic depredation, and sourcing from geographic areas with chronic depredation events should not occur.
- **Transportation method from source to Colorado:** The alternatives air; ground; and mix all have technical merit, with no group preference among the alternatives; each has situational relevance according to the plan of capture and translocation. Key to success is that capture, transport, and release should occur as quickly as possible to minimize time in captivity and stress on the animals.

Animal handling considerations

- **Collars/marks on animals initially reintroduced into the state:** Alternatives VHF; GPS; mix of VHF/GPS; PIT tags; ear tags (perhaps temporarily when in captivity) all have technical merit; the alternative “no collar” for animals initially reintroduced into the state does not have technical merit. It is preferred that every released wolf has a GPS collar, with variability in durability of GPS collar types as an important consideration. Ear tags are less preferred as compared to the other collaring/marketing alternatives.

Reintroduction considerations

- **Reintroduction technique:** Alternatives hard release; soft release; and a combination of soft and hard release all have technical merit, with hard release preferred to soft release and to a combination of soft and hard release. There are pros and cons to consider for both techniques; however, hard release has greater technical merit as well as greater logistical and economic feasibility and is thus recommended by the TWG as the preferred technique.
- **Time of year for reintroduction:** Alternatives spring and summer do not have technical merit; alternatives winter and fall both have technical merit; and winter is preferred over fall.
- **Considerations for where wolves could be released:** All of the following considerations have technical merit: land ownership; livestock presence; geographic context; prey base; likelihood of supporting multiple packs; proximity to state border; vote results; and seasonal elk supply. Vote results have least preference as a technical alternative to guide reintroduction location, but it is recognized that socio-political considerations will also be at play in selection of release area(s). A site where a wolf is released is not expected to be necessarily where the wolf will stay.
- **Number of release sites (and number of release areas):** The alternatives of flexibility in specific release sites for an area with multiple release points; multiple release areas; and one release area were all determined to have technical merit. The alternative to have flexibility in specific release sites for an area with multiple release points is most preferred.
- **Pace of wolf reintroduction:** All of the following alternatives have technical merit: about thirty to forty wolves reintroduced for one year (fast); about ten to fifteen wolves reintroduced per year for two to three years (medium); about five to ten wolves reintroduced per year for three to six years (slow); and “be flexible” (note: numbers are not concrete and are meant to suggest relative pace). The general technical preference is for a “medium” pace, followed by a “slow” pace, and, least favorably, a “fast” pace. It is important to be flexible and adapt the specific logistics of these paces according to conditions of the reintroduction. It is also important to be adaptive around specific dates and numbers. The overall goal is ultimately to establish a self-sustaining population. The goal of the initial translocation and restoration is to introduce enough wolves at an adequate pace to establish a growing population that can ultimately achieve a self-sustaining population. Without specifying what that might look like from a numerical perspective and/or other indicators, there are a variety of ways (i.e., paces) that could work to achieve a growing population. Note: discussion of this topic focused specifically on the number of wolves actively reintroduced, not long-term population goals or management thresholds.
- **When to stop and/or pause reintroduction:** The following alternatives all have technical merit: after about forty animals have been moved; indication of pack establishment; indication of pack establishment with some documented reproduction; two packs raising two pups for two consecutive years; and a flexible approach (i.e., do releases (e.g., of thirty to forty wolves) and then pause to see what happens) all have technical merit. The preferred option is to do ‘a bunch’ (undetermined number) of releases (e.g., release a total of approximately thirty to forty wolves), then pause, assess, and adapt based on whether the initial restoration phase has resulted in an adequately growing population that will ultimately achieve a self-sustaining population.

Summary of Technical Considerations on Compensation for Wolf Damage to Livestock

Key takeaways are presented below. See **Appendix F: Final Summary of Technical Considerations on Compensation for Wolf Damage to Livestock** for more detail.

- **Social dimensions of compensation plans:** While the TWG provided feedback on technical merit on potential compensation elements, it recognized that there are various social considerations for livestock compensation and thus the Stakeholder Advisory Group (SAG) was charged with leading the development of comprehensive recommendations regarding the compensation plan.
- **Confirmed and probable depredation:** There is TWG consensus that compensation for confirmed depredations at fair market value has technical merit. Compensation for probable depredation has technical merit. A range of compensation amounts (50-100% of fair market value) were suggested as having technical merit; however, lesser amounts (i.e., less than 50%) were not suggested.
- **Compensation ratios/multipliers:** There is TWG consensus that compensation ratios for missing cattle and sheep on public and private lands have technical merit, but there are different perspectives and technical considerations regarding when these ratios should be triggered and how they should be administered. TWG members generally were uncertain as to what an appropriate ratio should be.
- **Indirect losses:** There is TWG recognition of the technical reality of indirect losses. However, there was mixed feedback from the TWG on whether there is technical merit to compensate for indirect losses, as many factors can contribute to indirect losses, particularly as there is not a clear or proven technical approach for quantifying and compensating for indirect losses. Indirect losses include impacts to pregnancy rates, weaning rates, lower weight gains due to stress or increased activity rates, future economic losses (e.g., loss of future production or loss of investments in genetics).
- **Pay-for-presence:** The TWG did not have clear consensus on whether or not pay-for-presence programs have technical merit; they offered a variety of perspectives regarding feasibility, purpose, and efficacy.
- **CPW's current game damage program:** There are various considerations for whether and how the current program should be evolved specifically for wolves. There is general consensus regarding the value of consistency of process; however, there are a variety of opinions on whether there should be differences in compensation eligibility, amount, and/or criteria. Many TWG members suggest technical merit in consistency in using the existing program; however, the TWG also recognizes that there are various social considerations on this topic as well that the SAG will weigh in regarding whether and how the current program should be evolved for wolves.
- **Damage investigations:** Conducting damage investigations via CPW and APHIS-WS has technical merit. Investigators should have adequate training to conduct professional, consistent damage investigations.
- **Funding sources and administration:** TWG perspectives generally support using multiple sources of funding for compensation and other livestock interactions issues, although there were varying perspectives on whether this is a technical issue and/or is an issue with technical merit. Consistency in administration of funds, regardless of sources, was emphasized. Pros and cons of using other agencies as administrators for funding and/or for other elements of the game damage program was also discussed.
- **Non-lethal risk reduction requirements for compensation:** TWG members emphasized the importance of encouraging non-lethal risk reduction techniques; however, there were various perspectives regarding the technical merit and feasibility of requiring their use in order to receive damage compensation. The TWG discussed context-specificity of non-lethal risk reduction practices and losses; importance of maintaining flexibility rather than prescribing practices; difficulty in defining risk reduction requirements; value in strategies to incentivize adoption and creative problem solving; and maintenance of relationships with local producers.

Summary of TWG Recommendations on State Listing and Delisting Thresholds

Wolf Population Listing/Delisting Phased* Framework

The recovery metrics or thresholds outlined in the table below were developed through expert deliberation of TWG members and are presented in a phased framework. While the determination of these thresholds is a technical exercise, management actions corresponding to the phased framework should be informed by legal and social considerations, which will be addressed largely by the Stakeholder Advisory Group (SAG).

	Phase 1 <i>(correlating with state endangered status)</i>	Phase 2 <i>(correlating with state threatened status)</i>	Phase 3 <i>(correlating with state delisted, nongame status)</i>	Phase 4⁺ <i>(correlating with state delisted, game status)</i>
Start	Current (2022)	Minimum count of 50 wolves anywhere in Colorado for four successive years.	Phase 1 and Phase 2 conclusion requirements are both met. Phase 2 requirements may be met concurrently with Phase 1 requirements.***	Discretionary phase, not prescriptive nor legally required. A population estimate above the delisting threshold would be required.
Conclude	Minimum count** of 50 wolves anywhere in Colorado for four successive years.***	Minimum count of 150 wolves anywhere in Colorado for two successive years**** -OR- Minimum count of 200 wolves anywhere in Colorado with no temporal requirement.	No prescribed conclusion; not legally required.	No prescribed conclusion.
Action upon conclusion	Downlist to state threatened.	Delist from Colorado state list	Consider reclassifying to game species.	N/A
Criteria to move back into this phase	After downlisting, a minimum count of less than 50 wolves anywhere in Colorado for two consecutive years initiates review of relisting to state endangered status.	After delisting, a lower bound of a population estimate of less than 150 wolves anywhere in Colorado for two consecutive years initiates review of relisting to state threatened status.	To be determined depending on whether and under what criteria a game reclassification is made.	N/A

Notes on the framework

*Phases will be dictated by numeric and temporal wolf population thresholds described in the table. While it is intended that state status will also correspond to these thresholds, there may be a time lag as the Parks and Wildlife Commission undertakes the procedural process to change the state status based on population counts.

**Minimum population counts in any phase include gray wolves that have been reintroduced to Colorado and those that have naturally migrated into the state and their progeny. Wolf population minimum counts in this table refer to counts conducted in late winter to most accurately reflect recruitment.

***“Successive” means years in a sequence, with any number of gaps in between. Consecutive means years in a sequence with no gaps. The rationale for using a metric of successive years is to account for potential years when an adequate survey cannot be conducted.

****Downlisting to state threatened status may not occur until the four-successive year requirement is met in the state endangered status (Phase 1). However, the two-successive year timeline for the Phase 2 minimum count requirement begins when the minimum number is first met and may occur concurrently while in the Phase 1/endangered phase. Consequently, it is possible that delisting (conclusion of Phase 2) may occur immediately after Phase 1, should the Phase 2 requirements be met concurrently during Phase 1.

† The TWG’s inclusion of Phase 4 in the above table does not indicate a TWG consensus recommendation on whether or not Phase 4 should occur; it is intended to demonstrate that phased approaches may potentially include a Phase 4 (classification as a game species). The TWG recognized that determination of whether to move to game classification should consider a variety of information and perspectives and will also be informed by legal considerations including interpretation of authorities relative to the definition of gray wolves in CRS 33-2-105.8 as being a nongame species. Many TWG members support Phase 4; however, one TWG member opposed Phase 4 and also suggested that the Phase 4 column is redundant with information already described in Phase 3.

See **Appendix G: Final Report on Technical Recommendations for Colorado State Listing/Delisting Thresholds and Phasing** for more detail.

Summary of TWG Technical and Experiential Feedback on Wolf Management Considerations

See **Appendix H: Final Report on Technical and Experiential Feedback on Wolf Management Considerations** for more detail on each of the summary points below.

- **Conflict-centered management vs. objective-based management:** Wolf management should focus on management of conflict, with consideration of the social factors that accompany an impact-based management approach. Lessons from other states with wolves suggest population management is not robustly correlated with conflict minimization. Generally, the public has a high expectation that state wildlife agencies will address wildlife related challenges.
- **Avoiding misinterpretation of maximum vs. minimum population metrics:** It is important to use clear and consistent messaging to reinforce the purpose of minimum population counts/estimates, which are not intended as population objectives or maximums and have been misinterpreted in other contexts.
- **Zonal management:** Initial and long-term management should be impact-based. Zonal management of conflict could be a consideration for future management. Delineation of zones in the future could be informed by experience and data gathered through impact (and conflict)-based management, understanding of ecological and social suitability (inclusive of wildlife and agricultural interests), and learnings from wolf dispersal and establishment on the ground.
- **Wolf population self-regulation:** Intrinsic self-regulation of wolves is unlikely at a statewide scale; wolves will likely be extrinsically regulated particularly by social carrying capacity. Wolf population self-regulation does not achieve the same goals as conflict management.
- **Positive impacts and wolf management:** Positive and negative impacts can occur due to wolf presence; positive impacts do not generally require hands-on management but can be communicated through education and outreach and can inform management activities and funding opportunities.
- **Non-lethal livestock conflict minimization:** Adoption of proactive and reactive non-lethal conflict risk reduction techniques by livestock producers in Colorado is important to the long-term success of the wolf restoration and management program. The effectiveness of these tools is context-specific and not well quantified.
- **Post-depredation management of conflict wolves:** While wolf depredations on livestock in other states are uncommon and do not represent a notable burden to the livestock industry as a whole, some wolves do cause significant problems for some ranchers and some areas experience repeated and frequent wolf depredations on livestock. Management of wolf-livestock conflicts following depredations should allow flexibility for managers; non-lethal and lethal management techniques should be applied adaptively and are context-specific. To be effective at reducing further depredation events, lethal and non-lethal responses for resolving conflict should be applied quickly and properly. Relocation of depredating wolves has little technical merit.
- **Lethal management of conflict wolves:** Lethal and non-lethal management are both critically important tools for conflict minimization; lethal management will likely attract greater social attention. In evaluating the management approach on a context-specific basis, consider the trade-offs among ability to target depredating wolves, conflict minimization efficacy, cost, reproductive and recruitment success, wolf population size and listing status, impacts to livestock producers, and social/stakeholder interests when considering lethal take options, including incremental and whole pack removal.
- **Considerations for ecological effects:** Ecological function is an important factor to consider but is difficult to quantify and may be less relevant as a metric at the state scale.
- **Impacts of wolves to ungulates, big game, and big game hunting:** Although statewide impacts to ungulate populations and hunting opportunities have not occurred in other states and are unlikely in

Colorado, wolves can have local impacts to ungulate recruitment due to predation of young ungulates. Wolves prefer elk and will also prey on deer and other ungulates; moose may be targets of predation where they are abundant. Reduction in big game hunting opportunities and targeted wolf control have sometimes occurred locally in other states to address negative ecological or economic effects of reduced ungulate populations. Ungulate populations are impacted by a complexity of interacting factors.

- **Impacts of wolves to prey compromised by infectious disease:** Predators like the gray wolf may select for prey compromised by infectious diseases, which could prove useful in reducing infectious disease prevalence in ungulate populations, primarily when pathogens are directly transmitted among hosts. The strength of a potential disease reduction depends on numerous factors, including specific disease etiology, the strength of selection for infectious individuals, and overall predation rates. It is unclear whether wolves will have a measurable effect on chronic wasting disease (CWD) in Colorado, where environmental contamination is likely to be a primary transmission route and where CWD is already well-established in mule deer, a species that wolves generally do not select for in the presence of elk.
- **Interactions with other wildlife species:** Wolves are important components of trophic networks where they are present on the landscape and their presence may have interactions with other large carnivores. The presence of wolves will not have an impact on populations of threatened and endangered species in Colorado, specifically lynx and Gunnison sage grouse.
- **Management of conflict with humans:** Attacks by wolves on humans are exceedingly rare; education and outreach for recreationists and other public lands users should include best practices and guidance, including how to differentiate wolves and coyotes. Flexibility to address rare instances of wolf habituation in areas dominated by humans is important.
- **Management of conflict with pets and hunting dogs:** Wolf attacks on pets are uncommon; education, outreach, and management should be used to proactively prevent conflict. It is important that public messaging emphasizes the risks assumed when domestic and hunting dogs are present in areas with wolves.
- **Wolf monitoring and expectations for stakeholders and public:** Monitoring and research should be based on restoration and management goals, use a variety of techniques, and be connected to other elements of wolf management, including conflict minimization. While robust monitoring is valuable at early stages of reintroduction, limitations to monitoring will increase with wolf population growth, requiring transition to a population estimate approach. It is important to consider effective messaging and coordination with stakeholders and the general public when communicating monitoring objectives and data; lead with trust and share data on an as-needed basis.
- **Social and/or economic dimensions of wolf management:** Social and economic dimensions are critical to understand, measure, and incorporate into decisions on wolf management. Perceptions of wolves and perspectives on management vary among people, are generally consistent within interest groups, and often reflect deeply held beliefs and values. There is high potential for social controversy and conflict, particularly as related to expectations and acceptance for use of non-lethal practices, lethal control, recreational harvest/regulated public hunting, and wolf population numbers. Some research suggests that economic benefits can be substantial and much larger than economic costs; however, economic benefits and costs are not distributed equally across stakeholders and the public. Consider the breadth of existing social science research, economic indicators, and stakeholder and public feedback when making management decisions, and incorporate new social and economic research into future decisions. Education and outreach can also inform and be informed by social science. It is critical to have trusted, responsive managers on the ground and consistency of management.

Appendix A: Technical Working Group Members

Scott Becker	U.S. Fish and Wildlife Service, Regional Wolf Coordinator
Alan Bittner	Bureau of Land Management, Deputy State Director
Stewart Breck	National Wildlife Research Center U.S. Department of Agriculture, Research Wildlife Biologist
Roblyn Brown	Oregon Department of Fish and Wildlife, Wolf Program Coordinator
Wayne East	Colorado Department of Agriculture, Agricultural/Wildlife Liaison
Justin Gude	Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief
Jonathan Houck	Gunnison County Commissioner
Mike Jimenez	U.S. Fish and Wildlife Service, Retired
Merrit Linke	Grand County Commissioner
Steve Lohr	U.S. Forest Service, Rocky Mountain Region Renewable Resources Director
Carter Niemeyer	U.S. Fish and Wildlife Service, Retired
Martin Lowney	U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, State Director
Eric Odell	Colorado Parks and Wildlife, Species Conservation Program Manager
Mike Phillips	Rocky Mountain Wolf Project, Founder/Turner Endangered Species Fund, Executive Director
John Sanderson	Colorado State University Center for Collaborative Conservation, Director
Doug Smith	National Park Service, Yellowstone National Park, Senior Wildlife Biologist
Robin Young	Colorado State University Extension Service, Archuleta County Extension, Director, Natural Resources and Agricultural Agent

The Technical Working Group was supported with third party facilitation from Keystone Policy Center and with additional staff support from Colorado Parks and Wildlife.

Appendix B: Technical Working Group Member Biographies

Scott Becker, U.S. Fish and Wildlife Service, Wyoming Wolf Coordinator

Scott Becker is the Region 6 Wolf Coordinator for the U.S. Fish and Wildlife Service (USFWS) based in Lander, Wyoming. Scott has been involved with large carnivore (grizzly bear, black bear, mountain lion, and wolves) management since 2000 when he began working as a large carnivore biologist for the Wyoming Game and Fish Department (WGFD). Scott switched to strictly wolf management in 2008, working for both WGFD and then the USFWS, where he coordinated and directed wolf management activities around Cody, Wyoming between 2008 and 2012. Scott was the statewide wolf specialist for the Washington Department of Fish and Wildlife from 2012 to 2017, where he coordinated and directed field activities related to wolf recovery and management in the state prior to returning to Wyoming to serve in his current role. Scott received his B.S. in Wildlife and Fisheries Biology and Management in 1997 and his M.S. in 2008, both from the University of Wyoming. His M.S. research evaluated factors limiting population growth of the north Jackson moose herd in Wyoming.

Alan Bittner, Bureau of Land Management (BLM), Deputy State Director, Resources

Alan Bittner serves as the Deputy State Director for Resources and Planning at the BLM State Office in Colorado. The division provides guidance and policy direction to the four districts and ten field offices within BLM Colorado's 8.3 million acres. The division includes all biologic resources, wild horses, water rights, and cultural resource management. In addition, statewide planning guidance and recreation management are led out of the division. Previous to arriving in Colorado, Alan most recently served as the Northern California District Manager in Redding, California since 2017 where he oversaw four field offices in a district that stretched from the coast to NW Nevada. Alan served as the Anchorage Field Manager, where he oversaw 24 million acres of BLM-administered public lands in western, south-central, and southeast Alaska. Alan also served as an Assistant Field Manager in Carson City, Nevada for four years where he oversaw the forestry, range, recreation, wildlife and wild horse and burro programs. Alan began his career in Idaho where he worked for the U.S. Forest Service and BLM for 15 years. He has a bachelor's degree in biology from Cornerstone University in Michigan and he enjoys getting outdoors with his wife Monique and their two boys.

Stewart Breck, National Wildlife Research Center, Research Wildlife Biologist

Dr. Stewart Breck, Research Wildlife Biologist, is a researcher for the USDA-National Wildlife Research Center and his research is focused on carnivore ecology and behavior and minimizing conflict between carnivores and people. Studies include testing nonlethal methods for preventing conflict, measuring the impact of carnivores on livestock, influence of urban environments on carnivore ecology, and population biology and behavioral ecology of carnivores.

Roblyn Brown, Oregon Department of Fish and Wildlife, Wolf Program Coordinator

Roblyn graduated from The Ohio State University with a B.S. in 1993, then moved west as fast as she could. She worked on various carnivore (grizzly bear, mountain lion, lynx) and endangered species projects in CO, MT, ID, and Alberta for various NGOs, states, and federal government before moving to Oregon to monitor bighorn sheep in Hell's Canyon. For the last 12 years, Roblyn has been working for the Oregon Department of Fish & Wildlife (ODFW) implementing the Oregon Wolf Conservation and Management Plan. She arrived in Oregon about the time wolves were naturally recolonizing Oregon and has monitored the population as it has grown from 14 to 173 and expanded across the state. She has been the statewide coordinator since 2016, with responsibilities coordinating and directing capture, population monitoring, evidence-based depredation investigations, wolf-conflict response, and information and education.

Wayne East, Colorado Department of Agriculture, Agricultural/Wildlife Liaison

Wayne was born in La Junta and is a fifth-generation native Coloradan. Wayne has a B.S. in Wildlife Biology from Colorado State University and a Master of Public Administration from the University of Colorado at Denver. Wayne has enjoyed a diverse career in wildlife management and has served as the Wildlife Programs Manager at the Colorado Department of Agriculture since 2014. Wayne oversees programs that impact the agriculture and wildlife interface including Chronic Wasting Disease, Aquaculture, and Depredation. Wayne's honors include receiving the 2018 Wildlife Professional of the Year award from the Colorado Trappers and Predator Hunters Association, and the 2020 Friend of the Industry Award from the North American Elk Breeders Association.

Justin Gude, Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief

Justin Gude has been the Wildlife Research & Technical Services (RTS) Bureau Chief for Montana Fish, Wildlife & Parks (FWP) since 2008. The RTS Bureau consists of wildlife research, health, biometrics, and survey programs, and their work covers a variety of taxa ranging in size from songbirds and bats to moose, in all corners of the state. Justin is responsible for overseeing the work of the RTS Bureau and ensuring integration of the wildlife research and management programs at FWP. Justin has been involved in wolf predator-prey, population dynamics, monitoring, harvest, and depredation research and management for 25 years. He has an M.S. in Fish & Wildlife Management from Montana State University and a B.S. in Wildlife Ecology and Conservation from the University of Florida.

Jonathan Houck, Gunnison County, County Commissioner

Jonathan Houck was recently elected to this third term and is chair of the Gunnison County Board of County Commissioners. Prior to serving in his role as commissioner, he was Mayor of the City of Gunnison. A 30-year resident of Gunnison and graduate of Western Colorado University, he has spent his professional life as an educator before being elected commissioner. He is deeply involved and experienced in public lands and wildlife issues. He formed and led the County Coalition for the Gunnison Sage Grouse, a collaborative of ten southwest Colorado counties and one southeast Utah County working to improve habitat and opportunities for recovery of the species. He has worked with numerous regional and statewide stakeholder groups, agricultural producers, conservation organizations, and outdoor recreational advocates in his time as commissioner and has been a reliable bridge builder when working on challenging issues.

Mike Jimenez, U.S. Fish and Wildlife Service, Wolf Biologist, Retired

Mike Jimenez was a wolf biologist for 30 years, beginning in 1986. He has a master's degree in wildlife biology from the University of Montana. Most of Jimenez's career was with the USFWS in Wyoming, Montana, and Idaho. He was a field biologist and the project leader for wolf recovery in Wyoming for eighteen years and project leader for the entire Northern Rocky Mountains (NRM) for five years. He also served as the wolf project leader for the Nez Perce Tribe to reintroduce wolves into Idaho in 1995-96. Jimenez was also the project leader for the Wyoming Game and Fish Department when wolves were briefly delisted in 2008. In addition to field work, his responsibilities included research and management publications in scientific journals, presentations at scientific symposiums and government agencies, articles and presentations to special interest groups, and working directly with the U.S. Department of Justice to delist wolves in the NRM. Jimenez retired in 2016.

Merrit Linke, Grand County Commissioner

Merrit Linke is part of a 5th generation ranch family and Grand County native. He lives on the original 160 acres that was homesteaded in 1883 by his great-grandfather. He graduated from Middle Park High School in Granby, from Northeastern Junior College in Sterling, and from the University of Wyoming in 1985 with a B.S. degree in secondary education with a major in physics and minors in chemistry and earth science. From 1987-2001, he taught all levels of science, mostly chemistry and physics, and coached multiple levels of several sports ranging from 7th-grade girls' basketball to intercollegiate rodeo. He started a livestock feed and supplement business in

2001, worked for the livestock nutrition division for an international company and continued with his own feed distribution business until selling it in 2018. Merritt was elected Grand County commissioner in 2012 and was re-elected in 2016 and 2020. He is currently chair of the Board and serving his 3rd term. He also currently serves on the executive committee of Club 20; served as CCI Mountain diarist president for 3 years and currently serves as vice president of Middle Park Stockgrowers. He is a member of the Bureau of Land Management Resource Advisory Council (RAC) and serves as vice-chair of the Grand County Wildfire Council. Since 1999, he has owned and operated a livestock and hay production business in Grand country and continues to operate it today.

Steve Lohr, United States Forest Service, Renewable Resources Director, Rocky Mountain Region

Steve grew up in Beaufort, South Carolina where he became fascinated with coastal ecology at an early age. He received his bachelor's degree in biology from Lander University in Greenwood, SC in 1994. Steve was accepted to graduate school at Clemson University in 1997 (Go Tigers!), where he earned his master's degree in zoology in 1999. Following graduation, Steve accepted a position as a wildlife biologist with the South Carolina Department of Natural Resources where he served as the SC red-cockaded woodpecker recovery coordinator. In 2001, Steve took a position as a wildlife biologist with the US Air Force at Shaw Air Force Base in Sumter, South Carolina where he was responsible for wildlife management of a 16,000-acre bombing range. Steve began his career with the Forest Service in 2002 when he accepted the district wildlife biologist position on the Francis Marion National Forest in South Carolina. At the end of 2005, Steve began working as the forest wildlife biologist on the Tonto National Forest in Phoenix, Arizona. Steve was the District Ranger on the Cheoah and Tusquee Ranger Districts on the Nantahala National Forest from 2008 to 2011 where he focused on large scale watershed restoration efforts and completing \$7million of ARRA projects that focused on economic recovery of local communities. Steve was the Forest Supervisor in Alabama from 2011 to 2014 where he enjoyed the challenges of making decisions on a landscape scale and working with an outstanding group of natural resource professionals and partners. Steve was the Director of the National Partnership Office in Washington, DC from 2014 to 2016 where he worked to build the agency's capacity surrounding partnerships as well as maintain and develop new national level partnerships. Steve is currently the Director of Renewable Resources for the Rocky Mountain Region and has responsibility for the forest management, wildlife, range, water, and air programs. Steve has a wife, Stacy, and three children, Malia (19), Sam (17), and Will (14). They spend free time enjoying all outdoor activities including hiking, biking, skiing, and camping.

Martin Lowney, U.S. Department of Agriculture, Wildlife Services, Animal and Plant Health Inspection Service, State Director

Martin Lowney has worked for 34 years as a wildlife damage management biologist for the United States Department of Agriculture, Wildlife Services program. He has been the state director for the Wildlife Services programs in Colorado, New York, and Virginia and held other positions in Mississippi, Alabama, and other states. He is a Certified Wildlife Biologist by The Wildlife Society and serves as an editorial advisory board member for *The Professional*, a news journal published by The Wildlife Society. Martin Lowney earned his Master of Science degree in wildlife management from Mississippi State University and a Bachelor of Science degree in natural resource management from the University of Massachusetts. His job duties have been working with local and state governments, federal agencies, organizations, and individuals to develop and implement projects to reduce damage caused by wildlife to protect agriculture, human health and safety, natural resources, and property. Martin has broad experience working with the livestock industry to alleviate predation on sheep, goats, and cattle from coyotes, bears, mountain lions, and wolves. Additionally, he has lead projects for the restoration of shorebirds on the Atlantic coast and other wildlife depredated by native and non-native wildlife. Martin has published two training manuals on managing predation to livestock. Lastly, he has written grants for state wildlife agencies and non-governmental organizations for funds to conduct research on predation or to manage predation on native wildlife species.

Carter Niemeyer, U.S. Fish and Wildlife, Idaho Wolf Recovery Manager, Retired

Carter Niemeyer has Bachelor of Science (1970) and Masters (1973) degrees in wildlife biology from Iowa State University. He was a state trapper for the Montana Department of Livestock, and a district supervisor for USDA Wildlife Services in western Montana managing and controlling large predators. He was chosen as the wolf management specialist for USDA Wildlife Services covering the states of Idaho, Montana, and Wyoming. In that position, he was responsible for livestock depredation investigation, as well as wolf capture and removal. Niemeyer was a member of the wolf capture team in Canada during reintroduction in the mid-1990s. In 2001 he was recruited by the U.S. Fish and Wildlife Service to run the agency's wolf recovery program in Idaho, and retired in 2006, coincidentally on the same day that wolf management was officially handed over to the state of Idaho. He also has worked on wolf issues in Washington, Oregon, California, and Colorado, as well as England, Scotland, France, and Kyrgyzstan. He wrote his first memoir, *Wolfer*, in 2010. His second memoir, *Wolf Land* was published in 2016. Carter lives in Boise, Idaho with his wife, Jenny.

Eric Odell, Colorado Parks and Wildlife, Species Conservation Program Manager

Eric grew up in Colorado and gained a strong appreciation of the outdoors from an early age. He attended Middlebury College in Vermont, traveled extensively for a variety of field jobs and then began graduate school at Colorado State University where he completed his graduate degree in wildlife biology. He began working for the Colorado Division of Wildlife in 2000. He has worked for that agency, now Colorado Parks and Wildlife, in a variety of capacities since then - as a Habitat Biologist based in an NRCS field office, as a Conservation Biologist, as the Grassland Coordinator, and now as the Species Conservation Program Manager for Carnivores. In this role he directs conservation and management programs to aid in the establishment and protection of native, non-game carnivore species to the state. He is the biological lead for the wolf reintroduction effort for Colorado Parks and Wildlife.

Mike Phillips, Rocky Mountain Wolf Project, Founder/Turner Endangered Species Fund, Executive Director

Mike received his M.S. in wildlife ecology from the University of Alaska in 1986 and his B.S., ecology from the University of Illinois in 1980. He has served as the Executive Director of the Turner Endangered Species Fund and advisor to the Turner Biodiversity Divisions since he co-founded both with Ted Turner in June 1997. Since inception, the organizations have stood as the most significant private effort in the world to redress the extinction crisis through active reintroduction efforts on behalf of imperiled species. From 1985 through May 1997, Mike worked for the U.S. Department of Interior leading historic efforts to restore red wolves to the southeastern US and gray wolves to Yellowstone National Park. Mike has served on recovery teams for several species (e.g., ivory-billed woodpecker, black-footed ferret, red wolf, Mexican gray wolf) and has conducted important research on the impacts of oil and gas development on grizzly bears in the Arctic National Wildlife Refuge, predation costs for gray wolves in Alaska, and dingo and red fox ecology in Australia. From 2006 through 2020 Mike served in the Montana House of Representatives and Montana Senate. In 2014, Mike founded and led Rocky Mountain Wolf Project and Rocky Mountain Wolf Action Fund to use direct democracy to establish a lawful mandate to restore wolves to western Colorado. By November 2020, the work of both organizations had led to 1,590,299 votes being cast in favor of Proposition 114 and its subsequent passage. In 2021, Mike was selected as the Aldo Leopold Memorial Award recipient, the highest honor bestowed by the Wildlife Society.

John Sanderson, Colorado State University, Director, Center for Collaborative Conservation

John Sanderson is the Director of the Center for Collaborative Conservation at Colorado State University. At the Center, John and his staff work to build the capacity of organizations, communities, and future leaders to achieve conservation impact, while applying CSU's world-class research and education. John has been doing conservation work in the West for over 25 years, including at the Colorado Natural Heritage Program and at The Nature Conservancy, where as Director of Science he led a staff striving to protect land, manage rivers, restore forests, and mitigate and adapt to our changing climate. John earned a B.S. in engineering from Purdue

University, an M.S. in botany from the University of Vermont, and a Ph.D. from the Graduate Degree Program in Ecology at Colorado State University.

Doug Smith, National Park Service, Senior Wildlife Biologist, Yellowstone National Park

Douglas W. Smith Ph.D. is a Senior Wildlife Biologist in Yellowstone National Park. He supervises the wolf, bird, and elk programs – formerly three jobs now combined into one under Doug’s supervision. His original job was the Project Leader for the Yellowstone Wolf Project which involved the reintroduction and restoration of wolves to Yellowstone National Park. He helped establish this project and position. Doug received a B.S. degree in Wildlife Biology from the University of Idaho in 1985. While working toward this degree he became involved with studies of wolves and moose on Isle Royale with Rolf Peterson, which led to long-term involvement (1979-1994) with this study as well as a M.S. degree in biology under Peterson at Michigan Technological University in 1988. He then moved to the University of Nevada, Reno where he received his Ph.D. in ecology, evolution, and conservation biology in 1997 under Stephen H. Jenkins. He has published a wide variety of journal articles and book chapters on beavers, wolves, and birds and co-authored four popular books on wolves (*The Wolves of Yellowstone* and *Decade of the Wolf* which won the 2005 Montana book award for best book published in Montana) as well as publishing numerous popular articles. The third book, *Wolves on the Hunt*, came out in May 2016 and his fourth book *Yellowstone Wolves* came out in December 2020 and summarizes the first 25 years of wolf recovery. He has participated in numerous documentaries about wolves for National Geographic and British Broadcasting Company (BBC) and recently on CBS 60 Minutes as well as other media and done about 2000 media interviews. He is interviewed widely and speaks often about wolves to audiences all over the world. He also recently gave a TEDx talk on wolves. He is a member of the Mexican Wolf Recovery Team, the Re-Introduction Specialist Group, and Canid Specialist Group for the IUCN. Doug has studied wolves for 42 years. Besides wolves, birds, elk, and beavers, he is an avid canoeist preferring to travel mostly in the remote regions of northern Canada with his wife Christine and their two sons Sawyer and Hawken.

Robin Young, Colorado State University Extension Service, Archuleta County Extension Director, Natural Resources and Agricultural agent

Robin Young is the Archuleta County Extension Director, Natural Resources and Agricultural agent. She works closely with landowners, large and small, to define objectives using holistic methods to reach their goals. She started out her career in Flagstaff, AZ, where she attended Northern Arizona University and received a Bachelor of Science in forestry. She worked for the United States Forest Service on the Coconino National Forest for six years before moving to Colorado in 1995. She worked in fire, silviculture, range, and recreation during her time with the USFS and gained a broader knowledge in those resource areas. After moving to Colorado, she ran a private forestry business for 20 years. The primary focus for the business was forest health and fire mitigation. She has also worked as a Conservation District Manager and a range technician for the NRCS. Robin is in her 11th year with Extension and serves the communities of Archuleta County, the San Juan Basin region, and other communities around the state. She works with collaborative groups in the region and across the state. She served as the lead for the Natural Resources planning and reporting unit that led to a collaboration with the Center for Collaborative Conservation, the Center for Human Carnivore Coexistence, APHIS, and the Warner College of Natural Resources to address wolf education in Colorado. They published the Wolf Information booklet for the public. She will be facilitating the training efforts for Extension agents on their needs and the needs of their community members. Her expertise lies with communications and collaborations as a convener and a connector with people.

Appendix C: Technical Working Group Meeting Dates

Date(s)

- June 15, 2021
- July 20, 2021
- August 18, 2021
- September 15, 2021
- October 20, 2021
- November 17, 2021
- December 14-15, 2021
- January 19, 2022
- February 16, 2022
- March 11, 2022
- April 14, 2022
- June 15, 2022
- July 20, 2022
- August 17, 2022

All meetings were held virtually via Zoom with the exception of the joint meeting with the SAG in December 2021, which was held in Denver.

Appendix D: Technical Working Group Charter



**Colorado Wolf Restoration and Management Plan
Technical Working Group
to Colorado Parks and Wildlife**

**Governance Charter
6/8/21**

I. Purpose and Scope of the Technical Working Group

The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. Colorado Parks and Wildlife (CPW) staff will synthesize information, relevant research, and lessons from other locations and develop draft language and/or alternatives that will undergo internal CPW review. This draft language and/or alternatives will then be shared with the TWG for review and assessment of technical legitimacy for inclusion in the Plan. The TWG may also provide input to CPW on language or alternatives with technical merit that could be utilized to address feedback of the Stakeholder Advisory Group. In gathering feedback from the TWG on draft language and/or alternatives, CPW may utilize subgroups comprised of members of the TWG, and/or may consult with additional experts from outside of the TWG for insight into specific topic areas where specific knowledge may be lacking in the current TWG membership.

II. Governance

This document constitutes the TWG governance charter. The charter is approved by and may be amended by the CPW Director, including with consideration of input from the TWG.

III. Powers and Duties

CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research or operations. Upon completion of the plan, the TWG will be formally disbanded.

IV. Operating principles and responsibilities

Operating principles and responsibilities of members include:

- a.** Compliance with all aspects of this governance charter.
- b.** Members will demonstrate composure and respect working with those with different experiences, backgrounds and perspectives.
- c.** Members will demonstrate the ability to engage productively and in good faith in the TWG's business and provide timely input.
- d.** Members will demonstrate willingness and preparedness to engage in TWG meetings.
- e.** Members will demonstrate focus on the scope and charge of the group.
- f.** Members will refrain from behavior or comments that denigrate other TWG members or others involved in wolf restoration and management efforts, or are disruptive to the charge and progress of the group.
- g.** Members will treat all draft documents and deliberative communications received or generated by the TWG and its members as confidential and will not disclose their contents except through the reporting procedures discussed below.

V. Membership and Participation

a. Members

Members of the TWG are appointed by the CPW Director. TWG members bring to bear their individual expertise and the expertise of their agencies, departments, and/or fields of practice and study.

b. Resignation of TWG Members

Any member who is no longer able to participate on the TWG shall notify the CPW Director as soon as practicable.

c. Removal of TWG Members

A member may be removed from the TWG at the discretion of the CPW Director based on conduct or lack of participation.

d. Vacancies

If a vacancy occurs on the TWG, the CPW Director may appoint a member to fill the vacant position.

e. Meeting attendance

No TWG member may send a delegate to represent them at any meeting. Meetings will typically occur virtually. TWG and TWG subgroup members shall make best efforts to attend TWG and subgroup meetings in person when meetings are conducted in person, but virtual options will be provided.

VI. Consensus

a. Consensus

The TWG shall operate by consensus. Consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all

participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with.

For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

	Consensus exists if <u>ALL</u> participants are at level 1-3:
1	I enthusiastically support this recommendation, option or idea.
2	I support this recommendation, option or idea.
3	I do not fully agree with the decision, however I can abide by or live with this recommendation, option, or idea; I do not object.
4	I object to this recommendation, option or idea.
5	I strongly object to this recommendation, option or idea; I cannot support, live with or abide by it.

b. Reports

The TWG shall provide to CPW a summary report of feedback on draft plan language or alternatives, including technical rationale, relevant considerations, and any concerns or uncertainties regarding technical merit of the draft language or alternatives. The report shall be developed by the facilitator with input and review by the TWG. Interim reports on specific topics, options or alternatives may be provided by the TWG to CPW throughout the process. A final report authored by the TWG will compile interim and final feedback on all topics from the TWG to CPW.

VII. Technical Working Group Subgroups

a. Subgroup Membership

CPW, in consultation with the TWG, may establish *ad hoc* subgroups comprised of TWG members. The TWG and/or subgroup members may consult with additional experts from outside of the TWG for insight into specific topic areas where specific knowledge may be lacking in the current TWG membership.

b. Charge to Subgroups

CPW, in consultation with TWG, shall issue a specific, written charge to each subgroup including the scope of work, timeline of the subgroup, desired work product and manner of work, and reporting requirements.

c. Report of Subgroups

Any draft or preliminary options or alternatives, or feedback on draft plan language or alternatives, presented by a subgroup to the TWG subgroup shall be accompanied by a summary of technical rationale and relevant considerations, including any relevant concerns or uncertainties regarding technical merit.

VIII. Meetings and Records

a. Regular Meetings

CPW shall establish a schedule for TWG meetings in consultation with the facilitators. The TWG shall meet one day a month on average. Additional meetings will be called as necessary by CPW. Subgroups shall meet on an *ad hoc* basis as determined necessary to fulfill their obligations. The TWG does not have authority to adopt rules or create policy and is not subject to the Colorado Open Meetings Law.

b. Facilitation

The CPW Director will contract facilitators to facilitate the work of the TWG and subgroups. CPW staff person(s) will be appointed to coordinate with facilitators in the development of schedules, agendas, materials, and processes for the TWG.

c. Conduct of Meetings

The facilitator will manage meetings of the TWG in the most informal manner possible.

d. Minutes

Minutes shall be kept of all TWG and subgroup meetings and shall include at least names of all TWG members present, the location of the meeting (physical location or virtual meeting), and a summary of the issues or matters discussed. Minutes shall be kept by the facilitator and posted to the TWG website.

e. Open Records

Any records received by the TWG and/or CPW may be subject to the Colorado Open Records Act.

IX. Communication

The CPW Director or his/her designee within CPW shall be the official spokesperson regarding the TWG process. The CPW Director or designee shall be responsible for managing the communications regarding the TWG, including to the media, legislators, the Governor and other policy makers.

TWG members are free to discuss the TWG work with any interested party, but in so doing must clarify they are speaking for themselves, and not the TWG, and must abide by the confidentiality provision above regarding draft and deliberative materials. TWG members are urged to use discretion when discussing the group. Consistent with operating principles, members will refrain from communications that denigrate other participants or are disruptive to the charge and progress of the group.

X. Compensation

Members of the TWG may be offered a nominal stipend and reimbursement for necessary travel expenses incurred in the performance of their duties and in accordance with state government guidelines, when requested.

Appendix E: Final Report on Wolf Restoration Logistics Recommendations

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)**

**Final Report on Wolf Restoration Logistics Recommendations
November 2021**



(Photo credit: National Park Service)

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Contents

Introduction	3
Capture considerations	3
Donor populations	3
Capture methods at source	7
Age ratios	10
Color ratios	10
Sex ratios	11
Genetic considerations	11
Animal reputation	12
Disease issues at source sites	13
What to do with injured animals at source site	13
Transportation method from source to Colorado	14
Animal handling considerations	15
What to feed during a period of captivity	15
Where and how to hold animals prior to shipping and upon initial arrival in Colorado	16
Immobilization drugs to be used	16
Collars/marks on animals initially reintroduced into the state	17
Samples collected from animals	18
Veterinarian care in captivity	19
Disease testing and vaccine treatment	19
Reintroduction considerations	19
Reintroduction technique	19
Time of year	21
Considerations for where wolves could be released	21
Number of release sites (and number of release areas)	22
Pace of wolf reintroduction	23
When to stop and/or pause reintroduction	24
Appendix A: Technical Working Group members	26
<i>Final Summary of Technical Working Group Recommendations, August 2022</i>	2
<i>Appendix E: TWG Restoration Logistics Report, November 2021</i>	

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Introduction

This report summarizes Wolf Restoration & Management Plan Technical Working Group¹ feedback to date regarding options for the following restoration logistics, with discussion of 1) technical merit of each option, 2) technical preference among options, and 3) additional considerations:

- 1. Capture considerations:** Donor populations; Capture methods at source; Age ratios; Color ratios; Sex ratios; Genetic considerations; Animal reputation; What to do with injured animals at source site; Transportation method from source to Colorado
- 2. Animal handling considerations:** Feed options; Where and how to hold animals prior to shipping and upon initial arrival in Colorado; Immobilization drugs to be used; Collars/marks on animals initially reintroduced into the state; Samples collected from animals; Veterinarian care in captivity; Disease testing and vaccine treatment
- 3. Reintroduction considerations:** Reintroduction technique; Time of year; Considerations of general landscape characteristics where wolves could be released; Pace of wolf reintroduction; When to stop and/or pause reintroduction Number of release sites (and number of release areas)

Capture considerations

Donor populations

Alternatives considered: Idaho; Montana; Wyoming; Mix of Northern Rockies States; Washington; Oregon; Great Lakes; and Mexican Wolves

Capture and translocation of wolves from other states for translocation to Colorado will require authorization by the respective state wildlife Commission or agency Director. A decision process in the donor jurisdiction(s) will be required for such a project, which will need to be initiated well in advance of project initiation.

¹ **About the TWG:** The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations. The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Summary of TWG feedback: All alternatives have technical merit. Comparatively, the preferred options from a technical perspective, are:

- Idaho, Montana, Wyoming, and a Mix of these Northern Rocky Mountain (NRM) states are recommended as the preferred donor populations, as logistical, source site jurisdiction, and other considerations allow. Planning for all three states and keeping options open and flexible is also recommended both for the initial donor population and for subsequent donor populations as needed. Some TWG members recommend Wyoming as slightly preferred.
- Washington and Oregon are next in preference.
- Great Lakes are third in preference: wolves from this region should only be further considered if other options above are not available.
- Use of gray wolves from the above states would be consistent with state law in Colorado, which states that *Canis lupus* must be reintroduced to the state.
 - State law does not specify the source of the wolves, nor does it describe the differences among subspecies. With the exception of Mexican wolves, all other wolves in the western US are managed as a single entity, and use of gray wolves from ID, MT, WY, WA, OR, and the Great Lakes would be appropriate for reintroduction to Colorado as well as consistent with state law.
 - Wolves that have naturally colonized and were reintroduced to the NRM states are different subspecies than were mapped to have previously existed there, though delineating precise lines of where one subspecies' distribution ended and the other's began is not possible. The animals reintroduced are of comparable size and weight as to what was historically in the NRM and in Colorado.
- Mexican Wolves (*C. l. baileyi*) are lowest in preference; Mexican wolves should only be further considered if other options above are not available as substantial process hurdles are presented with the consideration of this uniquely listed entity under the Endangered Species Act. Colorado is not historical range for this unique subspecies. The existing 10(j) for Mexican wolves could not be expanded into Colorado, as habitat has not been demonstrated to be irreparably damaged within the historical range of the subspecies. Utilizing Mexican wolves in Colorado would essentially be placing a Federally Endangered Species in the state, with no recovery goals/commitments for the state but with a long horizon as the species is eventually recovered within Arizona, New Mexico, and Mexico. It would not be possible to extend the management flexibility afforded by the 10(j) designation within the Mexican Wolf Experimental Population Area which would lead to extremely challenging management scenarios.
- All decisions are subject to future conversations and decisions with potential donor states.

Rationale/discussion:

Wyoming

- Wyoming has an aerial capture system that is somewhat predictable to time. This could facilitate the scheduling of successful capture and increase the likelihood of catching wolves and thus a capture/shipment event could be planned to move wolves to CO.
- To meet statutory obligations and keep costs down, Wyoming may be a good state to begin sourcing. However, it is important to keep options of where to source from open as there is no

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

guarantee wolves will be available or that they can be captured in the predator zone when reintroduction begins.

- At least one of the currently documented wolves in Colorado naturally migrated from Wyoming and is currently successful, which may support sourcing from Wyoming. On the other hand, sourcing from states other than Wyoming could provide genetic variability as a complement to the natural migrators. However, it was alternatively suggested that the genetics in Wyoming are similar to those in other NRM states and that genetic variability is not a concern should Wyoming be chosen as a source of wolves.
- Wyoming has a smaller population of wolves and a requirement to maintain a minimum number of wolves, whereas, by comparison, Idaho and Montana have higher populations and may be easier to source donor wolves from. Wyoming has fifteen to sixteen breeding pairs currently, enough to theoretically provide five to ten wolves per year: this currently includes some animals in the predator zone where wolves can be legally killed.
- If WY is chosen as a donor population, wolves will be much closer to home so the homing instinct may be greater and may raise the risk of return to the predator zone where they could be harvested, leading to public criticism.
- It is also recommended to keep options open for getting wolves elsewhere, if available, at later dates. Although genetics are a non-issue now, some new genetics would have benefit if wolves reintroduced from places other than WY are used and become breeders.

Idaho, Montana, Mix of Northern Rocky Mountain Region states (MT, ID, WY)

- Considerations in support of sourcing donor populations from Idaho, Montana, and Wyoming include: the high number of wolves in those states (MT and ID); the very recent legislation in place around the status and management goals for reducing numbers of wolves in those states (MT and ID); generally negative public attitudes toward wolf presence in those states; that taking wolves from states where hunting is allowed may provide wolves that come with a fear of humans (MT, ID, and WY); that the prey preference of wolves in those states is elk (MT, ID, and WY); and their genetic viability (MT, ID and WY).
- Matching to the extent possible the ecological conditions at the capture and release sites (primary prey, migratory/resident behavior of prey, likely denning habitat, etc.) is important. In that sense, wolves across much of WY, MT, ID, eastern OR, and eastern WA would very likely work for western Colorado, where the primary prey is likely to be migratory elk that generally move from intermountain valley or lower elevation winter ranges to high elevation summer ranges.
- A recent genetic analysis of wolves in the Northern Rockies found a genetically connected population, such that selection of source wolves on a genetic basis was not a significant issue. Genetic variation is unlikely to lead to different behaviors.
- Maintaining contingency plans for other potential donor populations is important in the case of lack of availability or other obstacles.
- Proximity to Colorado's border, which facilitates some transportation logistics, was also considered as a factor of donor selection.
- It was also suggested that positive public perceptions of Yellowstone wolf populations may make them/NRM wolves more favorable for use as a source population. However, the public interest in individual wolves specifically from Yellowstone National Park; tolerance of those

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

wolves to humans; and policy processes make selection of donor populations from Yellowstone NP less desirable. Social acceptance may be low for removing and/or managing Yellowstone wolves outside of the park and thus sourcing wolves from the park is cautioned against.

Washington and Oregon

- Selection of donor populations from Washington and Oregon would be less favorable than selecting wolves from other NRM states, but the option still has technical merit. Although Washington and Oregon wolves are also NRM wolves, Idaho, Montana, and Wyoming donor populations may be in greater alignment with public preference, for political reasons, as compared to the Pacific Northwest donor populations.
- Both Washington and Oregon have programs to capture wolves in winter; however, winter conditions in November and December affect potential success; increased cost and longer transport times also make these states less preferable than other states discussed above.

Great Lakes

- Selection of donor populations from the Great Lakes region has technical merit but is of lesser preference as compared to the Northern Rockies and Pacific Northwest.
- Great Lakes wolf populations are a viable candidate with respect to taxonomy (as are all source locations under consideration as previously described); however, the dissimilarity of the ecological context between the Great Lakes states and Colorado makes this a less favorable option as a donor population. Although there is some historical and contemporary measure of genetic mixture between coyotes and Great Lakes wolf populations, this is not considered an exclusionary factor for Great Lakes as a donor population. Although use of Great Lakes wolves in the restoration effort in Colorado could have technical merit, wolves from this region should only be further considered if other options above are not available.

Mexican Wolves (Arizona/New Mexico)

- Mexican wolves (a subspecies of gray wolves, listed as a separate entity under the Endangered Species Act) is the least desirable of the considered options. The historical range of the Mexican wolf does not include Colorado. Because they are listed as a unique entity under the ESA, maintaining the genetic uniqueness of this subspecies is paramount. If Mexican wolves were present in Colorado, premature interbreeding with wolves from the north could compromise the Mexican wolf recovery effort. Management considerations to address this potential issue in the Mexican wolf geography of recovery (AZ, NM) will reside primarily with the USFWS Mexican Wolf recovery team. Should gray wolves from other source populations described above be used as donor populations to Colorado, coordination between the Mexican Wolf Recovery Program and CPW is recommended to plan for and address potential interbreeding.
- Although the TWG discussed that use of Mexican Wolves in the restoration effort in Colorado could have technical merit, it recommends that Mexican wolves could only be further considered if all other options above are not available.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Breeding programs

- A member of the TWG discussed whether CPW should consider use of a repository of unique genes from a captive population of the McCleery lineage of Great Plains 'buffalo wolves' (*C. l. nubilus*) as part of the gray wolf restoration effort.
- It was suggested by this TWG member that inclusion of this breeding program as part of the restoration effort could potentially conserve and restore unique genes from the original wolf population inhabiting the general region, enhance the populations' gene pool, maximize genetic diversity, and restore genes that would not necessarily be available in any other donor populations of wolves that could be used for restoration in Colorado.
- Several other TWG members raised technical concerns about high levels of inbreeding of the McCleery lineage as well as limited amount of genetic material available for artificial insemination and the overall conservation benefit; therefore, it is very difficult to assume that introduction of these genes is a net positive to the effort.
- Use of these genes is not recommended in the early years of restoration if they are to be used at all. If using a cross-foster method where pups of this lineage are bred in captivity and then introduced to established wolf dens, or artificial insemination of wild wolves, this would occur in later years of the restoration effort.
- One TWG member suggested that adding this genetic material does not address a need or an issue of low genetic diversity, as there is no evidence for low genetic diversity for the source populations of wolves being considered. While not the case, if the source populations were documented to have low genetic diversity, then there might be a reason to seek other genes to solve this currently non-existent problem.

Capture methods at source

Alternatives considered: Net gunning; helicopter darting; traps; snares; discretion of source population management; public trappers; other options.

Summary of TWG feedback: All alternatives have technical merit. The most preferred options are use of a net gun, helicopter darting, and discretion of source population managers, in no particular order. Snares and traps present a variety of concerns related to success rates and injuries.

Rationale/discussion:

Net gunning and helicopter darting

- Biological and social considerations support preference for helicopter darting and net gunning as capture methods. These techniques offer the most precise, data-informed predictive planning options and temporal relevance for fall and winter reintroduction efforts in the Northern Rockies. Either darts or net guns could be used depending on the landscape; helicopter work will be more challenging in highly forested landscapes and thus darting may be the only option if a helicopter is used. A well-coordinated helicopter pilot and gunner is important when undertaking a helicopter darting or net gunning capture method.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- Darting and helicopter capture also provide the best selective potential; however, even these methods are non-selective, particularly in forested areas. The agency may need to consider capturing more wolves than needed to be somewhat selective in taking the desired age, color, and sex ratios in addition to the most fit animals (see below). Use of immobilizing drugs also accompanies these options.
- The use of an advanced spotter plane is recommended to locate wolves, to determine if they are in a workable location, and - if in a workable location- to determine what direction is best to approach them from and to keep an eye on the pack as they scatter once captures are initiated with a helicopter. When wolves selected for transport are shuttled to a holding location, the spotter plane can be used to locate other wolves for the helicopter to pursue once the shuttle is complete.
- Weather conditions may also constrain capture efforts. For example, snow conditions in the Pacific Northwest create difficulty for helicopter capture until closer to February, although a December capture event could be possible. It is valuable to have local staff as scouts to gauge snow and weather conditions in local environments; the ability to predict snow conditions can also improve the speed and efficiency of capture.
- A capture team with ample experience and a history of successful wolf captures will be required for helicopter captures to be a viable option. Helicopter wolf captures are generally more difficult and time consuming than helicopter captures for big game, and experienced pilots and capture crews can be successful where less-experienced teams cannot.
- Wolf capture is generally not a profitable enterprise for helicopter charting companies, and there is likely to be competition with their ungulate capturing enterprises. This may lend to having an alternative method to capture wolves; overreliance on helicopters alone could slow down the process.
- “Judas Wolves” are wolves that are captured and released back into the source population with collars such that they can offer options to track and capture wolves for relocation in future years’ efforts.
- Even with assistance from methods such as “Judas Wolves” or experienced tracking teams, plan for multiple options with low, feasible goals of the number of wolves captured per trip. For example, planning three to four events to capture two to three wolves per trip could be a feasible pace of capture, which would support a medium pace of release. However, lack of familiarity with landscape and pack dynamics is a limiting factor in the pace of reintroduction.

Traps and snares

- Traps and snares have technical merit; however, multiple TWG members advocated against the use of snares and traps as a capture method. Seasonal considerations can complicate capture and release coordination times; foothold traps have limitations based on weather. Neck snares can lead to significant and often unseen injuries to wolves. In past reintroductions, some wolves badly injured by neck snares were rejected as potential donors while others needed veterinary treatment after being damaged by traps. If selected, use snares with stops to prevent strangulation.
- Negative public perception can accompany release of potentially damaged wolves; there may be a heightened fear that damaged wolves could not hunt naturally and would prey on livestock. While the use of trapping generally polls negatively with the public, it polls less negatively when

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

the purpose of conducting trapping is to enhance wildlife populations rather than be employed as for the purpose of regulated take.

- If traps and snares are to be used, consider strict regulations around the type of device, including features such as coil strength, and the need to check traps within every 24 hours to prevent freezing if wolves are caught in the winter. Trapping can be very effective if experienced trappers are employed (e.g., agency or professional public).
- Captures involving trapping are most likely to occur the summer/fall prior to reintroduction to fit wolves in potential donor packs with collars to aid in leading capture crews to their pack mates come winter. (See Judas wolves, above)
- Although novel capture techniques and technologies may be useful, there are capture techniques that have been proven effective in the NRM over the past twenty-six or more years: there is not a need to change approaches at this time.

Public trappers

- Public trappers can work in tandem with net gunning and helicopter darting tools. Use of public trappers can provide potential additional economic benefit that may be viewed favorably by donor states; one TWG member recommended avoiding using government trappers to avoid perceptions of bias and to ensure leading edge approaches. This option requires cooperation between state agencies in the source area and public trappers. In Montana, for example, if Colorado can contract with trappers directly, so they could earn money for their effort (as they may have otherwise, such as if they sold the pelt from a harvested wolf), the request to a state's wildlife commission could be to allow the trappers to capture live wolves to support this effort. Public trappers could also be used to assist agency personnel in capturing and collaring wolves the summer prior to captures in areas that are likely to be accessible to winter capture operations (See Judas wolves, above). While some wolves may not survive to winter, those that do will enhance the ease of winter capture.

Discretion of source population management

- Consider source population management and policies in potential donor population states. Some TWG members expected Montana policies to be highly favorable to selection for donor sourcing; others noted policies around species management in Montana, Idaho, and Wyoming may constrain sourcing options. Immediate engagement with potential donor states' game and fish agencies is important to build relationships in anticipation of potential donor selection, with considerations of the current political landscape in these states.

Additional logistical considerations for capture

- Coordination, knowledge, and understanding of populations, policies, and local officials in the source states enhance efficiency of capture; outreach to potential states' officials should be conducted as soon as possible.
- Advance work and coordination would greatly help in achieving a successful reintroduction by the end of 2023. Coordination with local officials from donor states may allow for early collaring of "Judas Wolves", which could add efficiency in capture: this could be done as early as 2022. Montana has six experts which coordinate to collar about twenty wolves per year over the

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

course of two to three months of summer trapping and a month of helicopter capture efforts in the winter. Similar capture and collaring efforts occur annually in Idaho and Wyoming.

- The National Park Service in the Northern Rockies states also have considerable infrastructure in place to assist capture, although, as mentioned above, there are also cautions against selecting wolves from Yellowstone National Park, given their notable public reputation.
- Capture methods selection is related to location of the source population and access to animals and holding and transport (including potential need for pens near the capture site) are also considerations.

Age ratios

Alternatives considered: Young of the year; yearlings (one year old); dispersing age (two years and older); mature animals; and a mix of young and mature animals.

Summary of TWG feedback: All alternatives except for young of the year have technical merit, with no preference among the remaining alternatives.

Rationale/discussion:

- There may be some value of mature over younger individuals, as long as a wolf is not senescent.
- Young and mature wolves have little difference in dispersal patterns or predation behaviors: these features are more dependent on the individual wolf than on the age of the wolf.
- Having sexually mature wolves would be sufficient; and selection for age in capture methods may be limited.
- Yearlings and breeding age animals are most likely to be the most encountered animals in capture events. These animals are likely to be successful in Colorado.

Color ratios

Alternatives considered: Gray; black; mix; does not matter.

Summary of TWG feedback: All alternatives have technical merit. Selection by color generally does not matter and in general the color mix is dependent on what wolves are captured ('you get what you get'); use of a mix of colors was preferred slightly over a single color.

Rationale/discussion:

- A heterozygous black wolf has been found to be slightly resistant to disease, as opposed to homozygous black or grey. This difference is very minor, but given that research, having more heterozygous black wolves could lend a survival advantage: yet this would not be possible to determine during capture.
- Black wolves also look more dissimilar to coyotes, are more visible, and thus may reduce illegal take resulting from wolves being mistaken for coyotes; on the other hand, if more easily identified, this could more easily facilitate illegal poaching.
- Gray wolves can have black pups and vice versa; some research in Yellowstone suggests gray and black wolves seek each other out when forming new packs more than wolves of the same color as it may provide some evolutionary benefit.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

Sex ratios

Alternatives considered: Female skewed; male skewed; or 50:50.

Summary of TWG feedback: All alternatives have technical merit; the preferred option is a 50:50 sex ratio mix; followed by preference for a female skewed initial population; and least preference for a male skewed initial population.

Rationale/discussion:

- A goal of a 50:50 mix can help to avoid unnecessary releasing when capturing donors, based on the probability of male/female capture.
- Female skewed sex ratios may improve denning success.
- Helicopter darting and net gunning may slightly enhance the ability for selectivity. However, this will be dependent on where donor wolves come from (more open vs. heavily timbered locations).
- Males disperse more whereas females have higher reproductive success and have higher success of joining existing packs; however, the latter is not relevant when there are no preexisting packs.
- Because wolves are monogamous, skewing the sex ratio is not likely to help with reproduction. In Oregon, multiple instances have been documented in which a new male comes into the pack and breeds with a breeding female and her 2-yr-old daughters. In this case, skewing the female ratio could increase reproduction: however, it is unclear that this would happen in a reintroduction scenario when there are not preexisting packs.
- In some cases, whatever wolf presents an opportunity should be captured regardless of what sex and age it might be because that may be the only opportunity for a capture. In many cases, the specifics are determined when wolves are in hand.

Genetic considerations

Alternatives considered: Related pack members; unrelated, dispersing age animals; mix of packs and unrelated individuals.

Summary of TWG feedback: All alternatives have technical merit, with highest preference for unrelated, dispersing age animals; followed by preference for a mix of packs and unrelated individuals; and least preference for selecting only related pack members.

Rationale/discussion:

- Sourcing and capture of whole packs would be more laborious, costly, and constrain sourcing. Under the conditions of a hard release, the pack is more likely to split than stay together, providing support to not intentionally pursue an entire pack.
- As more members of a pack are removed, the pack can become destabilized at the source location, potentially leading to unintended consequences at the source. It was noted that a similar outcome was observed when members of the depredating pack were relocated to

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

minimize conflict. However, destabilization vs. resilience of the pack at the source site may be specific to the age class removed. The removal of breeding females is most likely to destabilize the source pack, followed by breeding males; juveniles through two year-olds that are removed from the pack appear to have less repercussions on the stability of the source pack.

- If a hard release is used, there is limited impact/benefit of selecting related vs. unrelated animals on the dispersal patterns of released animals.
- There are some concerns that reproductive potential will be low for genetically related animals in localized release locations. However, a recent study in the Northern Rockies and Pacific Northwest that is near conclusion found that while there is some genetic structuring around the edge of the distribution (as expected of any species' population), there is a lot of genetic diversity and mixing across the whole region. Wolves have evolved mechanisms to minimize the effects of inbreeding, so inbreeding is likely to be a non-issue even if related wolves are released close to one another in space and time.

Animal reputation

Alternatives considered: Not known to be a depredator; known depredator; wolves that have been around livestock without conflict; wolves that have not been present around livestock at all

Summary of TWG feedback: The alternatives “not known to be a depredator,” “wolves that have been around livestock without conflict,” and “wolves that have not been present around livestock at all” were all determined to have technical merit as factors for sourcing donors; “known depredator” has technical merit as a criterion for exclusion from sourcing. Sourcing donor populations not known to be depredators (whether present around livestock or not) was preferential to sourcing populations not exposed to livestock, if possible. However, it is important to consider that most wolves overlap areas with livestock, and there is not a way to know the degree of interaction they have had with humans. No wolf should be translocated that has a known history of chronic depredation, and sourcing from geographic areas with chronic depredation events should not occur.

Rationale/discussion:

- There is nuance in determining depredation habits, with consideration of trends in the behavior of an individual and a pack. If a wolf is depredating livestock, the pack it belongs to is likely to depredate as well; additionally, if a pack is depredating, it is difficult to exclude one individual as non-depredating (see the Beartrap Pack's records of bison depredation). A known wolf or pack of wolves that have been identified as chronic depredators by the source location should not be used for translocation to Colorado.
- If a pack has had infrequent depredation events, as opposed to a chronic and well-known tendency to depredate, this should not, from a technical perspective, necessarily exclude consideration of a wolf or pack as a potential donor. However, from a social perspective, striving to use wolves with no known history of depredation is recommended. The history of a wolf's exposure to livestock populations is a consideration for potential for depredation. Sourcing from a pack that has not been exposed to livestock or a significant livestock grazing presence could be preferable: such packs exist in the central or northern Idaho wilderness, areas which have low grazing presence and scarce livestock, respectively. However, it might be more limiting than

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

beneficial to constrain potential source populations to areas that are not suitable for livestock. Sourcing from populations which have been exposed to livestock, such as many populations in Montana and Idaho, but do not have a history of depredation, could also be preferable.

- Because depredation is situational, even wolves that are not known to be depredators have the potential for depredation. Situational factors could include public lands grazing and the vulnerability of livestock. Overall, it is difficult to predict depredation behavior.
- A study of wolf-livestock depredation in Montana found that depredation tends to recur in the same places, and the majority of livestock depredations are concentrated in those places. Places with recurrent livestock depredations tend to be places with higher livestock density, higher wolf density, and with intermediate proportions of public land (e.g., about half public land juxtaposed right next to private land that is about half of the area as well). There is at least a possibility that depredations are characteristics of the landscape rather than the wolves that are there (i.e., any wolf that lives there may eventually become involved in livestock depredations). While these areas can be avoided as sources for donor populations, depredation as a function of landscape characteristics suggests that it may be less likely to identify wolf packs that are more or less likely to depredate. Areas known to have chronic depredation should be avoided as a source of donor populations.

Disease issues at source sites

Alternatives considered: Prioritize areas for wolf capture as being those without disease.

Summary of TWG feedback: The alternative “sourcing from areas without disease issues” was determined not to have technical merit.

Rationale/discussion:

- Sourcing populations from areas without disease issues is not technically feasible. All wolves have some pathogens and parasites, such as endo- and ectoparasites, Echinococcus, or canine distemper/parvovirus: this is consistent throughout all populations. A determination of which diseases are parameters for exclusion should consider the diseases that already exist in Colorado; for example, any disease coming out of Montana is likely to already be present in Colorado. Overly broad criteria for exclusion due to pathogens or parasites will significantly limit potential source populations. Be deliberate in selecting populations without known issues and manage public reactions to sourcing diseased wolves via treatment during transport and through education on disease in the wild.

What to do with injured animals at source site

Alternatives considered: Release at source site; treat and release at source site; treat and release in Colorado; consider euthanasia.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

Summary of TWG feedback: All alternatives have technical merit. Utilize capture methods to minimize injury and avoid major injuries altogether. No alternative was most preferred; however, “treat and release at source site” was least preferred.

Rationale/discussion:

- In general, it is critical to select the most appropriate capture method, have standard protocols around capture and treatment (e.g., reference manuals from Yellowstone), and follow veterinary advice for appropriate treatment. This will also help assuage public concern or fear regarding injured wolves.
- The alternative selected depends on the severity of the injury. Injury will likely occur during capture; capture method largely determines frequency and severity of injuries (*see above*). Treatment for the minor injuries incurred during darting and net gunning is feasible and easy. Also consider the importance of maintaining capture and treatment methods that would not competitively disadvantage source individuals, and potentially make source populations more likely to prey on livestock.
- Minor injuries are injuries that could be addressed in a single treatment and do not require extended care. Provided there are no significant concerns, plan to translocate animals with minor injuries. Consider a more extensive rubric of conditions that might prevent translocation (e.g., multiple missing digits, multiple missing canine teeth, advanced age/unhealthy, etc.).
- Major injuries should be assessed and treated under veterinary guidance; do not translocate animals with major injuries. Major injuries would be those that would require repeated treatment, extended holding, or cannot be treated and require euthanasia. Portable radiography may be beneficial to have available in making assessments of injuries.
- Alternatives to treatment, such as euthanasia, for injured wolves at the source site not deemed viable to be used as a donor individual should consider veterinary input and local ordinances and protocols from source states. Euthanizing drugs lead to bioaccumulation and should not be used unless the carcass is retrieved. In cases of euthanasia, remove heads to prevent skull collection.
- Long-term care options should also be considered.
- If an animal is not healthy enough to be released into Colorado, it is up to the source site managers to decide whether it is healthy enough to be released back into the source population. Make sure that wildlife veterinarians from the donor jurisdiction and CPW are involved in capture plans and part of the capture team, so they can make real-time decisions about injury treatment and euthanasia. Defer to CPW and source site veterinarians as appropriate.

Transportation method from source to Colorado

Alternatives considered: Air; ground; mix.

Summary of TWG feedback: All alternatives have technical merit, with no group preference among the alternatives; each has situational relevance according to the plan of capture and translocation. Key to success is that capture, transport, and release should occur as quickly as possible to minimize time in captivity and stress on the animals.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Rationale/discussion:

- There is a trade-off between the cost and time of each alternative and options are situationally dependent on the location (e.g., need for over-snow vehicles).
- Volunteer aircraft may help to reduce costs.
- Keeping options open enhances the latitude and flexibility of decision making in the translocation process, especially in the case of inclement weather and unexpected conditions.
- For air transport, consider holding pens near the capture location, transport to the airport in trucks via large crates, use of a cargo-type aircraft that can hold multiple crates for quick transport to Colorado, and transport from airport to release location via vehicle, helicopter or any other transport method.
- Consider the most appropriate handling crates for holding and transport, including consideration that crates provide protection such that wolves cannot chew them. TWG members can provide further details, experiences, and design recommendations from past reintroductions.

Animal handling considerations

What to feed during a period of captivity

Alternatives considered: Roadkill; carnivore logs; minimizing captivity time and feeding needs; ice/snow/free water.

Summary of TWG feedback: All alternatives have technical merits, with various practicalities to consider. Regarding food source, minimizing captivity time and feeding needs is preferable, followed by carnivore logs (typically, conditioned horsemeat) and roadkill. Ice/snow/free water are all recommended.

Rationale/discussion:

- Slight preference for carnivore logs over roadkill is due to the additional logistic details to consider with sourcing roadkill, such as availability, concerns that roadkill could have been poisoned, and prions and other diseases that exist in roadkill, all of which would need to be coordinated with the Colorado (and source state) wildlife health program. Carnivore logs would help guarantee the standards of having available food at a rate of ten pounds per animal per day of captivity.
- Stress in a condition of captivity prevents some wolves from feeding. Feeding approach depends on release method: The goal of a hard-release translocation should be to reduce the amount of time in captivity, and thus reduce the feeding needs. There are no data to suggest that a well-fed, hard released reintroduced animal would have more of a proclivity to stay close to their release site than a hard released animal that was held in captivity for a minimal time and not fed. Roadkill elk and deer would be preferred in holding pens at release sites if soft release is the preferred method, but if capture and transport occurs rather quickly, food is not likely to be needed.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

- Technical feedback on topics regarding social perceptions:
 - Providing food may be important for some stakeholders from a public perception standpoint. While feeding may not be biologically important during capture and transport, this may depend on the length of holding and transport. It is still recommended to make food available should it be needed, should delays or other contingencies arise.
 - There could be a social concern that use of carnivore logs would lead to a public perception of training reintroduced wolves to eat cattle. The technical reality is that carnivore logs will not create depredation tendencies. Wolves do not learn to prey on livestock by eating dead livestock; feeding of carnivore logs does not precondition for or against livestock predation.

Where and how to hold animals prior to shipping and upon initial arrival in Colorado

Alternatives considered: Bare bones holding facility to be used for as short a time as possible.

Summary of TWG feedback: Bare bones facility for as short a time as possible is preferred.

Rationale/discussion:

- This topic refers specifically to where and how animals are held, as needed, in their state of capture as well as upon immediate arrival in Colorado. This topic does not refer to whether wolves are hard released or moved to a soft release site after initial arrival (see 'Reintroduction Technique,' below).
- Minimize the period of captivity in a hard-release condition. Past experiences included public scrutiny of the period of captivity; however, gray wolves are resilient and durable.
- Flexibility is key when approaching this issue.
- As noted in capture considerations, holding pens near capture may be needed, in part because not all animals may be captured on the same day.
- Preparations and contingency plans should also be made for holding pens, as needed due to weather or other reasons, in Colorado.

Immobilization drugs to be used

Alternatives considered: Telazol, tranquilizer use during transport

TWG feedback: Telazol is preferred as an immobilization drug for capture; tranquilizer use during transport has technical merit but is not preferred and should be avoided. Travel and holding time should be minimized and use of tranquilizers and immobilization drugs during transport should be minimized as much as possible.

Rationale/discussion:

- Telazol is a standard immobilization drug used in previous processes and is the safest given its streamlined application.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- Tranquilizers for muscle relaxation (not sedation) should be avoided: if needed they should be used under the direction of a veterinarian. Use of multiple drug regimens have previously resulted in seizures and post-release mortalities, and there was advocacy to simplify the drugs used.
- Wolves can be successfully held in a shipping container without tranquilizers from twenty-four to thirty-six hours from capture to release; simplicity is key.
- Defer to CPW and other veterinarians as appropriate. Maintain flexibility to tailor drug protocols to the specific situation.
- As discussed above, consider the most appropriate handling crates for holding and transport, including consideration that crates provide protection such that wolves that are not tranquilized or immobilized cannot chew their crates.

Collars/marks on animals initially reintroduced into the state

Alternatives considered: VHF; GPS; mix of VHF/GPS; no collar; PIT tags; ear tags (perhaps temporarily when in captivity)

Summary of TWG feedback: All alternatives have technical merit, *except* the alternative “no collar” for animals initially reintroduced into the state. It is preferred that every released wolf has a GPS collar, with variability in durability of GPS collar types as an important consideration. Ear tags are less preferred as compared to the other collaring/marking alternatives.

Rationale/discussion:

- There is value in collaring every wolf reintroduced for monitoring and data collection purposes and to learn from and improve upon for future releases; however, it is important to educate the public and set expectations that not every wolf in Colorado will be collared as the population grows. It is also important to understand that collars tell us where wolves have been but not where they are present. Collaring can also help to catch poachers.
- For any collar used, ensure that the frequency used accounts for the potential for interference due to environment/terrain or other collared wildlife and/or domestic dogs that share the same frequency. Coordination with other states on frequencies will also help for tracking dispersers into other states. Use of similar frequencies as neighboring states for wolf collaring is recommended.
- Satellite-linked GPS collars can provide the best remote data but are more breakable/less durable than VHF collars. There are tradeoffs in which GPS collars are selected based on durability vs. frequency of monitoring; survey collars are more durable, but research-type collars will provide more data points. Experiences in other states suggest that some brands may be more reliable, albeit more expensive.
- VHF radio telemetry is more durable. However, any radio collar can have problems at any point in time, and VHF frequencies -- as with other collars -- can be problematic, especially for dispersers; given how much wolves move and how hard the signals can be to find (especially in mountainous environments), some VHF collared wolves may be lost.
- VHF also forces biologists to be in the field and helps increase understanding of how wolves interact with the landscape. This is seen as beneficial. When comparing the two, there is value in the authenticity of monitoring and reporting to the public through use of VHF and the auxiliary

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

data collected while in the field, in comparison to the remote data collection via GPS collar. However, costs of in field monitoring using VHF may not justify the cost compared to GPS. Be certain that proper FCC licensing has been completed.

- Consider use of GPS to start followed by later use of VHF as wolves begin to form packs; a combination of VHF and GPS could also be considered upon release: however, this is less preferred. When sourcing radios, use stout collars to mitigate damage from chewing.
- Colored collars could discourage illegal harvest by distinguishing wolves from coyotes: however, it could alternatively enable illegal harvest by making wolves more recognizable. Colored collars can be helpful in the event of a report or a photo of a wolf with a failed collar.
- Pit tags are preferred over ear tags due to robustness of monitoring and ear infections. However, DNA studies on captive wolves may obviate use of pit tags, and it may be somewhat expensive to pit tag every wolf. This should not be a requirement but can be employed when feasible. There are no perfect marking identifiers, with tradeoffs to each; selection of tool will be dependent on the goals and objectives of the monitoring program.
- There is no justification for not placing a collar on an animal that is handled for the reintroduction. All animals released should have a collar. Too much money and resources will have been invested in each translocated animal and monitoring the success of reintroduced animals is fundamental to the program.
- Recommendations regarding use of collars for monitoring after initial release will be discussed separately by the TWG in the future.

Samples collected from animals

Alternatives considered: Blood (red and purple tops); tissue; hair; photographs; fecal, other

Summary of TWG feedback: All alternatives have technical merit.

Rationale/discussion:

- Hair is not the best available sampling technique for genetics, especially for long term storage. Consider a simple cheek swab, whether ear tags are used; an ear punch can be collected as well (using a baby cryovial with desiccant).
- Weight, size, and basic physiological characteristics should be collected: these statistics help to address public questions and misconceptions on reintroduced wolves.
- Preexisting anomalies on wolves should be documented to record that the capture team did not negatively impact the wolf.
- Ectoparasites (if present) should also be collected.
- Whisker samples could be taken for stable isotope diet analysis.
- Consider collecting a minimum of 2 sample types from each animal in hand (2 genetic samples, 2 red top blood tubes, 2 EDTA blood tubes, multiple fecal samples, etc.) More would enable banking them in different locations.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

Veterinarian care in captivity

Alternatives considered: Defer to handling protocols

Summary of TWG feedback: As also discussed above, it is important to have standard protocols and for experienced veterinarians to be involved when wolves are in captivity to assist with: animal health monitoring, emergency care if necessary, sample collection, administration of vaccinations, etc. Biologists that have experience handling wolves and/or other wildlife will also be on hand to fit wolves with collar, ear tags, and/or PIT tags, and conduct basic monitoring, etc.

Disease testing and vaccine treatment

Alternatives considered: Test and treat everything possible

Summary of TWG feedback: Donor populations will have diseases and naturally migrating wolves will bring them. For captured wolves, the general recommendation is to test and treat everything possible, as this will help establish healthy populations; this will also help to foster social acceptance of reintroduction protocols.

Rationale/discussion:

- See above discussion of disease.
- *Echinococcus granulosus* (tapeworm) has been of concern at times for stakeholders in Montana.
- Some treatments may require multiple treatments for efficacy.
- Defer to veterinary expertise when devising disease treatment plans.

Reintroduction considerations

Reintroduction technique

Alternatives considered: Hard release, soft release, combination

Summary of TWG feedback: All alternatives have technical merit, with hard release preferred to soft release and to a combination of soft and hard release. There are pros and cons to consider for both techniques; however, hard release has greater technical merit as well as greater logistical and economic feasibility and is thus recommended by the TWG as the preferred technique.

Rationale/discussion:

- The key distinction between soft and hard release is related to acclimation. A hard release would entail capturing wolves and immediately translocating and releasing them to a site in Colorado, whereas a soft release would entail a period of conditioning wolves to their surroundings in Colorado before they were released into the wild.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- In experiences with soft releases in Yellowstone National Park (YNP) and hard releases in central Idaho, both techniques worked. However, the hard release in Idaho was more successful in terms of both survival and population growth. Thus, the perspective of technical outcomes, hard release is preferred, and the logistical feasibility and associated economic burden of a soft release should deprioritize consideration of this technique for Colorado.
- Hard releases are quicker and cheaper, but their use may also lengthen the time for individual wolves to locate one another and pair up to produce offspring. Wolves may be more likely to travel further from the release location.
- In a hard release, there is some experience in transporting anesthetized wolves to a temporary pen; however, biologists did not observe much difference in the outcome than in a normal hard release.
- A soft release may be more likely to limit dispersal, with packs more likely to stay together and may be less likely to disperse and interact with livestock, decreasing conflict potential in the short term. However, while documented in the NRM releases, these benefits should not be overstated because wolves that are soft-released will still have post-release movement, as exhibited within the first five years following the soft release in Yellowstone. There is also variability of movement among individual wolves.
- A soft release could be considered should specific areas be identified that are highly suitable for wolves where there is a desire to keep wolves localized closer to the release areas. A soft release strategy should also consider suitable habitat for where wolves will overwinter; pens may need to be located at or near overwinter habitat. Soft release could be considered particularly if there is concern that a lack of distribution of suitable habitat would limit the success of and/or increase conflict with wolves that disperse following a hard release. However, social-ecological suitability mapping data does not provide clarity that there is such a preferred soft release acclimation site for Colorado.
 - TWG members further noted that, while not a technical issue, using soft release to attempt to address social concerns about post-release movement could create other social concerns if specific communities are perceived as being targeted for having wolves in their areas.
- A mating pair may remain together in a soft release strategy to raise a litter after being released, even if auxiliary members split. The soft release strategy with a related pack may build social structure, foster greater reproductive potential, and attenuate dispersal, but at a significantly greater financial and logistic cost. In the Yellowstone soft release, penned animals were unrelated and matched via sex and age. Wolves are likely to disperse regardless of pack dynamics; individual reputation would be a greater factor in conflict.
- The soft release in YNP included significant resources, including building structures, patrolling and staffing pens 24/7 while wolves were in the pens (for 10 weeks), and feeding wolves. Existing infrastructure at Yellowstone enabled the construction and tending of pens, which was not the case during the reintroduction effort in central Idaho.
- There are questions regarding the feasibility of a soft release in Colorado, including whether Colorado has the resources and manpower at its disposal to execute a soft release. The release technique may largely be determined by logistics considerations (including whether there are suitable sites for soft release) and funding.

**Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics**

- Soft release in YNP also resulted in behaviors by wolves reflective of frustration with captivity. Quick capture, moving, and release is preferred.
- There is not a correlation between the method of capture and the method of release. Also, experience in trapping wolves to relocate them away from livestock indicates that capture practice had little to no effect on their dispersal patterns.

Time of year

Alternatives considered: Winter; spring; summer; fall

Summary of TWG feedback: Of the alternatives considered, spring and summer do not have technical merit; winter and fall both have technical merit; and winter is preferred over fall.

Rationale/discussion:

- Summer and spring do not have merit because of the undue heat stress the seasons place on reintroduced individuals.
- Fall presents risks of hunting season in the context of the vulnerabilities of recently reintroduced wolves.
- Winter (November through March) is preferred due to colder temperatures; snow cover to enable tracking; proximity to the first breeding season; proximity to annual peak ungulate prey vulnerability; and greater ease of protecting livestock during winter.

Considerations for where wolves could be released

Alternatives considered: Land ownership; livestock presence; geographic context; prey base; likelihood of supporting multiple packs; proximity to state border; vote results; seasonal elk supply.

Summary of TWG feedback: All alternatives have technical merit; vote results have least preference as a technical alternative to guide reintroduction location, but it is recognized that socio-political considerations will also be at play in selection of release area(s).

Rationale/discussion:

- A release area is any contiguous space where it is suitable for wolves to be released, whether via a single discrete release site or at multiple discrete release sites within the area. A release site can be used multiple times. A site where a wolf is released is not expected to be necessarily where the wolf will stay. See further discussion below.
- The highest quality habitat is generally large, contiguous areas of public lands with a high abundance of prey and low livestock densities. Consider where most big game are located during the time when releases occur and where livestock are or will be in relation to big game during other seasons. Regardless of where wolves are released, habitat selection may differ greatly compared to habitat models.
- Release sites do not necessarily have to be federal lands. Consideration of overall landscape context should inform the selection of release areas/sites.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- Dispersal and homing tendencies of reintroduced wolves may or may not affect donor population selection. The proximity of Wyoming to Colorado may lead to a higher potential of wolves returning across state lines after being reintroduced. Dispersal studies reflect an average dispersal from the release site being sixty to seventy miles but could vary significantly by individual. Some TWG members suggested there is a northerly homing tendency; others suggested wolves disperse in a starburst pattern, with no particular cardinal orientation.
- Post-release dispersal is not comparable to natural dispersal; the average duration of dispersal is five and a half months after release. Seasonal dispersal and seasonal migration patterns of prey species such as wild ungulates will also affect dispersal of wolves.
- It is important to consider the proximity of the release area to a state border. Release at least seventy-five miles from a state border should be considered. This buffer should also be considered for the borders of sovereign Tribal nations in Colorado, in consultation with these Tribes; so that wolves do not immediately disperse to neighboring states/Tribal lands.
- Especially under the conditions of a hard release, not much attention needs to be paid to territoriality. Consider release sites that can support several packs to create a small population that supports reproduction and the sustainability of the reintroduced wolf population. Avoid creating widely dispersed, isolated packs to improve connectivity. Clusters of packs will help to avoid poor survival and recolonization trends.
- Interactions with human populations should be considered, and large populated areas should be criteria for exclusion of release sites and areas. A flexible pace outlined below can also help to address issues as they arise.
- Wolves can succeed anywhere with adequate habitat where there is social acceptance; consider findings from an in press (as of 8/2021) landscape analysis to inform the social and human considerations for release sites and areas. Due to dispersal, where wolves settle may be far away from the release location; consider social and topographic factors where wolves might pass through during dispersal when selecting release sites and areas.

Number of release sites (and number of release areas)

Alternatives considered: Flexibility in specific release sites for an area with multiple release points; multiple release areas; and one release area

Summary of TWG feedback: All alternatives were determined to have technical merit. The alternative to have flexibility in specific release sites for an area with multiple release points is most preferred.

Rationale/discussion:

- Consider the number of release areas *vis a vis* the number of wolves reintroduced. It is likely that not many release areas will be needed in Colorado to ensure wolf population growth. Flexibility between a few (e.g., one to four) release areas would be prudent, with the option to return to the same area or areas to release wolves over the course of several years. Adaptive management will allow refinement of reintroduction logistics and technique year-by-year.
- A minimal number of release sites, such as a one or two logging roads, could serve to meet the goals of reintroduction in a short period of time with minimal logistical complications.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- Use of a higher number of areas and release of wolves in largely geographic dissimilar and dispersed locations complicates the likelihood that wolves will encounter one another and begin breeding. It is therefore not desirable to have too many geographically diverse release areas.
 - If wolf population growth proceeds in Colorado like it did in the NRM following those reintroductions, most of Colorado would be occupied by wolves within about ten years. Reducing the social or geographic burden on specific release sites by distributing these areas is only a consideration for a few years before wolves spread out on their own.
 - If the wolf population in Colorado does not grow following the translocation as fast as occurred in the NRM, there would be an opportunity to establish additional release areas or sites as appropriate to meet recovery goals.
- Alternatively, all wolves could be released in one area, at multiple sites to provide for security and flexibility.
- Lessons from other states include:
 - When combined with natural recolonization into northwestern Montana (as is currently occurring in northwestern Colorado) beginning in the 1980s, two release areas were used in the northern Rockies in the mid-1990s. Within ten years of those releases, much of the suitable habitat in Idaho, Montana, and Wyoming was occupied, and within twenty years wolf populations had become established in Washington, Oregon, and California, all based on these two release areas.
 - To better understand the terminology used, Yellowstone National Park is a large release area with multiple (six) release sites.
 - The human population density of Colorado should play a role in informing the number of release areas and sites.

Pace of wolf reintroduction

Alternatives considered: About thirty to forty- wolves reintroduced for one year (Fast); about ten to fifteen wolves reintroduced per year for two to three years (Medium); about five to ten wolves reintroduced per year for three to six years (Slow), be flexible (*Note:* numbers are not concrete, and are meant to suggest relative pace)

Summary of TWG feedback: All alternatives were determined to have technical merit. The overall goal is ultimately to establish a self-sustaining population. The goal of the initial translocation and restoration is to introduce enough wolves at an adequate pace to establish a growing population that can ultimately achieve a self-sustaining population. Without specifying what that might look like from a numerical perspective and/or other indicators, there are a variety of ways (i.e., paces) that could work to achieve a growing population. The general technical preference is for a “medium” pace, followed by a “slow” pace, and, least favorably, a “fast” pace. It is important to be flexible and adapt the specific logistics of these paces according to conditions of the reintroduction. It is also important to be adaptive around specific dates and numbers. *Note:* Discussion of this topic focused specifically on the number of wolves actively reintroduced, not long-term population goals or management thresholds. The latter will be addressed at a future meeting(s).

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

Rationale/discussion:

- A medium pace is an appropriate balance between the need to reach critical mass and a maintain a feasible pace to reach critical mass. It is important to employ adaptive management strategies and robust monitoring to maintain the flexibility of reintroduction efforts, to be nimble to adapt to the constraints around capture, and to monitor the success of release. Public support may also be garnered by approaching reintroductions with a moderate and flexible pace.
- Rationale against a slow pace of reintroduction is that the population may not reach critical mass to achieve a growing population under this pace. The vulnerability of recently reintroduced wolves to illegal human-caused mortality may be an additional impediment to reaching critical mass. Colorado has smaller tracts of public land compared to Yellowstone and the NRM region, which may enhance susceptibility to illegal mortality. A slow pace has a higher likelihood of program failure than does a medium pace.
- A fast pace may not be logistically feasible (see capture considerations above) and the complicated logistics associated with a fast pace may also lead the program to a premature failure.
- Much of the discussion around pacing revisited topics of capture methods (see above) as well as considerations for release areas and sites. Coordination of capture efforts with release sites is important; the pace of release may be constrained by efficiency of capture.

When to stop and/or pause reintroduction

Alternatives considered: After about forty animals have been moved; indication of pack establishment; indication of pack establishment with some documented reproduction; two packs raising two pups for two consecutive years; flexible approach: i.e., do releases (e.g., of thirty to forty wolves) and then pause to see what happens

Summary of TWG feedback: All alternatives have technical merit. The preferred option is to do ‘a bunch’ (undetermined number) of releases (e.g., release a total of approximately thirty to forty wolves), then pause, assess, and adapt based on whether the initial restoration phase has resulted in an adequately growing population that will ultimately achieve a self-sustaining population. *Note:* This discussion is focused specifically on when to pause active reintroduction, not on long-term population goals, definitions for self-sustaining populations and long-term success, or management thresholds. These latter topics will be addressed at a future meeting(s).

Rationale/discussion:

- Adaptive management is important: generally, it is recommended to release some number for two to three years, pause, and then monitor and model population growth to determine trajectory toward a self-sustaining population, and adaptively manage based on that model.
- The parameter of ‘when to stop reintroduction’ is not the same as the definition of a ‘self-sustaining population,’ but is rather a benchmark toward achieving that goal.
- It is important to predict and monitor a rate of growth and conduct analysis between rate of growth and the overall status of the population.

Colorado Wolf Restoration and Management Plan
Technical Working Group (TWG)
to Colorado Parks and Wildlife (CPW)
November 2021
Final Report on Restoration Logistics

- Experiences in other states can inform the approach; however, adaptive management and flexibility to learn and respond to what happens in Colorado is key.
- TWG members have a variety of perspectives on topics related to ‘when to stop reintroduction.’ In addition to the general feedback of the group (above), additional *individual perspectives are provided below*:
 - There was discussion around the definition of a pack; some define it as at least a pair of wolves; others define it as a pair of reproducing wolves with a litter. In the Northern Rockies, a breeding pair was defined in the recovery plan as a pair that recruited at least two pups through the end of the year.
 - There is no reason to pause before thirty to forty wolves are released over the course of twelve to eighteen months: data are adequate to support the pause with a more minimal approach.
 - Recognize that a pause in reintroduction might lead to a stop, given a monitoring program to track population growth after two to three years.
 - A pause should occur when the reintroduction target of approximately thirty to forty wolves (released at a ‘medium pace’ of approximately two to three years as described above) is achieved to assess whether the population is growing at an adequate rate toward a self-sustaining population and if wolf-livestock conflicts can be managed successfully in the areas where wolves become established. In general, some ambiguity is needed to allow for the flexibility required by adaptive management; objectives should not be overly restrictive to prevent adaptation to experiences and/or conflicts during the reintroduction phase. Arbitrary numbers for defining the number of wolves to be reintroduced or when to pause reintroduction should be avoided as they could be limiting or create problems for adaptive management later.
 - Each reintroduction effort’s population growth is different; it is possible that the Northern Rockies is the best model to follow to determine models for Colorado’s population growth. In Oregon, from a population of fourteen wolves, the population doubled every two years for the first five years. Mexican gray wolves were released from captive stock and repopulation dynamics were considerably different than in the Northern Rockies and are still releasing twenty years after initial reintroduction.

**Colorado Wolf Restoration and Management Plan
 Technical Working Group (TWG)
 to Colorado Parks and Wildlife (CPW)
 November 2021
 Final Report on Restoration Logistics**

Appendix A: Technical Working Group members

Scott Becker	U.S. Fish and Wildlife Service, Regional Wolf Coordinator
Alan Bittner	Bureau of Land Management, Deputy State Director
Stewart Breck	National Wildlife Research Center U.S. Department of Agriculture, Research Wildlife Biologist
Roblyn Brown	Oregon Department of Fish and Wildlife, Wolf Program Coordinator
Wayne East	Colorado Department of Agriculture, Agricultural/Wildlife Liaison
Justin Gude	Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief
Jonathan Houck	Gunnison County Commissioner
Mike Jimenez	U.S. Fish and Wildlife Service, Retired
Merrit Linke	Grand County Commissioner
Steve Lohr	U.S. Forest Service, Rocky Mountain Region Renewable Resources Director
Carter Niemeyer	U.S. Fish and Wildlife Service, Retired
Martin Lowney	U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, State Director
Eric Odell	Colorado Parks and Wildlife, Species Conservation Program Manager
Mike Phillips	Rocky Mountain Wolf Project, Founder/Turner Endangered Species Fund, Executive Director
John Sanderson	Colorado State University Center for Collaborative Conservation, Director
Doug Smith	National Park Service, Yellowstone National Park, Senior Wildlife Biologist
Robin Young	Colorado State University Extension Service, Archuleta County Extension, Director, Natural Resources and Agricultural Agent

Technical Working Group report developed with third party facilitation from Keystone Policy Center.

Appendix F: Final Report on Technical Considerations on Compensation for Wolf Damage to Livestock

Colorado Wolf Restoration and Management Plan Technical Working Group (TWG) to Colorado Parks and Wildlife (CPW)

Final Summary of Technical Considerations on Compensation for Wolf Damage to Livestock February 2022

Background & Purpose

The document summarizes the Wolf Restoration and Management Plan Technical Working Group (TWG) discussions regarding technical considerations of potential components of a livestock damage compensation plan. ‘Technical considerations’ in this context include perspectives on biological relevance, ability to quantify and/or measure, impact on technical outcomes, feasibility for managers, and experiences with and/or in implementing programs in other states. This document is intended to help provide background to inform discussions regarding a Colorado compensation plan for wolf damage to livestock.

This document is not a comprehensive set of recommendations on a complete compensation plan. The TWG recognizes that there are various social considerations for livestock compensation that the Stakeholder Advisory Group (SAG) has discussed, and that the SAG was charged with leading the development of comprehensive recommendations regarding the compensation plan.

Contents

Eligible Damages: Technical considerations for confirmed depredation; probable depredation; missing livestock (including compensation ratio/multiplier, minimum acreage requirements, and public and private land considerations); indirect loss; pay for presence	2
Administration and Funding: Damage investigations; funding sources; administration	6
CPW’s current game damage program: Technical considerations for using the current program for other predator damage in compensating for wolf damages to livestock	8
Non-lethal conflict risk reduction: Feedback on non-lethal practices and programs; feedback on considerations for requiring non-lethal practices for compensation. <i>This report is specific to conflict risk reduction as related to compensation; it does not address, more broadly, the development of a non-lethal conflict risk reduction program, nor does it address lethal management of conflict wolves.</i>	9
Appendix A: About the Technical Working Group	11

Eligible Damages

Confirmed depredation

Background: To confirm a depredation, CPW uses a "Preponderance of Evidence" standard; documentation by the claimant necessary to support a claim for damage can include "tangible evidence" such as photographs, scat, tracks, attack and feeding characteristics, puncture wound spacing, hemorrhaging, etc.

Summary of TWG feedback: Compensation for confirmed depredations at fair market value has technical merit.

Discussion and rationale

- TWG members emphasized the importance of timely and skilled investigation to confirm a depredation. They noted that the presence of scat and tracks alone are not technically sufficient to confirm a depredation. Because wolves are also scavengers, their presence at a carcass is not enough to confirm that they killed the livestock.
- TWG discussed that probable losses, missing livestock, and/or indirect costs associated with confirmed wolf depredations could provide technical merit for compensating more than 100% for the confirmed loss. Discussion of these topics, including discussion of multipliers and compensations ratios, is detailed below.

Probable depredation

Background: CPW currently does not have a definition for 'probable loss,' and rather uses a preponderance of evidence standard. Different states apply different definitions of 'probable' loss. An example definition for "probable" loss based on USDA APHIS/Wildlife Services includes the presence of some evidence to suggest possible predation but a lack of sufficient evidence to clearly confirm predation by a particular species. A kill may be classified as probable depending on factors including but not limited to recent confirmed predation by the suspected depredating species in the same or a nearby area, recent observation of the livestock by the owner or the owner's employees, and telemetry monitoring data, sightings, howling, or fresh tracks suggesting that the suspected depredating species may have been in the area when the depredation occurred.

Summary of TWG feedback: Compensation for probable depredation has technical merit. A range of compensation amounts (50-100% of fair market value) were suggested as having technical merit, however lesser amounts (i.e., less than 50%) were not suggested.

Discussion and rationale

- Criteria of probable depredation
 - Clear definition of probable depredation is important for managers in administration of the program and for producers in understanding the program.
 - U.S. Department of Agriculture Animal Plant Health Inspection Service – Wildlife Services (USDA APHIS-WS)'s definition of probable losses has been adapted by the states that have adopted probable depredation compensation models. Consultation with other states regarding their experience around probable losses is advised.

- In some states, the incidence of compensation for probable losses was initially high but has waned over time, due to the increased knowledge and experience of investigators over time. With this experience, there is likely to be a decrease in the number of incidents classified as probable losses, and thus a decrease in compensation paid for probable losses.
- It is important to define whether/what secondary management actions are triggered by a 'probable depredation' designation, as well as whether a 'probable depredation' can trigger a multiplier or compensation ratio (see below).
- Compensation amount
 - Compensation at 50-75% of fair market value were suggested to be economically feasible and adequate for probable depredation. Higher amounts (i.e., 100% of fair market value) were also seen by many as having technical merit as well as potential social merit in increasing social tolerance.
 - Different payment amounts for confirmed vs. probable depredations could complicate use of a multiplier if both kinds of losses trigger a multiplier (see below).
 - Compensation for probable losses at a different rate than confirmed losses may also complicate management of the compensation program and potentially could make the claims process more onerous for producers.

Compensation ratios/Multipliers

Background: The TWG considered the potential for use of a compensation ratio or multiplier to address missing livestock and/or indirect losses. The TWG considered use of a compensation ratio on public versus private lands, the value of the compensation ratio, and minimum acreage required, if any, to be eligible for compensation ratios.

Summary of TWG feedback: Compensation ratios for both cattle and sheep on public and private lands have technical merit, but there are different perspectives and technical considerations regarding when these ratios should be triggered and how they should be administered. TWG members generally were uncertain as to what an appropriate ratio should be. Technical considerations for and against minimum acreage requirements include consideration of total leased lands, use of penning versus open range grazing, and other factors.

Discussion and rationale

- There is significant complexity in considering how to fairly apply a multiplier or compensation ratios.
- Frequency of missing livestock occurs at different rates depending on the age and type of livestock, spatial and temporal factors and differences in producer practices, such as regularity of cattle checks and detection rates.
- Compensation ratios may be more likely to be used in situations where locating depredations is more challenging and for livestock that are more vulnerable to depredation (i.e., calves and all sheep). Patterns of depredations observed in other states could be useful to constrain criteria for compensation ratios to only include certain ages or types of livestock.
- Compensation ratios could be employed with spatial considerations. However, this would be complex to implement.
- Variation in detection rate between producers, uncertainty in cause of death (such as due to another predator), and lack of well-documented trends lends to the importance of management discretion if a multiplier is to be employed.

- The use and value of a compensation ratio could also consider other factors such as implementation of conflict reduction cost-share programs or pay for presence programs.
- Compensation ratios may incentivize regularity of cattle checks but may also disincentivize conflict risk reduction solutions and improved management practices, as well as impede management of wolves similarly to other predators in Colorado.
- Minimum acreage requirements may lend managers flexibility for best management decisions, but number of missing livestock may also be a better criteria. Minimum acreage requirements are complicated by land use and ownership issues, such as livestock producers leasing multiple small acreage parcels. Further, current game damage program criteria do not distinguish between various types of operations (e.g., producer vs. hobbyist); acreage requirements may be confusing and create arbitrary distinctions for eligibility that may be inequitable.
 - For example, minimum acreage requirements could refer to the total area within which a livestock herd experiencing depredations is grazing. The idea would be to offer a compensation ratio for livestock depredations that occur in herds that are grazing a vast area, such that documenting additional depredation events would be difficult even if additional individual livestock are missing. Conversely, compensation ratios might not be applied when depredations occur in smaller pastures in more controlled settings, where detecting depredations is easier.
 - Terrain and vegetation characteristics may also be considered when determining whether and how to apply a multiplier for large tracts of lands where missing livestock are more difficult to find.
- Range cattle producers by the nature of their operations and large scale of acres being grazed will have difficulty participating in any compensation program since they infrequently become aware of depredation events that allow timely submission of documents to CPW.
 - Multipliers typically require having verified losses; it is more difficult to verify losses for cattle than for sheep and thus it will be more difficult to apply a multiplier or compensation ratio to cattle.
 - Given this challenge, alternatives for compensating for missing cattle, other than multipliers, should be considered. Criteria such as animals put on grazing allotments, the difference in animals collected at end of the grazing season and known presence of wolves on the grazing allotment may be appropriate to consider for missing cattle.
 - Multipliers may not be appropriate for all calving on open range because of the difficulty of distinguishing whether calving was successful vs. whether calves were lost to depredation. However, not all producers have a choice as to whether or not they calve on open range.
- From a technical perspective, size of pasture or rangeland is important in impacting detection of confirmed, probable, and missing livestock.
- Land ownership (public vs. private) is a social consideration rather than a technical consideration for compensation.

Indirect losses (Also referred to as production losses by the SAG)

Background: Indirect losses are those associated with economic impacts other than death of livestock.

Types of indirect losses considered: Pregnancy rates, weaning rates, lower weight gain due to stress or increased activity rates, future economic losses (for example, loss of future production or loss of investments in genetics), other losses.

Summary of TWG feedback: The TWG noted the technical reality of indirect losses such as those considered above but also noted that many factors can contribute to indirect losses. There was mixed feedback on whether there is technical merit to compensate for indirect losses, particularly as there is not a clear or proven technical approach for quantifying and compensating for indirect losses.

Discussion and rationale

- Reduced summer weight gain and other indirect losses can be subject to external factors beyond wolf depredation – for example, spatial or interannual variability in weather and forage production, other predation, and effects of other land use pressures such as recreation on public lands. It can be difficult to separately determine or fairly compensate indirect loss due to effects of wolf-livestock interactions.
- There is a lack of a concrete scientific body of research on indirect losses and conflicting anecdotal information. Documentation of indirect losses varies between producers.
- Indirect losses could be compensated through a multiplier or compensation ratio. If allowing compensation for indirect losses separate from a multiplier, stringent documentation and confirmation criteria are important to prevent abuse. In one state that allows compensation for indirect losses, the process is cumbersome and complex for producers. Currently, there is not a consistent approach among states, nor technical consensus on an approach for quantifying and compensating for indirect losses apart from using multipliers for confirmed losses.
- Multipliers have served to reduce social conflict in some places.
- The TWG recognized that there are also social considerations regarding compensation of indirect losses. A member noted that there are social science studies that indicate that wolf restoration would be better received if indirect losses were acknowledged and accounted for.
- Availability, or lack of availability, of lethal management tools to reduce indirect losses is also a consideration for whether to compensate for indirect losses.

Pay for presence program

Background: Pay for presence programs provide compensation for presence of wolves on lands used for livestock production, regardless of whether there is confirmed, probable, or indirect loss.

Summary of TWG feedback: The TWG offered a variety of perspectives regarding feasibility, purpose, and efficacy of a pay for presence program, without clear consensus on whether or not such programs have technical merit.

Discussion and rationale

- Pay for presence programs can help to recognize and value the benefits of private landowners in providing wildlife habitat, migration corridors, carbon sequestration, watershed health, and recreational opportunities. Additionally, implementation of a pay for presence program may be a simpler way to address indirect losses and/or probable depredation.
- Pay for presence programs were implemented to minimize illegal killing of wolves to assist in and benefit species recovery, as it was employed to do in the Mexican gray wolf recovery effort in Arizona and New Mexico, but may not lend to conflict reduction.
- Potential drawbacks of a pay for presence program include inconsistency of treatment of wolves vs. other predators, funding constraints and monitoring requirements. Similarly, paying for wolf presence on private land may lead to paying for presence of other wildlife species, or at least

landowners questioning why this is not the case, which could lead to more expense and distribution monitoring needs for other species.

- Actual damage may not justify pay for presence, with spatial and landscape factors such as vulnerability of livestock and location of dens and range geography more greatly informing depredation patterns than presence of wolves.
- To properly distribute available funds, this program may also require a greater degree of monitoring, which may constrain agency flexibility to allocate time and staffing resources to the development and deployment of conflict risk reduction tools.
- Pay for presence would create an additional financial burden.
- Pay for presence may also disincentivize producers to adopt conflict minimization practices, while not reducing conflict between wolves and livestock.
- The funding constraints of compensation, in addition to the staffing and capacity constraints indicated above, may also prevent management flexibility and ability to compensate for confirmed, probable, or indirect losses.
- One consideration for initial restoration is to compensate producers through a pay for presence program near and around a certain radius of release sites. It would need to be determined whether such compensation would be for a certain amount of time following release, or indefinitely. It would be difficult to determine the appropriate radius or amount of time for which to do this , and could create administrative challenges as well as concerns over fairness for producers falling just outside of temporal or spatial boundaries to qualify for the program.

Administration and Funding

Damage investigations

Background: CPW conducts most game damage investigations in the state. Some verification is also conducted by USDA APHIS-WS.

Summary of TWG feedback: Conducting damage investigation via CPW and APHIS-WS has technical merit. Investigators should have adequate training to conduct professional, consistent damage investigations.

Discussion and rationale

- A central consideration for investigative authority is adequate training. Both CPW and APHIS-WS staff are well-trained and trusted in local communities to conduct damage investigations. Investigation training courses could be offered on a regular basis to ensure investigators stay up-to-date on investigation practices.
- Regardless of the compensation formulas used, key to a successful compensation program are unbiased field investigators providing honest and accurate assessments.
- While the TWG generally did not see technical merit in the use of other potential investigative bodies, they noted that there may be other social values in having local officials accompany professional investigators and livestock producers and/or landowners during damage investigations.
- It will be important to depoliticize damage investigations as much as practical. In some highly politicized or controversial investigations, USDA APHIS-WS could serve as a sort of “third-party neutral,” which would help to protect relationships between state officials and local

communities. However, different agencies may be viewed differently by various stakeholders. Consistency of approaches within the state is important to build trust between the agencies, and among agencies, livestock producers and the public.

- Communication of investigation standards to impacted parties should be a priority, and local individuals should be equipped with the appropriate knowledge and tools to navigate the claims process. A valuable purpose of public and stakeholder engagement is in increasing knowledge of how to 1) protect the scene of a potential depredation so an investigation may be conducted with minimal contamination and 2) follow the appropriate steps to successfully file a claim for compensation if a wolf, or other large predator, were determined to be the cause of the depredation.

Funding sources

Background: CPW's Game Damage Program is funded by the appropriation of sportspeople's dollars from the Wildlife Cash Fund. HB21-1243, passed during the 2021 Colorado legislative session, prohibited use of wildlife cash funds generated from the sale of hunting and fishing licenses or from associated federal grants to fund the program implementation and administration of the restoration and management of gray wolves.

Summary of TWG feedback: TWG perspectives generally support using multiple sources of funding for compensation and other livestock interactions issues, although there were varying perspectives on whether this is a technical issue and/or is an issue with technical merit. Consistency in administration of funds, regardless of sources, was emphasized.

Discussion and rationale

- Maintaining reliability and consistency of funding are common considerations. Donations and/or funding from external sources such as NGOs should be considered from these perspectives.
- While some suggested a decentralized funding paradigm could support localized management strategies, others strongly discouraged management priorities and administration of funding to be set by any agency other than CPW and the Parks and Wildlife Commission.
- In some other states, the Department of Agriculture is responsible for administration, however Colorado statutes are clear that this responsibility lies with CPW. Use of sources that are already allocated for other special interests, such as license plates or tax checkoffs, would potentially dilute already limited funding.
- Some encouraged maintaining the status quo regarding funding for other species; others suggested wolves may imbalance current financial frameworks.
- Difficulties in obtaining and maintaining federal funds were noted.

Administration

Background: CPW is currently the sole administrator of reimbursement for game damage.

Summary of TWG feedback: The importance of consistency of funding administration was common feedback. The pros and cons of using other agencies as administrators for funding and/or for other elements of the game damage program was also discussed.

Discussion and rationale

- Other states' funding administrators include state departments of agriculture and/or livestock, local government, and federal government.
- Political agendas, public and private special interests, and trust in administrators were recurring concerns regarding multiple administrators.
- Use of a sole administrator offers simplicity, transparency, and ease of access to members of the public.
- Coordination between state and federal wildlife agencies should be considered to anticipate potential delisting of the gray wolf and its implications for game damage compensation and management.
- Local NGOs and coalitions may have roles to play in funding, stakeholder engagement, information dissemination, training and promotion of conflict risk reduction tools, and communication to inform agency best management practices.

CPW's current game damage program

Background: CPW reimburses for damages caused by big game species to livestock. Wolf damage to livestock is currently included under this program; CPW is considering updates to the program specifically for wolves. Additional information about the current program is linked from the CPW website and from www.wolfengagement.co.org.

Summary of TWG feedback: There are various considerations for whether and how the current program should be evolved specifically for wolves. There is general consensus regarding the value of consistency of process, however there are a variety of opinions on whether there should be differences in compensation eligibility, amount and/or criteria. Many TWG members suggest technical merit in consistency in using the existing program, however the TWG also recognizes that there are various social considerations on this topic as well that the SAG will weigh in regarding whether and how the current program should be evolved for wolves.

Discussion and rationale:

- If the current program is effective and well-respected, there is value to both livestock producers and wildlife managers in consistency of approach to game damage across different species of predators. At the very least, consistency of the process used streamlines ease, access, timeliness, and administration. There are technical arguments as well for treating all predators similarly rather than differentiating wolves as unique from other predators.
- The wolf restoration effort could be an opportunity to make improvements to the current program, such as incorporating incentives for non-lethal conflict prevention or minimization tools.
- As wolves are currently a state and federally-protected species, livestock producers may not have the same management tools available for wolves as for other predators such as bears and lions. If the program changes over time, including based on listing status and available management tools, changes in the compensation program might be appropriate. Any changes should be clearly communicated to the public.
- Generally, for compensation programs for wolves throughout the West, "burden of proof" is often a primary reason for producers to find a compensation program unsatisfactory. Clarity of

who investigates, how investigations occur, and how to make the claims process more accessible and efficient for producers are key components of a successful compensation program.

- The TWG anticipates that there are a variety of social considerations that the SAG might discuss affecting whether and how compensation amount, eligible expenses, and/or other criteria should be modified for wolves as compared to the current program.

Non-lethal conflict risk reduction

Feedback on practices and programs

Background: Non-lethal conflict risk reduction techniques are employed to prevent livestock conflict, and include strategies such as management intensive grazing, livestock guard dogs, carcass management, riders and herders, fladry, scare devices, high risk landscape management, and herd composition.

Summary of TWG feedback: Adoption of non-lethal conflict risk reduction techniques by livestock producers in Colorado is important to the long-term success of the wolf restoration and management program. Their effectiveness is context-specific and not well quantified. Various considerations for how to disseminate and facilitate adoption of conflict risk reduction techniques were also discussed. *Note: This report does not address lethal management for conflict risk reduction.*

Discussion and rationale

- The adoption of conflict risk reduction techniques by producers as both a proactive and reactive (post-depredation) approach to livestock conflict will be important to the long-term success of wolf management in Colorado.
- Experiences with livestock producers in other states also suggests that incentivizing and allowing creativity in conflict risk reduction approaches and working with producers is an effective approach.
- Context-specific considerations for effectiveness and feasibility of use of conflict risk reduction techniques include livestock type, age, time of year, land size, other land uses, landscape conditions, and local geospatial features, among other considerations that may impact livestock operations and wolf predation behaviors.
- Quantifying the effectiveness of various non-lethal tools is difficult and research in this area is in development, suggesting effectiveness is highly context-specific and requires some trial.
- The effectiveness of translocation of conflict wolves may vary, and some landscape conditions, independent of individual predator or pack reputation or conflict minimization, may create conflict hotspots.
- Suggestions for dissemination of non-lethal tools included building upon and/or leveraging relationships with members of the agricultural community, including through agency outreach (CPW, USDA APHIS-WS, and/or Colorado Department of Agriculture), community collaboratives, NGOs, stakeholder groups and livestock producer associations, rancher-to-rancher engagement and training programs, academic programs such as Colorado State University Extension, and conflict risk reduction cooperatives.
- Providing funding support, either directly or through cost-share programs, may help to foster adoption of techniques.

Non-Lethal risk reduction requirements for compensation

Background: The TWG discussed technical considerations regarding requirements that non-lethal risk reduction techniques be used prior to depredation to be eligible for compensation.

Summary of TWG feedback: TWG members emphasized the importance of encouraging non-lethal risk reduction techniques, however there were various perspectives regarding the technical merit and feasibility of requiring their use in order to receive damage compensation. The TWG discussed context-specificity of non-lethal risk reduction practices and losses, importance of maintaining flexibility rather than prescribing practices, difficulty in defining risk reduction requirements, value in strategies to incentivize adoption and creative problem solving, and maintenance of relationships with local producers.

Discussion and rationale

- As stated above, the context-specific effectiveness of non-lethal conflict risk reduction tools may suggest that the requirement of techniques may not always lead to conflict reduction, and flexibility in tool use should be prioritized.
- Questions around the assessment burden on agency staff, what should be required, and how conflict risk reduction should be assessed and regulated arose as important considerations.
- Requirement of non-lethal risk reduction techniques may also shape the technical and social value of these tools: some producers may simply use them to fulfill the requirement, while others may invest a lot of time and effort into conflict reduction. This variability complicates implementation of risk reduction requirements.
- Some producers will likely view additional requirements to be another unfunded mandate, which may strain or harm relationships between local agency officials and producers.
- Whether or not non-lethal conflict risk reduction techniques are required for compensation, development of programs to alleviate the financial burden on producers and foster the adoption of techniques may be more effective to achieve conflict reduction.

Appendix A: About the Technical Working Group

The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations. The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

Technical Working Group Members:

Scott Becker	U.S. Fish and Wildlife Service, Regional Wolf Coordinator
Alan Bittner	Bureau of Land Management, Deputy State Director
Stewart Breck	National Wildlife Research Center U.S. Department of Agriculture, Research Wildlife Biologist
Roblyn Brown	Oregon Department of Fish and Wildlife, Wolf Program Coordinator
Wayne East	Colorado Department of Agriculture, Agricultural/Wildlife Liaison
Justin Gude	Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief
Jonathan Houck	Gunnison County Commissioner
Mike Jimenez	U.S. Fish and Wildlife Service, Retired
Merrit Linke	Grand County Commissioner
Steve Lohr	U.S. Forest Service, Rocky Mountain Region Renewable Resources Director
Carter Niemeyer	U.S. Fish and Wildlife Service, Retired
Martin Lowney	U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, State Director
Eric Odell	Colorado Parks and Wildlife, Species Conservation Program Manager
Mike Phillips	Rocky Mountain Wolf Project, Founder/Turner Endangered Species Fund, Executive Director
John Sanderson	Colorado State University Center for Collaborative Conservation, Director
Doug Smith	National Park Service, Yellowstone National Park, Senior Wildlife Biologist
Robin Young	Colorado State University Extension Service, Archuleta County Extension, Director, Natural Resources and Agricultural Agent

Technical Working Group report developed with third party facilitation from Keystone Policy Center.

Appendix G: Final Report on Technical Recommendations for Colorado State Listing/Delisting Thresholds and Phasing

Colorado Wolf Restoration and Management Plan Technical Working Group (TWG) to Colorado Parks and Wildlife (CPW)

Final Report on Technical Recommendations for Colorado State Listing/Delisting Thresholds and Phasing

May 2022

Background & Purpose

This document summarizes the Wolf Restoration and Management Plan Technical Working Group (TWG) recommendations regarding population recovery thresholds for downlisting and delisting gray wolves from the state endangered species list in Colorado. As of February 10, 2022, wolves are listed under the Federal Endangered Species Act as Endangered. This effort does not replace a federal recovery plan, nor does it outline federal recovery goals. This effort describes state management of a species for when management authority is returned to the state (i.e., federally delisted). This effort may inform development of federal rulemaking processes in the interim, in particular consideration of development of a 10(j) Experimental, Non-Essential designation.

The thresholds were developed through expert deliberation of TWG members and are presented in a phased framework. While the determination of these thresholds is a technical exercise, management actions corresponding to the phased framework should be informed by legal and social considerations, which will be addressed largely by the Stakeholder Advisory Group (SAG). The framework is presented below (page 2) and is followed by a summary of TWG discussion and rationale.

Colorado State definitions for state endangered and threatened species are as follows:

- Endangered Species (CRS 33-1-102 (12)): any species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy as determined by the commission.
- Threatened Species (CRS 33-1-102 (44)): any species or subspecies of wildlife which, as determined by the commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered.

Contents

Colorado Gray Wolf Population Listing/Delisting Phased* Framework	2
Discussion and Rationale	4
Appendix A: About the Technical Working Group	8

Colorado Gray Wolf Population Listing/Delisting Phased* Framework

	Phase 1 <i>(correlating with State Endangered status)</i>	Phase 2 <i>(correlating with State Threatened status)</i>	Phase 3 <i>(correlating with State delisted, nongame status)</i>	Phase 4 <i>(correlating with State delisted, game status)</i>
Start	Current (2022)	Minimum count of 50 wolves anywhere in Colorado for four successive years.	Phase 1 and Phase 2 conclusion requirements are both met. Phase 2 requirements may be met concurrently with Phase 1 requirements.***	Discretionary phase, not prescriptive nor legally required. A population estimate above the delisting threshold would be required.
Conclude	Minimum count** of 50 wolves anywhere in Colorado for four successive years.***	Minimum count of 150 wolves anywhere in Colorado for two successive years**** -OR- Minimum count of 200 wolves anywhere in Colorado with no temporal requirement.	No prescribed conclusion; not legally required.	No prescribed conclusion.
Action upon conclusion	Downlist to State Threatened.	Delist from Colorado State list	Consider reclassifying to game species.	N/A
Criteria to move back into this phase	After downlisting, a minimum count of less than 50 wolves anywhere in Colorado for two consecutive years initiates review of relisting to State endangered status.	After delisting, a lower bound of a population estimate of less than 150 wolves anywhere in Colorado for two consecutive years initiates review of relisting to State threatened status.	To be determined depending on whether and under what criteria a game reclassification is made.	N/A

Notes on framework:

*Phases will be dictated by numeric and temporal wolf population thresholds described in the table. While it is intended that state status will also correspond to these thresholds, there may be a time lag as the Parks and Wildlife Commission undertakes the procedural process to change the state status based on population counts.

**Minimum population counts in any phase include gray wolves that have been reintroduced to Colorado and those that have naturally migrated into the state and their progeny. Wolf population minimum counts in this table refer to counts conducted in late winter to most accurately reflect recruitment.

***“Successive” means years in a sequence, with any number of gaps in between. Consecutive means years in a sequence with no gaps. The rationale for using a metric of successive years is to account for potential years when an adequate survey cannot be conducted.

****Downlisting to State Threatened status may not occur until the four-successive year requirement is met in the State Endangered status phase 1 (Phase 1). However, the two-successive year timeline for the phase 2 minimum count requirement begins when the minimum number is first met and may occur concurrently while in the Phase 1/endangered phase. Consequently, it is possible that delisting (Conclusion of Phase 2) may occur immediately after Phase 1, should the Phase 2 requirements be met concurrently during Phase 1.

Discussion and Rationale

The TWG generally **supports a phased approach** to gray wolf downlisting, delisting, and management:

- It provides clarity for current and future management while supporting the statutory goal of managing for a self-sustaining wolf population.
- It can allow for increasing management flexibility as the wolf population increases, as well as for flexibility to manage conflict throughout all phases.
- Other states have similarly used phased approaches to managing their wolf populations.
- It is important to maintain public trust in CPW in each phase of restoration and management by being responsive to current and future conditions of conflict, social conditions, and wolf population trends.
- Thresholds for phasing are based on best available science and meet all requirements under state statute.
- Some members suggested that linking the specific population metrics, rather than state listing status, to management options would lend to more management flexibility – particularly if delisting actions are tied up in litigation when the population hits the corresponding population metric. However, others suggested linking listing status directly to management phases would simplify messaging and expectations for field staff and members of the public. The difference in management options currently allowed under State law for endangered and threatened listing statuses is relatively inconsequential. The framework suggests that the population metrics should correspond with state status, but they are not directly linked: it is expected that once the wolf population reaches the metrics defined for downlisting/delisting, the management flexibility defined by the subsequent phase will be immediately in place, while at the same time the Colorado Parks and Wildlife Commission undertakes the processes to take the necessary action to down/delist the species. There may be a procedural delay when moving from Phase 2 to Phase 3.

The TWG generally **supports minimum population count with a temporal threshold to downlist wolves from state endangered to state threatened and to delist wolves.**

- *Rationale for recommendation of minimum population count as the relevant metric for downlisting and delisting:*
 - The social behaviors and resiliency of wolf populations, specifically wolves' tendency to form packs and documented reproductive success, support a minimum population count to satisfy the technical specifications of CRS 33-2-105.8 to restore a self-sustaining population of wolves to Colorado.
 - At the population level, the reproductive potential of a greater number of smaller packs or a smaller number of larger packs does not significantly differ and thus supports population counts rather than a minimum number of packs, although tracking pack statistics may be useful to document population stability and growth.
 - There are differing definitions of a 'pack' found in the scientific literature and in different states' management plans. In various contexts, a pack has been defined as 2 wolves, 4 wolves, or a breeding pair and two litters from different years.

- Defining management thresholds around breeding pairs will be difficult and expensive to monitor as the population grows.
- Geographic distribution metrics were discussed as potential thresholds, but some suggested that this may be at odds with Colorado’s 2004 wolf working group recommendations to allow wolves that do not cause conflict to live without bounds.
- A minimum count is recommended in the early phases of reintroduction. A minimum count is more labor and resource intensive; however, it is beneficial for accuracy of monitoring and both technical and social confidence in informing downlisting and delisting decisions and management. Minimum population counts can be more accurate at lower population sizes than they are at higher population sizes.
- As the wolf population grows, minimum population counts are more difficult to conduct and are less reliable for understanding total population size.
 - As the wolf population grows larger, and upon transition to delisted status, consider the use of a minimum population estimate and/or population models as a more reliable metric, i.e., models based on distribution, vital rates, and abundance estimates, etc.
 - Minimum counts will be important to compare with population estimates throughout phases 1 and 2, and population estimates can validate minimum counts.
 - Weather, staffing, and other unforeseen events can affect ability to conduct minimum counts.
- *Rationale for temporal component to minimum population metric:*
 - A temporal threshold of multiple successive years after minimum population counts were met in each phase was suggested as a measure of persistence in population trends.
 - Members suggested interaction between minimum population count and the length of time could accommodate rapid or slow population growth. For example, rapid population growth could eliminate the need for a temporal requirement between phases.
 - ‘Successive’ means years in a sequence, with any number of gaps in between. ‘Consecutive’ means years in a sequence with no gaps.
 - Members suggested that a temporal requirement of successive minimum population counts for downlisting are important to ensure a trend of a stable or increasing population, to account for the potential temporary population increases that may occur through reintroduction, and to allow for temporary fluctuations in population and/or unforeseen monitoring challenges over time.
 - Members suggested that review of State relisting (to threatened or endangered status) should be initiated when thresholds are not met for two consecutive years; this allows for potential temporary population decreases and/or unforeseen monitoring challenges that may affect minimum count while also initiating timely review should counts fall below threshold two years in a row.
- *Additional considerations for minimum population counts:*
 - Minimum counts for delisting are NOT intended as population objectives or maximums.

- In recommending specific minimum population counts for downlisting and delisting, the TWG cited wolf population trends, modeling efforts, other wolf recovery efforts, literature review of population modeling, and criteria for phased management elsewhere.
 - Minimum counts should include wolves that have naturally migrated to Colorado and their progeny as well as those that were reintroduced.
 - While wolf monitoring occurs throughout the year, the wolf population minimum count to inform downlisting/delisting decisions should be held in late winter to reflect recruitment most accurately.
- *Considerations for spatial distribution and ecological niche:*
 - The social and spatial tendencies of gray wolves suggests that 150-200 wolves would distribute among several million acres of territory in Colorado; spatial occupancy can be estimated based on literature regarding pack and territory size.
 - Minimum population count as a metric for State downlisting and delisting is thus correlated with spatial distribution.
 - Spatial distribution, ecological function and the 3Rs model (representation, redundancy, resiliency) are important considerations and goals for conservation.
 - Given the large-scale movements and natural history of wolves, the 3Rs approach is more relevant for larger or range wide conservation (i.e., throughout all the Lower 48 contiguous United States); however, it is less relevant at the scale of Colorado for state reintroduction and down/delisting metrics.
 - Positive ecological effects from having wolves on the landscape can occur, however they are difficult to quantify and document, require appropriate scale, and are also situation-specific.
 - Ecological effectiveness is a vague concept and situation-specific; for example, positive effects of a full complement of large carnivores in Yellowstone may not apply in other areas.
 - Ecological effectiveness and trophic cascades across a large area do not fully occur until there is a saturated wolf population. However, social carrying capacity and conflict in human-dominated landscapes will impact pack size and distribution and will likely limit achievement of ecological carrying capacity.
 - Landscape level ecological effects are thus both difficult to quantify and to achieve and are not appropriate as a metric or criteria for State downlisting and delisting.
- *Considerations for connectivity:*
 - Measures of genetic health and/or connectivity, such as measuring adequate heterozygosity from blood or tissue samples, are important metrics that should be periodically monitored over time as an indicator of a self-sustaining population.
 - Indicators of genetic connectivity are not necessary as a threshold for State downlisting and delisting. If wolves from the Northern Rockies or Pacific Northwest are sources for reintroduction, and wolves continue to disperse into Colorado from neighboring areas, the genetic makeup of Colorado wolves will already reflect the genetics of these areas. Colorado's wolf population is demographically connected to other populations in the Northern Rockies. Colorado thus does not require higher numeric population downlisting/delisting thresholds set for other locations that lack spatial connectivity.

- *Considerations for species reclassification and management after wolves are delisted:*
 - As noted above, connectivity is an important indicator for long-term monitoring, as it contributes to a self-sustaining population.
 - Reclassification of gray wolves from nongame to game status would be a phase discretionary to the Colorado Division of Parks and Wildlife, rather than a prescribed phase. Reclassification to game species is not legally required nor discussed by statute CRS 33-2-105.8.
 - Determination of whether to move to game classification should include consideration of social input regarding acceptability of wolf harvest and means of take, demand for population size management, livestock conflicts, impacts on other wildlife populations, other impacts from conflict, and/or demand for harvest opportunity. Many game populations in Colorado are managed to achieve a population size or trend objective, which will be an important consideration when this determination is made. There are advantages to early discussion on this topic; however, learning will also occur over time.
 - There should be clarity on the objectives of reclassification, for example, more liberalized management of conflict vs. management of populations through regulated hunting.
 - Consideration of reclassification should require maintenance of a minimum population estimate greater than the delisting threshold, with a sufficient buffer to avoid the need to relist.

Appendix A: About the Technical Working Group

The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations. The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

Technical Working Group Members:

Scott Becker	U.S. Fish and Wildlife Service, Regional Wolf Coordinator
Alan Bittner	Bureau of Land Management, Deputy State Director
Stewart Breck	National Wildlife Research Center U.S. Department of Agriculture, Research Wildlife Biologist
Roblyn Brown	Oregon Department of Fish and Wildlife, Wolf Program Coordinator
Wayne East	Colorado Department of Agriculture, Agricultural/Wildlife Liaison
Justin Gude	Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief
Jonathan Houck	Gunnison County Commissioner
Merrit Linke	Grand County Commissioner
Steve Lohr	U.S. Forest Service, Rocky Mountain Region Renewable Resources Director
Carter Niemeyer	U.S. Fish and Wildlife Service, Retired
Martin Lowney	U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, State Director
Eric Odell	Colorado Parks and Wildlife, Species Conservation Program Manager
Mike Phillips	Rocky Mountain Wolf Project, Founder/Turner Endangered Species Fund, Executive Director
John Sanderson	Colorado State University Center for Collaborative Conservation, Director
Doug Smith	National Park Service, Yellowstone National Park, Senior Wildlife Biologist
Robin Young	Colorado State University Extension Service, Archuleta County Extension, Director, Natural Resources and Agricultural Agent

Technical Working Group report developed with third party facilitation from Keystone Policy Center.

Appendix H: Final Report on Technical and Experiential Feedback on Wolf Management Considerations

Colorado Wolf Restoration and Management Plan Technical Working Group (TWG) to Colorado Parks and Wildlife (CPW)

Final Report on Technical and Experiential Feedback on Wolf Management Considerations August 2022

Background & purpose

This document summarizes the Wolf Restoration and Management Plan Technical Working Group (TWG) discussions regarding technical and experiential feedback on a variety of wolf management issues, including perspectives on biological relevance, ability to quantify and/or measure impacts, impact on technical outcomes, feasibility for managers, and experiences with and/or in implementing programs in other states.

This document is not intended as a literature review nor as a definitive set of recommendations regarding wolf management in Colorado. Rather, it offers a consensus-based synthesis of key takeaways from the TWG – based on its in-depth knowledge and practice of biological science and wolf management – to help inform the wolf restoration and management plan that will be developed by Colorado Parks and Wildlife.

The TWG recognizes that there are various social considerations for impact-based management that the Stakeholder Advisory Group (SAG) has discussed in informing an impact-based management plan for Colorado. A recurrent theme across many topics is to consider trust – including trust in managers, messengers, and stakeholders – as an input for effective management, and conversely to consider how to address lack of trust as a barrier to effective management.

Key takeaways

- **Conflict-centered management vs. objective-based management:** Wolf management should focus on management of conflict, with consideration of the social factors that accompany an impact-based management approach. Lessons from other states with wolves suggest population management is not robustly correlated with conflict minimization. Generally, the public has a high expectation that state wildlife agencies will address wildlife related challenges.
- **Avoiding misinterpretation of maximum vs. minimum population metrics:** It is important to use clear and consistent messaging to reinforce the purpose of minimum population counts/estimates, which are not intended as population objectives or maximums and have been misinterpreted in other contexts.
- **Zonal management:** Initial and long-term management should be impact-based. Zonal management of conflict could be a consideration for future management. Delineation of zones in the future could be informed by experience and data gathered through impact- (and conflict-) based management, understanding of ecological and social suitability (inclusive of wildlife and agricultural interests), and learnings from wolf dispersal and establishment on the ground.

- **Wolf population self-regulation:** Intrinsic self-regulation of wolves is unlikely at a statewide scale; wolves will likely be extrinsically regulated particularly by social carrying capacity. Wolf population self-regulation does not achieve the same goals as conflict management.
- **Positive impacts and wolf management:** Positive and negative impacts can occur due to wolf presence; positive impacts do not generally require hands-on management but can be communicated through education and outreach and can inform management activities and funding opportunities.
- **Non-lethal livestock conflict minimization:** Adoption of proactive and reactive non-lethal conflict risk reduction techniques by livestock producers in Colorado is important to the long-term success of the wolf restoration and management program. The effectiveness of these tools is context-specific and not well quantified.
- **Post-depredation management of conflict wolves:** While wolf depredations on livestock in other states are uncommon and do not represent a notable burden to the livestock industry as a whole, some wolves do cause significant problems for some ranchers and some areas experience repeated and frequent wolf depredations on livestock. Management of wolf-livestock conflicts following depredations should allow flexibility for managers; non-lethal and lethal management techniques should be applied adaptively and are context-specific. To be effective at reducing further depredation events, lethal and non-lethal responses for resolving conflict should be applied quickly and properly. Relocation of depredating wolves has little technical merit.
- **Lethal management of conflict wolves:** Lethal and non-lethal management are both critically important tools for conflict minimization; lethal management will likely attract greater social attention. In evaluating the management approach on a context-specific basis, consider the trade-offs among ability to target depredating wolves, conflict minimization efficacy, cost, reproductive and recruitment success, wolf population size and listing status, impacts to livestock producers, and social/stakeholder interests when considering lethal take options, including incremental and whole pack removal.
- **Considerations for ecological effects:** Ecological function is an important factor to consider but is difficult to quantify and may be less relevant as a metric at the state scale.
- **Impacts of wolves to ungulates, big game, and big game hunting:** Although statewide impacts to ungulate populations and hunting opportunities have not occurred in other states and are unlikely in Colorado, wolves can have local impacts to ungulate recruitment due to predation of young ungulates. Wolves prefer elk and will also prey on deer and other ungulates; moose may be targets of predation where they are abundant. Reduction in big game hunting opportunities and targeted wolf control have sometimes occurred locally in other states to address negative ecological or economic effects of reduced ungulate populations. Ungulate populations are impacted by a complexity of interacting factors.
- **Impacts of wolves to prey compromised by infectious disease:** Predators like the gray wolf may select for prey compromised by infectious diseases, which could prove useful in reducing infectious disease prevalence in ungulate populations, primarily when pathogens are directly

transmitted among hosts. The strength of a potential disease reduction depends on numerous factors, including specific disease etiology, the strength of selection for infectious individuals, and overall predation rates. It is unclear whether wolves will have a measurable effect on chronic wasting disease (CWD) in Colorado, where environmental contamination is likely to be a primary transmission route and where CWD is already well-established in mule deer, a species that wolves generally do not select for in the presence of elk.

- **Interactions with other wildlife species:** Wolves are important components of trophic networks where they are present on the landscape and their presence may have interactions with other large carnivores. The presence of wolves will not have an impact on populations of threatened and endangered species in Colorado, specifically lynx and Gunnison sage grouse.
- **Management of conflict with humans:** Attacks by wolves on humans are exceedingly rare; education and outreach for recreationists and other public lands users should include best practices and guidance, including how to differentiate wolves and coyotes. Flexibility to address rare instances of wolf habituation in areas dominated by humans is important.
- **Management of conflict with pets and hunting dogs:** Wolf attacks on pets are uncommon; education, outreach, and management should be used to proactively prevent conflict. It is important that public messaging emphasizes the risks assumed when domestic and hunting dogs are present in areas with wolves.
- **Wolf monitoring and expectations for stakeholders and public:** Monitoring and research should be based on restoration and management goals, use a variety of techniques, and be connected to other elements of wolf management, including conflict minimization. While robust monitoring is valuable at early stages of reintroduction, limitations to monitoring will increase with wolf population growth, requiring transition to a population estimate approach. It is important to consider effective messaging and coordination with stakeholders and the general public when communicating monitoring objectives and data; lead with trust and share data on an as-needed basis.
- **Social and/or economic dimensions of wolf management:** Social and economic dimensions are critical to understand, measure, and incorporate into decisions on wolf management. Perceptions of wolves and perspectives on management vary among people, are generally consistent within interest groups, and often reflect deeply held beliefs and values. There is high potential for social controversy and conflict, particularly as related to expectations and acceptance for use of non-lethal practices, lethal control, recreational harvest/regulated public hunting, and wolf population numbers. Some research suggests that economic benefits can be substantial and much larger than economic costs, however economic benefits and costs are not distributed equally across stakeholders and the public. Consider the breadth of existing social science research, economic indicators, and stakeholder and public feedback when making management decisions, and incorporate new social and economic research into future decisions. Education and outreach can also inform and be informed by social science. It is critical to have trusted, responsive managers on the ground and consistency of management.

Contents

Background & purpose	1
Key takeaways	1
Wolf population management	5
Conflict-centered management vs. objective-based management	5
Avoiding misinterpretation of maximum vs. minimum population metrics	6
Zonal management	6
Wolf population self-regulation	7
Positive impacts and wolf management	8
Management of livestock conflict	8
Non-lethal livestock conflict minimization	8
Post-depredation management of conflict wolves	9
Lethal management of conflict wolves	10
Management of interactions with ungulates and other wildlife species	11
Considerations for ecological effects	11
Impacts of wolves to ungulates, big game, and big game hunting	12
Interactions on other wildlife species, particularly other large predators and/or other threatened and endangered species	13
Management of conflict with humans and domestic pets	14
Wolf monitoring and expectations for stakeholders and public	15
Social and/or economic dimensions wolf management	17
Appendix A: About the Technical Working Group	19

Wolf population management

Conflict-centered management vs. objective-based management

Summary of TWG Feedback: Wolf management should focus on management of conflict, with consideration of the social factors that accompany an impact-based management approach. Lessons from other states with wolves suggest population management is not robustly correlated with conflict minimization. Generally, the public has a high expectation that state wildlife agencies will address wildlife related challenges.

- Focus on conflict-centered management properly scaled for issues involving livestock, ungulates, etc.
 - Have a systematic and flexible plan to be able to support and respond proactively and reactively to minimize conflict.
 - Impact-based management alone will not necessarily satisfy the needs and interests of those that are concerned about wolf populations on the landscape.
 - Impact-based management may also not satisfy the interests and concerns of those that want wolves on the landscape.
- The link between wolf population management (i.e., developing population objectives and managing towards those objectives) and conflict reduction is not necessarily robust on a statewide basis.
 - There may not necessarily be more depredations with higher statewide wolf populations (at some level, there are more conflicts as the population increases but these do not necessarily have a linear relationship).
 - Wolf population size and frequency of depredations do not share a linear relationship at a Statewide scale in the northern Rocky Mountain states and other states. Conflict minimization (lethal and non-lethal) play a role in this pattern in other states.
 - Depredations are more common in places with higher wolf density and livestock density at the local scale.
- Effective management of livestock, big game and other conflicts at a local scale are distinct as management issues from population objectives and population management over larger scales. That is to say that local, impact-based management (managing to resolve conflicts) is different than statewide management for population objectives. Diverse stakeholders need to be involved at both scales, i.e., in defining approaches to local conflict management and determine population size management over larger scales.
- A population objective is not required for diverse stakeholder involvement in statewide population management. Consensus on whether a population objective is needed or what it might be has not been achieved among public advisory councils in other states, and similarly the TWG could not reach consensus on this. A variety of biological and social considerations affect this issue.
- *If* a population objective is considered in the future:
 - Any population management objective should be based in biological and social science, including an understanding of social carrying capacity determined over time.
 - If a wolf population objective is established, it is difficult to manage to that objective through conflict management alone.
 - If using regulated hunting for population management toward a population objective, efficacy of regulated hunting depends on when the objective is set (i.e., the population

at that time), what it is set at, and what other management and allowance for lethal take are in place. Insights from other states suggest that regulated hunting is likely more effective to maintain or achieve that objective when the wolf population is smaller.

- TWG members do not have agreement on whether a population objective should be established. Some members expressed concern in wildlife managers' ability to maintain adequate pace of response to conflict as wolf populations grow. Some members suggested that proactive management - setting and managing towards local or statewide population objectives - may help to mitigate potential management capacity issues. Other members do not support the need for statewide population objectives.

Avoiding misinterpretation of maximum vs. minimum population metrics

Summary of TWG feedback: It is important to use clear and consistent messaging to reinforce the purpose of minimum population counts/estimates, which are not intended as population objectives or maximums and have been misinterpreted in other contexts.

Note: Please see TWG's separate report on recommendations and rationale regarding minimum population thresholds and metrics for State downlisting and delisting.

- Minimum population counts for downlisting and delisting are not intended as and should not be interpreted as population objectives nor maximums.
 - Be clear and consistent in the messaging of this; reinforce the message constantly at the highest levels of leadership within the State.
- Trust in the agency and its managers on the ground, along with its responsiveness and engagement with the public, is important for the management of population size and other topics.
- Public and stakeholder focus on the minimum as a maximum is indicative of various interests or concerns about wolves on the landscape, for example, concerns about livestock conflict, ungulate impacts, ecological benefits, etc.

Zonal management

Summary of TWG Feedback: Initial and long-term management should be impact-based. Zonal management of conflict could be a consideration for future management. Delineation of zones in the future could be informed by experience and data gathered through impact- (and conflict) based management, understanding of ecological and social suitability (inclusive of wildlife and agricultural interests), and learnings from wolf dispersal and establishment on the ground.

- Zonal management is a consideration for how to address social and ecological dynamics and conflicts. Zonal management is the concept whereby different local areas are managed differently with respect to the tradeoff between wolf conservation versus local wolf conflicts while considering wolf population goals and trends at a larger scale. Conflicts refer to those with livestock and big game, or other, less likely, interactions with humans, pets, or other species. Management in some areas may be focused on wolf population conservation and growth while management in other areas may have higher wolf mortality rates to proactively minimize impacts on big game or livestock depredation, so long as overall wolf population size or growth are adequate.

- Zonal management does *not* refer to geographic recovery area; the TWG has proposed Statewide recovery thresholds for Colorado.
- Zonal management does *not* refer specifically to management based on population objective, but rather based upon ecological and social suitability and conflict.
- Above minimum population thresholds, zonal management can be used with management favoring different outcomes (e.g., wolves, agriculture) where social and ecological conditions support them.
 - Consider the Colorado State University (CSU) and US Department of Agriculture Animal and Plant Health Inspection Service- Wildlife Service (USDA-APHIS-WS) model for habitat suitability/conflict to inform zonal management: this includes social and ecological factors.
 - This model suggests the existence of ecological and social suitability in Colorado, with low conflict, to support zonal management.
 - Truthing the model with data collected from wolf monitoring in Colorado will help to validate it prior to establishing any zonal management in the state.
- A consideration for timing of implementation of zonal management is that where wolves are released is not necessarily where they will end up: this includes consideration that Proposition 114 requires release west of the Continental Divide but introduced wolves will almost certainly move east of the Divide and naturally migrating wolves are already present east of the Divide. Delineation of management zones is best informed with experience and data on wolf establishment and distribution on the ground.
- Delineation of wolf management units with lines on a map is complex, should be informed by Colorado-specific data and goals, and should embed flexibility over time based on management learning and experience. For example, in Montana, the decision to apply zonal management was made with 15 years of data on wolves on the landscape.
- Impact/conflict-based management can occur without zonal management; i.e., rather than drawing lines on maps, manage based on impacts in areas that emerge from the experiences on the ground. Impact/conflict-based management can also inform the development of zonal management over time, such that zones are delineated and managed according to the emergent patterns of impacts.

Wolf population self-regulation

Summary of TWG feedback: Intrinsic self-regulation of wolves is unlikely at a statewide scale; wolves will likely be extrinsically regulated particularly by social carrying capacity. Wolf population self-regulation does not achieve the same goals as conflict management.

- Wolves are territorial; intrinsic self-regulation occurs at a high population density: in combination with extrinsic regulation (see below) this can also be referred to as ecological carrying capacity.
- Self-regulation may be possible at a smaller scale but is unlikely to be seen at a statewide scale; population density necessary for statewide self-regulation is unlikely to be seen in Colorado.
- Wolves will adjust to food supply (extrinsic regulation) below the level at which intrinsic population control limits the population size or growth rate.
- Wolf population self-regulation is not a substitute for conflict management. Managers will have to address conflict management before a wolf population reaches a point where it is functioning at ecological carrying capacity, or the combination of extrinsic and intrinsic self-regulation.

Positive impacts and wolf management

Summary of TWG feedback: Positive and negative impacts can occur due to wolf presence; positive impacts do not generally require hands-on management but can be communicated through education and outreach and can inform management activities and funding opportunities.

- Positive and negative impacts can occur due to wolf presence on the landscape; these can include ecological, social and economic impacts as discussed in sections below.
- Positive impacts can be communicated and supported through education, information, and outreach. For example, managers could share distribution maps (general areas, not den locations or other sensitive data) to support wolf tourism (viewing, howling). Consider both the positive and negative impacts of increasing tourism.
- Positive impacts generally do not require hands-on-wolf management. However, where positive impacts exist, they could inform management; for example, if there are positive impacts in a park, consider managing for them by creating a buffer for management around that area.
- Some literature indicates that while the economic benefits of wolves can be many times higher than the costs of management to prevent and resolve conflicts, the distribution of benefits do not align with the distribution of costs. Positive impacts could inform funding and support for wolf management.

Management of livestock conflict

Non-lethal livestock conflict minimization

Summary of TWG feedback: Adoption of proactive and reactive non-lethal conflict risk reduction techniques by livestock producers in Colorado is important to the long-term success of the wolf restoration and management program. The effectiveness of these tools is context-specific and not well quantified.

- Non-lethal conflict reduction techniques include those implemented prior to and to prevent conflict as well as those implemented following depredation to prevent further conflict.
- To be most effective at minimizing and preventing depredation events, non-lethal conflict techniques should ideally be applied early and properly when wolves are in or anticipated in an area. To accomplish this, advanced preparation and engagement among the agency, partners, livestock producers, nonprofits, and others working on conflict minimization in Colorado is strongly advised prior to and continuing through reintroduction.
- Experiences with livestock producers in other states also suggests that incentivizing and allowing creativity in conflict risk reduction approaches and working with producers is an effective approach.
- Context-specific considerations for effectiveness and feasibility of use of conflict risk reduction techniques include livestock type, age, time of year, land size, other land uses, landscape conditions, and local geospatial features, among other considerations that may impact livestock operations and wolf predation behaviors.
- Quantifying the effectiveness of various non-lethal tools is difficult and research in this area is in development, suggesting effectiveness is highly context-specific and requires some trial.

- Suggestions for dissemination of non-lethal tools include building upon and/or leveraging relationships with members of the agricultural community, including through agency outreach (CPW, USDA APHIS-WS, and/or Colorado Department of Agriculture), community collaboratives, NGOs, stakeholder groups and livestock producer associations, rancher-to-rancher engagement and training programs, academic programs such as Colorado State University Extension, and conflict risk reduction cooperatives.
- Providing funding support, either directly or through cost-share programs, may help to foster adoption of techniques.

Post-depredation management of conflict wolves

Summary of TWG feedback: While wolf depredations on livestock in other states are uncommon and do not represent a notable burden to the livestock industry as a whole, some wolves do cause significant problems for some ranchers and some areas experience repeated and frequent wolf depredations on livestock. Management of wolf-livestock conflicts following depredations should allow flexibility for managers; non-lethal and lethal management techniques should be applied adaptively and are context-specific. To be effective at reducing further depredation events, lethal and non-lethal responses for resolving conflict should be applied quickly and properly. Relocation of depredating wolves has little technical merit.

- A guiding principle for management should be to allow wildlife managers flexibility, such as in defining a problem and/or conflict wolf and/or chronic depredation.
- Chronic depredation would consist of multiple depredations and could consider temporal and spatial factors (e.g., from other states: two depredations in a calendar year, three within ninety days, or four within a relative nine-month window from first depredation), as well as the phase of recovery and management. Simplicity should be a guiding factor in this definition. A potential definition for a conflict wolf would be a wolf that creates conflict, not exclusive to but including depredation.
- Management response may vary between one or multiple depredations, and depredation response may not always be driven solely by depredation frequency. For example, lethal removal might be an effective way to reduce future depredations after an initial depredation event if the wolf population is large enough, and implementation of non-lethal deterrents may be effective after multiple depredation events in a small pasture situation.
- It can be difficult to determine which individual wolf or pack is depredating, and an alternative could be to consider depredation by area, such as focusing on depredations affecting a producer and/or community rather than on the individual wolves and/or packs. Knowledge of areas where conflict is more likely to occur will increase over time, and adaptive responses can be tailored based on this knowledge. Areas with higher wolf density and livestock density tend to be those with higher conflict.
- Efficacy of non-lethal techniques vary on a case-by-case basis, including factors such as if a depredation has already occurred as well as spatial and temporal conditions for when and how the depredation occurred.
 - While efficacy of non-lethal methods may decrease over time or after an initial depredation, implementation of non-lethal methods and aversive conditioning post-depredation have had success to prevent further depredations and prevent use of lethal management actions.
 - A specific example of an effective non-lethal technique is the removal of bone piles and other attractants, ideally pre-depredation, or potentially post-depredation.

- Some landscape conditions, independent of individual predator or pack reputation or conflict minimization, may create conflict hotspots.
- The effectiveness of translocation of conflict wolves may vary. Relocation of conflict wolves has little technical merit and presents a social challenge in relocating a known depredator elsewhere.
 - Those wolves might attempt to return back to their original location and/or create problems for producers in other places.
 - Relocation takes significant time and resources.
 - If the purpose of relocation is to stop further depredations, it is important to consider whether this accomplishes that purpose.
 - This practice has only been previously used if managers do not have flexibility via regulation to use other conflict wolf management tools.

Lethal management of conflict wolves

Summary of TWG feedback: Lethal and non-lethal management are both critically important tools for conflict minimization; lethal management will likely attract greater social attention. In evaluating the management approach on a context-specific basis, consider the trade-offs among ability to target depredating wolves, conflict minimization efficacy, cost, reproductive and recruitment success, wolf population size and listing status, impacts to livestock producers, and social/stakeholder interests when considering lethal take options, including incremental and whole pack removal.

- Availability of both lethal and non-lethal management tools is important to support management flexibility.
- Lethal management of wolves will be accompanied by significant social attention in Colorado.
 - Some social science research suggests Coloradans are least likely, compared to other states in the region, to support lethal management and that non-lethal tools will need to be an integral part of management.
 - Wildlife damage management research has consistently shown the affected public supports lethal management and the unaffected public generally does not support lethal management regardless of species involved.
 - Proper emphasis and exercise of non-lethal techniques, quality of investigations, agency transparency and education and outreach about conflict management and conflict wolves should be among factors considered prior to justifying lethal techniques to respond to and prevent future depredations.
- Targeted lethal control may decrease future depredations. There are tradeoffs between incremental (individual) removal and whole pack removal:
 - There have been both successes and failures with incremental removal.
 - The more wolves that are removed, the higher the efficacy for reducing conflict and reducing likelihood of an additional depredation; however, there is a tradeoff in terms of wolf recruitment, and in some cases, social acceptability.
 - Incremental removal of individuals responsible for the depredation may be more socially acceptable. However, it is difficult to effectively target the individual depredators (due to time, knowledge, and monitoring constraints); consider targeted incremental removal in early phases when managers have the ability to target depredating wolves.
 - Wolf populations can sustain 25-30% annual mortality while maintaining a stable or increasing population. This is well above the level of mortality that would be expected

due to lethal take for management of depredating wolves: however, it does not address the specific ecological and social consequences of lethal removal when only a small number of wolves or packs are present (i.e., early in reintroduction).

- Data do not suggest that depredation will increase due to lethal removal of individual wolves from a pack.
- Lethal take of depredating wolves may increase effectiveness of non-lethal management techniques by removing individuals with bolder behavior and conditioning fear of humans in remaining pack members: however, the science is not robust on this topic.
- Lethal removal is problematic if the individual depredators are also the breeding individuals, which will affect recruitment. The probability of persistence and reproduction decreases as more individual wolves are removed from a pack.
 - If there is not reproduction, lack of pups can lead to pack dissolution.
 - The larger a pack, there will be more resilience to a mortality event and the higher likelihood that the pack will recruit pups the year following removal. However, larger packs are also more likely to depredate again.
 - Seasonality and whether the removed wolves are breeding individuals will also affect pack persistence and reproduction.
- Management options could consider the role of lethal control in areas of public land grazing vs. areas of mixed public and private lands. This was a consideration for phased management in one Northern Rockies state, where more liberal management was included in earlier phases for areas of mixed private and public land, whereas management was liberalized in later phases for public lands. However, differentiation raises challenges for consistency of management. Alternatively, options could consider land use patterns rather than land ownership. There are many areas where public and private lands are interspersed and not fenced; knowing precisely whose land an action occurred on can be problematic. However, it may be possible to consider management based on the general use patterns (agricultural, residential, recreational, wilderness, etc.).
- Public harvest (different than conflict management) has not directly led to a decrease in depredation in areas of harvest in other states, but there are indirect impacts for wolves being sensitized to and fearful of humans as a result of public harvest, which may in turn decrease wolf interactions with and depredations of livestock.

Management of interactions with ungulates and other wildlife species

Considerations for ecological effects

Summary of TWG feedback: Ecological function is an important factor to consider but is difficult to quantify and may be less relevant as a metric at the state scale.

- Positive ecological effects from having wolves on the landscape can occur, however they are difficult to quantify and document, require appropriate scale, and are also situation-specific. Landscape level ecological effects are both difficult to quantify and to achieve.
 - Ecological effectiveness is a vague concept and situation-specific; for example, positive effects of a full complement of large carnivores in Yellowstone may not apply in other areas.

- Ecological effectiveness and trophic cascades across a large area are not likely to occur until there is a saturated wolf population. However, management to address social carrying capacity and conflict in human-dominated landscapes will impact pack size and distribution and will likely limit achievement of ecological carrying capacity.

Impacts of wolves to ungulates, big game, and big game hunting

Summary of TWG feedback: Although statewide impacts to ungulate populations and hunting opportunities have not occurred in other states and are unlikely in Colorado, wolves can have local impacts to ungulate recruitment due to predation of young ungulates. Wolves prefer elk and will also prey on deer and other ungulates; moose may be targets of predation where they are abundant. Reduction in big game hunting opportunities and targeted wolf control have sometimes occurred locally in other states to address negative ecological or economic effects of reduced ungulate populations. Ungulate populations are impacted by a complexity of interacting factors.

Predators like the gray wolf may select for prey compromised by infectious diseases, which could prove useful in reducing infectious disease prevalence in ungulate populations, primarily when pathogens are directly transmitted among hosts. The strength of a potential disease reduction depends on numerous factors, including specific disease etiology, the strength of selection for infectious individuals, and overall predation rates. It is unclear whether wolves will have a measurable effect on chronic wasting disease (CWD) in Colorado, where environmental contamination is likely to be a primary transmission route and where CWD is already well-established in mule deer, a species that wolves generally do not select for in the presence of elk.

- At a statewide level, wolves are unlikely to have a major impact on overall big game populations or hunting opportunities in Colorado based on evidence from northern Rocky Mountain states.
- Ungulate populations are impacted by a complexity of interacting factors.
- Impacts of wolves to ungulates are a local rather than statewide issue; ungulate management in response to gray wolf impacts should also be localized.
- Wolf-prey selection demonstrates a strong preference for elk over deer, where elk are present.
- The impact of predation is focused on recruitment because wolves tend to eat young elk; they will prey on a variety of age classes of different ungulate species (including reproductive and non-reproductive age): however, their preference is for young and old elk. This impact occurs in combination with presence of other predators and ungulate habitat limitations. Wolf predation occurs throughout the year, with some seasonal variability and peak kill rates in late winter.
- In other states where wolves are present with other carnivores, reduction in big game hunting opportunities (particularly cow hunting or through changes in license type) has sometimes occurred to maintain ungulate population size. Declines in ungulate population size have occurred when reductions in recruitment due to predation have occurred in combination with cow hunting. Therefore, recent big game management in other states where wolves are present has focused on reducing or eliminating cow hunting opportunities to avoid population declines.
- In some states, under both federal and state management authority, wolf control may be considered if it was determined that wolves were a contributing factor to negative performance of big game populations.
 - Wolf impacts to ungulate populations are localized, typically occur in the presence of impacts from multiple large carnivores, and examples of impacts and subsequent management of wolf impacts to big game are rare; some areas such as NW Montana and the LoLo area of Idaho have been managed for wolf impacts to big game.

- Under federal management authority, it was only allowed for nonessential experimental populations in States that had Service-approved wolf management plans (i.e., ID, MT, WY), although when this might be considered changed slightly over time.
- Many state wolf management plans also consider wolf impacts to big game populations and when wolf control may be considered to improve the performance of big game populations. These considerations vary by state. In Montana, Idaho and Wyoming, there are regulated hunting seasons. Both Washington and Oregon have very similar language as to what is proposed for how wolves could be managed should there be demonstrated effects on local ungulate populations.
- In addition to considerations for infectious disease and CWD (discussed above), there are considerations for potential wolf effects on ungulate population health and noncommunicable disease. Gray wolves preferentially select for relatively weak prey, including old and diseased (i.e., noncommunicable) prey, which may reduce disease prevalence such as arthritis.
- Moose are generally not a significant portion of wolf diet; however, wolf predation of moose is variable and the impacts to the moose population are localized, dependent in part on the size of the moose population. Wolves are more likely to select moose where moose populations are higher. In Yellowstone, moose are rare and moose predation is low. In locations where moose populations are low, there is potential for relatively higher impacts from wolf predation, even if wolf predation of moose is low.
 - Moose are challenged by a variety of problems that overshadow wolf predation; these include living on the southern end of their range, including habitat, parasites and ticks, bear predation, and potential competition with elk on winter range; challenges are driven by climate and heat stress at the southern end of their range and this can be compounded by climate change. Moose populations in Colorado are doing well.

Interactions on other wildlife species, particularly other large predators and/or other threatened and endangered species

Summary of TWG feedback: Wolves are important components of trophic networks where they are present on the landscape and their presence may have interactions with other large carnivores. The presence of wolves will not have an impact on populations of threatened and endangered species in Colorado, specifically lynx and Gunnison sage grouse.

- Various species benefit from carcasses of prey killed by wolves.
- Abundance and distribution of carrion/carcasses in the winter may benefit wolverines.
- Wolves will kill individual coyotes; Yellowstone data show that coyote populations survive but may change their pack dynamics and behaviors.
- Wolves, lions, and bears may interact and cause some limited mortality for each other.
- Wolf kill rates may decrease in the presence of grizzly bears (not present in Colorado); grizzly bears are dominant on wolf kill carcasses in summer and wolves will stick with carcasses thus reducing kill rates.
- The effects of wolves on lion populations are variable. Northern Yellowstone research did not find a population effect of wolves on lions. Lions may move down in elevation in the absence of wolves. Mountain lion kill rates may increase in presence of wolves because wolves are dominant to lions on carcasses, and lions may increase their kill rates as a result.
- Wolves will eat beavers; in the Great Lakes states, beaver can represent half of wolf diets and 30% of biomass consumed: however, there is generally not a population effect on beavers. Wolf predation of beavers is potentially more opportunistic than bear predation of beavers.

- There is no reason to believe that there will be a significant impact of wolves on lynx or the Gunnison Sage-grouse and Greater Sage-grouse.

Management of conflict with humans and domestic pets

Summary of TWG feedback: Attacks by wolves on humans are exceedingly rare; education and outreach for recreationists and other public lands users should include best practices and guidance, including how to differentiate wolves and coyotes. Flexibility to address rare instances of wolf habituation in areas dominated by humans is important.

Wolf attacks on pets are uncommon; education, outreach, and management should be used to proactively prevent conflict. It is important that public messaging emphasizes the risks assumed when domestic and hunting dogs are present in areas with wolves.

- Strong public messaging should emphasize that dogs can be an attractant for wolves, and, although rare, wolves will kill dogs. Recreationists and hunters should all be aware of this risk when taking dogs into wolf country.
- Hunters that use hunting hounds should be aware of wolf presence where they are hunting and factor that into their decisions regarding whether to hunt with dogs in that area. Wolves do kill hunting hounds, particularly those that hunt far away from people.
- Livestock guardian dogs remain an important consideration for conflict minimization; livestock producers with livestock guardian dogs should also be aware of the risk of wolves to dogs. The use of larger livestock guardian dogs to protect against wolves can also have potential impacts for domestic pets and hunting dogs, due to conflicts between the livestock guardian dogs and pets/hunting dogs sharing the same landscape.
- Consideration of recreationists' experience and purpose on the landscape can help inform education.
- There can be issues with mistaken identity: dogs can be misidentified as wolves; recreationists that are shooting coyotes could mistakenly shoot wolves.
- Distinguish between tolerant and habituated wolves:
 - Tolerant wolves may walk through campsites or pass by people. Wolves that become more tolerant of people are more susceptible to poaching and hunting.
 - Wolves may occasionally become habituated. For example, in Yellowstone National Park, wolves may occasionally take human food or items from campsites.
 - Hazing is a key part of the toolkit for managing habituated wolves and is an effective tool used on a case-by-case basis.
 - Effectiveness of hazing is increased when it is implemented early, before wolves become more bold and habituated.
 - Hazing and aversive conditioning can also be challenging for a management agency because of the need to catch the animals consistently in the act of the behavior that you want to discourage.
 - Having hazing available to producers can support early intervention.
 - A phased approach to hazing and habituation could be considered based on population status.
 - There have been two instances in Yellowstone of lethal take for aggressive and habituated wolves.
- Management approaches:

- State and federal law allow take of wolves that are threatening human safety.
- Management of a wolf that kills a pet or hunting dog will depend on the context; it is important for state agencies to have flexibility.
- Flexibility to address other situations such as wolves denning in human-dominated areas with various tools and on a case-by-case basis is recommended. It is difficult to anticipate all scenarios for interactions with humans, recreationists, livestock, other wildlife, etc.
- Well-trained staff that are good at communicating and managing is important.

Wolf monitoring and expectations for stakeholders and public

Summary of TWG feedback: Monitoring and research should be based on restoration and management goals, use a variety of techniques, and be connected to other elements of wolf management, including conflict minimization. While robust monitoring is valuable at early stages of reintroduction, limitations to monitoring will increase with wolf population growth, requiring transition to a population estimate approach. It is important to consider effective messaging and coordination with stakeholders and the general public when communicating monitoring objectives and data; lead with trust and share data on an as-needed basis.

- There is value in collaring every wolf that is reintroduced for monitoring and data collection purposes and to learn from and improve upon for future releases; however, it is important to educate the public and set expectations that not every wolf in Colorado will be collared as the population grows. There is a risk that the public will incorrectly perceive that the agency is failing in its monitoring efforts over time as fewer wolves are collared and monitored.
- It is important to understand that collars tell managers where wolves have been but not where they are present; monitoring cannot necessarily prevent conflict, but it can increase education on wolf behaviors, patterns, and presence in an area. It can also help in educating people on what to look for with respect to livestock conflict minimization.
 - Some non-lethal tools (i.e., radio-activated guard (RAG) boxes) rely on radio collars; there may be interest in collaring for these purposes, aside from collaring for the state monitoring program. RAG boxes can be used to scare wolves away over a short distance. Ideally, they would be used to alert ranchers of wolf presence, particularly in areas of prior depredation.
 - Immediately following a depredation event can also be an effective time to capture and collar wolves.
 - Collar reliability and longevity varies, and GPS collars are less reliable than VHF collars. A combination of collars can support an effective monitoring program.¹
- Monitoring and research programs should be based on the wolf restoration and management goals and objectives.
 - Colorado's downlisting and delisting thresholds provide recovery goals to guide monitoring program design.
 - Population growth rate is an important indicator for recovery goals. It can be informed by abundance monitoring (e.g., minimum counts, population estimations, number of packs), survival monitoring (adult and pup), recruitment (including reproduction and survival, as well as immigration), and distribution (e.g., den locations).

¹ See the November 2021 TWG Restoration Logistics Report, Pages 17-18, for additional discussion of collars.

- Survival monitoring is an indicator of performance rather than population size. Survival is affected by conflict management, including lethal control.
- Monitoring and research program design, costs, and effectiveness are interrelated with the entirety of the wolf program, including conflict management.
 - It is essential for those conducting monitoring and those leading conflict management and depredation investigations to communicate and effectively coordinate with each other. Monitoring approaches and costs should evolve with the wolf population size, from minimum counts and intensive ground (i.e., camera) and aerial monitoring toward population estimates.
 - A wolf reintroduction and management plan should include a research effort to develop a population estimate model beginning in the early stages of reintroduction. Such a model will support a long-term monitoring program that does not rely on intensive capture and collaring as the population size grows.
- Monitoring and research are a year-round effort involving a variety of techniques to locate and collar wolves.²
 - While a lot of monitoring work can be accomplished from the air and with aerial captures, these techniques are more effective when there are already a lot of collars deployed.
 - A fixed wing pilot with experience locating and tracking uncollared wolves from the air can be an enormous asset in improving the success of helicopter capture efforts.
 - Foothold traps are an important tool for monitoring in other states. Injury rates for foothold traps are low. Use of traps for all wildlife management in Colorado is extremely limited per state Constitution; traps can be used for some conflict mitigation and research purposes.
 - Significant groundwork and scouting are also needed to locate wolves, particularly in early phases of restoration; groundwork increases absent the use of other techniques listed above.
- Adopt an approach to monitoring, information- and data-sharing that leads with trust.
 - Sharing data should be discretionary on an as-needed basis – for example, when working with producers to minimize and manage conflict, or with research partners – rather than a want-to-know basis.
 - Legal implications, including open records laws, should be considered prior to the decision to share data. The statutory and regulatory basis for not sharing data should be made clear to the public.
 - Information-sharing can be general in nature; it does not necessarily need to involve sharing of specific telemetry data or other more sensitive information.
 - Sharing information with the ranching community provides transparency and factual information, can build early trust, and can empower communities to understand the data.
 - This must be balanced against protecting wolves from illegal take; however, there have been positive experiences in other states in sharing monitoring data and locations.
 - Trust is reciprocal; there is risk in sharing information but agencies and ranchers must be able to trust each other.
 - Monitoring activities can also include the public and private property owners.

² See the November 2021 TWG Restoration Logistics Report, Pages 7-10, for additional discussion of capture methods and considerations.

Social and/or economic dimensions wolf management

Summary of TWG feedback: Social and economic dimensions are critical to understand, measure, and incorporate into decisions on wolf management. Perceptions of wolves and perspectives on management vary among people, are generally consistent within interest groups, and often reflect deeply held beliefs and values. There is high potential for social controversy and conflict, particularly as related to expectations and acceptance for use of non-lethal practices, lethal control, recreational harvest/regulated public hunting, and wolf population numbers. Some research suggests that economic benefits can be substantial and much larger than economic costs, however economic benefits and costs are not distributed equally across stakeholders and the public. Consider the breadth of existing social science research, economic indicators, and stakeholder and public feedback when making management decisions, and incorporate new social and economic research into future decisions. Education and outreach can also inform and be informed by social science. It is critical to have trusted, responsive managers on the ground and consistency of management.

- Social and economic dimensions of wolf management consider a variety of stakeholders, interests, and values, for example rural/agricultural and urban.
 - There is high potential for controversy and conflict among different perspectives with respect to wolf restoration and management. There are deeply held, conflicting cultural beliefs or values regarding wolves that are unlikely to change.
 - Social and economic dimensions affect all aspects of wolf management, including restoration, conflict management, compensation and whether and how to approach population management.
 - There is a broad spectrum of perspectives and research to consider specifically in relation to social dimensions of wolf management, social acceptance, and recreational harvest (or, regulated public hunting of wolves). Related to these issues are varying perspectives on ethics and fair chase where regulated public hunting is allowed. These topics will be controversial and contextual; demand, acceptance and/or opposition for harvest will vary by cultures and geographies. Whether allowance or disallowance of recreational harvest/regulated public hunting will change fundamental beliefs is unclear. In addition to being informed by social considerations, allowance or disallowance of regulated public hunting will also be informed by legal considerations including interpretation of authorities relative to the definition of gray wolves in CRS 33-2-105.8 as being a nongame species.
 - There is also high potential for social controversy regarding whether and/or how to set recovery criteria population goals, define self-sustaining populations, and manage populations.
 - Failure to adequately consider different viewpoints can lead to politically driven swings in management.
 - Wolf management and issues in other places, and especially in and around National Parks, affect the national dialogue and state management; management around National Parks involving more national interest groups and polarization can increase the amount of social conflict.
 - Trust in messengers is important; different messengers are effective for different audiences.

- Having responsive, trusted managers on the ground is important for navigating diverse cultures and contexts with respect to wolves.
- Existing and future social and economic science can inform management decisions.
 - Research should be balanced with experiential insights and learning from managers and partners on the ground.
 - Social, economic and biological/ecological research each have the potential to be interpreted to confirm and/or serve different perspectives and positions.
 - Stakeholder representation and leadership in development of the plans increases trust and acceptance; general survey data are not enough.
 - Social/economic indicators (positive and negative) combined with on-the-ground insights can inform future suitability assessments and zonal management by helping to understand patterns of conflict, economic benefits, etc. (see discussion above).
 - A TWG member suggested engaging social scientists and economists to help expand on insights synthesized in this report, including by summarizing public opinion surveys conducted since the early 1990s, research insights from the 2020 Colorado election results on Proposition 114, and other existing literature.
- Social indicators to help inform management could include:
 - Consider the CSU and USDA-APHIS-WS model for habitat suitability/conflict (includes ecological and social data (voting patterns)).
 - Consider ongoing CSU/CPW social science research in Colorado.
 - Behaviors and attitudes in response to wolf presence (for example, adoption of and attitudes toward non-lethal conflict minimization practices and/or compensation, or evidence of poaching or illegal take).
 - Perceptions and values. Consider examples of research from the Northern Rockies. For example, in Montana, social science research has been conducted in 2012 and 2017 and is scheduled to be repeated in 2022; it initially included surveys of big game license holders, wolf license holders, landowners and wolf advocates, and then became a general household survey. It included general wolf acceptance questions and questions on tolerance of specific management actions (reactive to what was done); managers noted that information collected from such surveys can be informative to management but does not necessarily help with the issue of building trust.
- Economic indicators to help inform management could include:
 - Impacts from any changes (if applicable) in ungulate harvest management correlating with wolf restoration, with consideration of pre- and post-restoration license sales as well as the relationship between hunting license sales and outfitting and ranching economics.
 - Positive economic consequences (for example, for the outdoor industry, reduced vehicle collisions, etc.).
 - Economic costs to producers of direct and indirect losses, non-lethal and lethal management, and funding availability for management.
 - Economic costs to agencies (management, compensation, education/outreach, additional staffing, resources, etc.).
 - If there is a net economic benefit, consider how, if possible, it can be quantified and directed toward where the costs are incurred.
 - Economic assessments, particularly those that demonstrate significant positive benefits of wolf restoration, could also be valuable to inform legislators/legislation and support general assembly funding for wolf management.

Appendix A: About the Technical Working Group

The purpose of the Technical Working Group (TWG) is to review objective, science-based information as well as provide its own knowledge and experience at the state/federal/tribal level to inform the development of the Colorado Wolf Restoration and Management Plan. The TWG is composed of members who bring experience in wolf reintroduction, wolf management, conflict minimization, depredation compensation, and other relevant topics. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The TWG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The TWG is not a decision-making body and has no authority on wolf management policy, research, or operations. The TWG operates by consensus. For purposes of the TWG, consensus refers specifically to general agreement, or lack of objection, that an option or alternative has sufficient technical merit to be recommended for consideration by CPW. In the absence of consensus, dissenting views will be documented.

Technical Working Group Members:

Scott Becker	U.S. Fish and Wildlife Service, Regional Wolf Coordinator
Alan Bittner	Bureau of Land Management, Deputy State Director
Stewart Breck	National Wildlife Research Center U.S. Department of Agriculture, Research Wildlife Biologist
Roblyn Brown	Oregon Department of Fish and Wildlife, Wolf Program Coordinator
Wayne East	Colorado Department of Agriculture, Agricultural/Wildlife Liaison
Justin Gude	Montana Fish Wildlife and Parks, Research and Technical Services Bureau Chief
Jonathan Houck	Gunnison County Commissioner
Merrit Linke	Grand County Commissioner
Steve Lohr	U.S. Forest Service, Rocky Mountain Region Renewable Resources Director
Carter Niemeyer	U.S. Fish and Wildlife Service, Retired
Martin Lowney	U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, State Director
Eric Odell	Colorado Parks and Wildlife, Species Conservation Program Manager
Mike Phillips	Rocky Mountain Wolf Project, Founder/ Turner Endangered Species Fund, Executive Director
John Sanderson	Colorado State University Center for Collaborative Conservation, Director
Doug Smith	National Park Service, Yellowstone National Park, Senior Wildlife Biologist
Robin Young	Colorado State University Extension Service, Archuleta County Extension, Director, Natural Resources and Agricultural Agent

This Technical Working Group report was developed with third party facilitation from Keystone Policy Center.

Appendix C. Stakeholder Advisory Group Synthesis Report.



STAKEHOLDER ADVISORY GROUP

FINAL SUMMARY OF RECOMMENDATIONS
FOR THE COLORADO WOLF RESTORATION
AND MANAGEMENT PLAN

**Stakeholder Advisory Group
(SAG) to Colorado Parks and
Wildlife (CPW)**

September 2022

Contents

Introduction from the Stakeholder Advisory Group	3
About the Stakeholder Advisory Group	4
Report on Wolf Restoration Logistics Recommendations	6
Recommendations on Preventative, Nonlethal Wolf-Livestock Conflict Minimization	10
Comments to the Parks and Wildlife Commission on Proposed Wolf Hazing Regulation	15
Report on Livestock Compensation Recommendations	18
Report on Impact-Based Management Recommendations	47
Report on Ungulate Management Recommendations	69
Statement on Regulated Public Hunting of Wolves	77
Report on Outreach and Education	80
Report on Funding Recommendations	87
Appendix A: Stakeholder Advisory Group Members	91
Appendix B: Stakeholder Advisory Group Biographies	92
Appendix C: Stakeholder Advisory Group Meeting Dates and Locations	98
Appendix D: Stakeholder Advisory Group Charter	99

Note: Each of the sections following “About the Stakeholder Advisory Group” and prior to “Appendix A: Stakeholder Advisory Group Members” are the original Stakeholder Advisory Group reports released between November 2021 and August 2022. The reports are reprinted here as the final compilation of all of the SAG’s recommendations. The reports remain unaltered from their original versions, with the exception of a footer, “Final Summary of SAG Recommendations, Fall 2022, [page number] of 103.” The compilation of reports is organized thematically rather than by order of original report release dates.

The Stakeholder Advisory Group was convened by Colorado Parks and Wildlife and supported with third party facilitation from Keystone Policy Center.



KEYSTONE
POLICY CENTER

Introduction from the Stakeholder Advisory Group (SAG)

With the reintroduction of wolves, Colorado has an opportunity to restore its biodiversity while honoring the livelihoods and traditions of our diverse communities. The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group was convened to seek consensus among wolf advocates, ranchers, hunters, outfitters, and conservationists who were tasked to explore the social, economic, and scientific aspects of wolf reintroduction and management in an effort to benefit both wildlife and people.

This charge may have seemed impossible in a world of often polarized opinions. Over the course of 15 months of relationship-building, difficult conversations, and information gathering, the SAG ultimately reached consensus on a wide range of important issues that will guide CPW as wolves are returned to the state. Throughout, the SAG fostered civil discussion and understanding across differences, often resulting in strong convergence even on the most contentious issues.

In the SAG's attempts to reach consensus, members recognized that there are areas where interests and beliefs remained disparate and there was disagreement, as will be the case with the public. However, for Colorado's wolf program to be successful, there is a need to realize that there are real people affected by any decisions and recognize people have more in common than apart. Everything will have unintended consequences that need to be considered and can be lessened by having early conversations that lead to effective actions. Room needs to be made for individual perspectives and locally-based solutions that help resolve challenges and reduce divisions.

Across all topics, SAG members discussed the importance of achieving restoration of wolves with thriving ungulate populations, rural communities, and agricultural economies. Discussions emphasized utilizing science-based, adaptive, and impact-based management at the local level that involves leaving wolves wherever they are if they are not causing problems, minimizing conflict, and addressing issues on a case-by-case basis using a variety of management tools. SAG members also underscored the critical need for long-term funding as well as outreach and engagement to support wolf reintroduction and management.

Per the SAG's charter, consensus recommendations in this report 'will receive priority consideration by CPW.'

Accomplishments of the SAG include consensus on the following topics:

- A variety of [restoration logistics recommendations](#) provided by the Technical Working Group.
- [Preventative, nonlethal wolf-livestock conflict minimization](#).
- [Outcomes and principles for livestock compensation](#). The SAG also [developed and voted on eight compensation plan alternatives](#), reaching a high level of support for several of the alternatives regarding compensation ratios and production losses.
- [Impact-based management assumptions](#). The SAG also developed and reached consensus on a variety of elements for a [framework for impact-based management techniques](#) allowed during various phases of wolf management in Colorado.
- A [statement on regulated public hunting of wolves](#) including a recommendation that a decision on this topic **should not** be made in the restoration and management plan to be finalized in 2023.
- [Ungulate management recommendations](#) regarding strategies to manage ungulate populations and hunter opportunities in the context of wolf reintroduction and management.
- [Funding recommendations](#) to support and sustain a successful wolf restoration and management plan.
- [Outreach and education recommendations](#) to increase trust, transparency, and awareness as a component of a successful restoration and management plan.

About the Stakeholder Advisory Group (SAG)

This is a final summary and compilation of considerations and recommendations provided by the Stakeholder Advisory Group (SAG) for the Colorado Wolf Restoration and Management Plan process. **Per the SAG's charter, consensus recommendations in this report 'will receive priority consideration by CPW.'**

The report synthesizes the SAG reports on restoration logistics; livestock compensation; nonlethal conflict risk reduction; impact-based management; ungulate management and sportsperson opportunities; regulated public hunting; education, engagement, and outreach; and funding. The full-length reports for each topic are included as in chapters in this report.

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan (hereafter, Plan). SAG members were selected through an open application process by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process reflective of the issues and topics to be addressed in the wolf restoration and management plan. The SAG has a number of wolf proponents, sportspersons, scientists, ranchers, outfitters, and many other stakeholders who provide valuable and meaningful input to the agency's planning process. The SAG was conscientiously convened to represent the wide variety of perspectives that people in the state have on wolves; however, the SAG was not intended to proportionately represent the general population, rather to assure adequate representation from critical stakeholder groups. The SAG is comprised of 17 voting members and 3 non-voting members. See [Appendix A for the member list](#) and [Appendix B for SAG biographies](#). It also includes representation from the Southern Ute Tribe; however, this representation is not a substitute for government-to-government consultation.

The CPW-led planning process inclusive of the SAG was approved by the Parks and Wildlife Commission, which is the sole body responsible for creating and approving the Plan as directed by the statute (CRS 33-2-105.8). Colorado Parks and Wildlife (CPW) is responsible for writing the Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of Plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research, or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG was able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option, or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option, or idea that all can live with. See [Appendix D for the SAG charter](#).

Where consensus did not exist, or where it existed and a roll call vote was requested, a roll call vote was taken and the votes of individual voting members present for the vote were recorded along with a summary of the rationale for supportive and dissenting views. Votes taken were recorded for each SAG

member on a 1-5 consensus scale reflecting the following: 1) enthusiastically support; 2) support; 3) can abide by or live with/does not object; 4) object; and 5) strongly object. CPW and the PWC are encouraged to review and consider the details of each vote to understand nuances and insights in situations where consensus was not reached, and to better understand why members objected, supported, or could live with a particular idea.

SAG votes reflect level of support on an issue, not level of consensus; further, a majority or minority of votes does not indicate passage or failure of a recommendation. Because the SAG is an appointed stakeholder body rather than elected representatives, vote results are intended to help illustrate individual, stakeholder views and are not indicative of the proportion of those opinions in Colorado's general population.

The SAG met once monthly in-person from June 2021 to August 2022, including a joint meeting with the Technical Working Group (TWG) in December 2021 and virtually in January 2022. A total of 15 meetings were held with the SAG, inclusive of the SAG-TWG joint meeting. Meetings of the SAG were open to in-person public observation (virtual in the case of the January meeting) and each offered a public comment period. Meeting summaries were developed and published for each meeting. See [Appendix C: Stakeholder Advisory Group Meeting Dates and Locations](#) for a list of meeting dates and locations.

Report on Wolf Restoration Logistics Recommendations

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Wolf Restoration Logistics Recommendations November 2021

This report summarizes Wolf Restoration & Management Plan Stakeholder Advisory Group (SAG) feedback regarding wolf restoration logistics. SAG feedback below is made in reference to the [Technical Working Group's \(TWG\) report and recommendations on restoration logistics](#), and particularly the 'Summary of TWG feedback' sections of that report.

The [summaries of the SAG's August 2021, September 2021, and October 2021 meetings](#) may also be referenced for further detail of SAG member perspectives, questions and suggestions to the TWG regarding clarification of the language and rationale of its report.

The SAG voting members have consensus in support of, and/or without objections to, the TWG's recommendations on the following:

Capture considerations:

- *Donor populations*
- *Capture methods at source*
- *Age ratios*
- *Color ratios*
- *Sex ratios*
- *Genetic considerations*
- *Animal reputation*
- *Disease issues at source sites*
- *What to do with injured animals at source site*
- *Transportation method from source to Colorado*

Animal handling considerations:

- *What to feed during period of captivity, **with the recommendation** that native ungulate meat should be preferred over carnivore logs.*
- *Where and how to hold animals prior to shipping and in Colorado*
- *Immobilization drugs to be used, **with the recommendation** that should a better, reversible drug other than Telazol become available, it should be considered.*
- *Collars/marks on animals initially reintroduced into the state*
- *Samples collected from animals*
- *Veterinarian care in captivity*
- *Disease testing and vaccine treatment*

Reintroduction considerations:

- *Reintroduction technique (hard vs. soft release)*
- *Time of year*

The voting SAG members also discussed the TWG’s recommendations on the following reintroduction considerations, and provided the following feedback:

- *Considerations for where wolves could be released.* SAG members recommended that the following factors also be considered, in addition to those discussed by the TWG: recreation in various forms and contexts; finer detailed spatial sensitivity to local livestock operations and potential acute social conflicts; need for direct engagement with immediately affected communities; and the Brunot Agreement lands (i.e., consideration of management and Tribal consultation needs; not, however, a recommendation to apply a spatial buffer to these lands; a spatial buffer to sovereign Tribal lands is discussed in the TWG report and was suggested by SAG members). It was also suggested that considerations for release sites include deer or elk population Data Analysis Unit (DAU) trends and whether they are below or above objective, as well as impacts on populations of other wildlife species of concern, beyond deer and elk, such as moose, bighorn sheep, lynx and sage grouse. There was not consensus (i.e., full support and/or no objection) for these recommendations; there was a range of support for the TWG recommendations with the above additions, along with various concerns and two formal objections that primarily addressed the process, timing, and/or implications of voting on this specific topic during the SAG October 2021 meeting. SAG members emphasized that their support for the considerations for where wolves could be released does not automatically imply support for specific release locations. There were also concerns that a 75 mile buffer from state and Tribal borders would overly constrain release locations that might otherwise be ecologically and/or socially suitable.
- *Number of release sites (and release areas).* SAG members did not vote on this topic. They discussed arguments for a smaller number of release sites including better ability to manage, concentrate resources, and minimize widespread conflict or social tension. Arguments for a greater number of release sites included maintaining the ability to be flexible in reintroduction; distributing reintroduction over a greater area rather than targeting a smaller number of communities; and the possibility that using multiple areas might better align with the intent of those who voted in support of wolf restoration. Comments cautioned against overly constraining locations and sites.
- *Pace of wolf reintroduction and when to stop and/or pause reintroduction.* SAG members did not vote on these topics. They suggested the importance of adaptive management to assess both the success of wolves and additional factors, including conflict minimization, ungulate population trends, and social attitudes. Arguments for a slow pace included listening to requests from the Western Slope to reintroduce wolves cautiously and slowly; to account for the presence of naturally migrating wolves in Colorado; and to ensure that staffing, financial capacity and ability to respond to conflict is not overwhelmed. Arguments for a medium or fast release pace included ensuring a critical mass of wolves; accounting for potential illegal mortality as well as other challenges to survival; minimizing genetic bottlenecks; avoiding loss of investment due to any of these factors; and consideration of when lethal management tools could become available as related to pace of introduction and the presence vs. rarity of wolves on the landscape; it was suggested that these arguments are similar to those for wolf reintroduction, in general. There was concern as to whether a ‘medium’ pace is a foregone conclusion because it is defined as being between slow and fast paces.

About the Stakeholder Advisory Group:

The Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations. The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klinglesmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Dan Prenzl, Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Recommendations on Preventative, Nonlethal Wolf-Livestock Conflict Minimization

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group to Colorado Parks and Wildlife (CPW)

Recommendations on Preventative, Nonlethal Wolf-Livestock Conflict Minimization March 2022

This report summarizes consensus recommendations of the voting members of the Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) regarding preventative, nonlethal wolf-livestock conflict minimization.

Conflict minimization program principles: Overview

- Conflict minimization should be encouraged and explored as the first line of defense.
- Support both preventative and post-depredation non-lethal practice implementation; emphasize and implement proactive actions where possible and reactive actions as needed.
- Provide financial, technical, and operational assistance to promote and implement conflict minimization and risk reduction practices.
- Apply and update, as relevant, regulations to support non-lethal conflict minimization practices.
- Emphasize context specificity.
- Recognize that not all efforts will prevent loss, while encouraging and supporting implementation and innovation.
- Emphasize producer education and outreach, leveraging experiences and lessons of other producers.
- Provide sufficient agency capacity and funding for implementation.
- As necessary based on resources, prioritize support for those that have experienced losses or are likely to in the near future.
- Use public-private partnerships to support CPW in funding, education, and implementation for conflict minimization.
- Adapt the conflict minimization program over time as needed.

Funding & capacity

- **The conflict minimization program must be robustly and consistently funded for success.**
 - Establish and maintain separate funding sources for conflict minimization and compensation, while providing for adaptability of the program over time to assess and address needs for each.
 - Recognize that long-term funding will be necessary and while there are many potential opportunities, funding sources can be complex and challenging to secure, with competition for a variety of priorities.
 - Funding for each source will ideally be appropriated from taxpayer money (state and/or federal) and/or through multi-year public funds or grants (such as Great Outdoors Colorado (GOCO) and/or federal programs), as well as other sources such as NGOs and private organizations.
 - Sources should be additive to existing funding streams, provide longevity, and be insulated from political debates.
 - Establish a competitive grant or review program to review conflict minimization project proposals.

- Enable additional sources (NGOs, private organizations, etc.) to contribute to funding for conflict minimization.
 - Establish a conflict minimization fund and solicit or encourage external funding contributions early and/or prior to reintroduction while interest is high, so that it is available when needed in both the short- and long-term.
 - External organization funding should support projects and materials; state and federal funding should be used to fund agency staff positions, capacity and services.
 - Match funding mechanisms can be encouraged but should not be required; match could help to increase competitiveness but a requirement should not stand in the way of good projects.
 - Flexibility for external funding contributions is important.
- **CPW capacity should include both depth and breadth of expertise on wolf and large carnivore conflict minimization and management.**
 - Provide a wolf specialist(s) that offers coordination, leadership, consistency and emergency response across the state. The specialist should also broadly understand carnivore conflict minimization. CPW should fund this capacity.
 - Require training for all District Wildlife Managers (DWMs) to create a breadth of experience and insight for all carnivore damage and conflict minimization (bear, lion, wolf).
- **The economics of conflict minimization are a critical consideration for conflict minimization funding, implementation, and management, and will be context-specific.**
 - Economics and efficacy of tools should be considered to inform:
 - Funding needs and sources for the program.
 - Management approaches that consider feasibility of conflict prevention.
 - Economic considerations should be included in training for producers. Community-specific training and insights of resource economists and those with practical experience over time will be important.
 - The specific tools needed, and costs (material and labor) of implementation will vary by situation.
 - Conflict minimization plans ideally should holistically consider not only wolves, but the economics and resiliency of the ranch.

Delivery and implementation of conflict minimization tools

- **Incorporate producer perspectives and concerns in design and implementation of a program.**
 - Producers want to be proactive and preventative in protecting their livestock.
 - Conflict minimization can feel overwhelming to producers. Concerns include but are not limited to:
 - Capacity
 - Cost (to individuals and for the program as a whole)
 - Uncertainty over effectiveness of practices for specific circumstances
 - Interaction with other contracts, leases, and conservation strategies/requirements
 - Guard dogs and liability
 - There is a particular need to provide early support to producers in initial wolf release areas.
- **Success of conflict minimization depends on providing not just the tools and materials, but also support to producers through technical knowledge, training, funding, labor and capacity to effectively implement them.**

- There are details about the implementation for each tool that matter for success. It is important to have the support and insight of people who have experience and knowledge on how to implement and use these tools effectively.
 - Successful use of some tools and materials requires knowledge of both how and when to deploy them and also how and when to remove them. For example, fladry has a limited period of efficacy and should be lent out and reclaimed for use by multiple producers.
 - The costs and labor requirements of specific tools should be considered when anticipating the level of financial and capacity support that will be needed for conflict minimization.
- **Outreach and training should occur proactively and continuously, and should provide practical insights from producers.**
 - Training and shared learning should occur proactively and in an ongoing manner.
 - Training and messaging should be improved and adapted over time based on initial learnings and experiences.
 - Training should include producer-to-producer insights from those with on-the-ground experience.
 - Examples should include realistic, authentic perspectives on conflict minimization, including when it has and has not worked. Examples should include success stories as well as challenges beyond a limited set of case studies.
 - Training should include economic considerations (material and labor costs).
 - Customize training and outreach with personal and local/community scale approaches.
 - Include field demonstrations as part of training in order to provide hands-on, experiential learning about conflict minimization tools.
- **A community level approach can foster broader implementation of conflict minimization.**
 - Some conflict minimization practices are more effective at a community level, and community wide implementation can help to mitigate displacement of impacts among neighboring producers.
 - Under a community level approach, there are a variety of potential partners with community connections that can help to develop a proactive effort.
 - There are existing community cooperatives and structures used by producers to fund and support conflict minimization, and there are also other kinds of community cooperatives (e.g., conservation districts, watershed groups, etc.) that could provide a basis and structure for collaboration.
- **Producers have different relationships with different agencies and organizations; leverage these relationships for success and do not rely on a single messenger.**
 - Consider the role of and potential for resources to support U.S. Department of Agriculture Animal and Plant Health Inspection Service - Wildlife Services (USDA APHIS-W), Colorado Department of Agriculture (CDA), Colorado State University (CSU) Extension and other organizations in conflict minimization.
 - Consider the role of both wildlife and agricultural expertise.
 - A diversity of expertise and public and private sector organizational representation can be beneficial in providing information and training.
- **There is a need for better understanding of how implementation of conflict minimization tools and strategies on federal lands interacts with federal land management expectations, policies, permit requirements and allowances.**
 - There may be opportunities for policy level state or regional discussion on these issues; however, decisions are often specific to allotment conditions and modifying permits is difficult.

About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Dan Prenzlów, Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Comments to the Parks and Wildlife Commission on Proposed Wolf Hazing Regulation

CPW WOLF RESTORATION & MANAGEMENT PLAN STAKEHOLDER ADVISORY GROUP

COMMENTS ON PROPOSED WOLF HAZING REGULATION

December 22, 2021

SUBMITTED to THE PARKS AND WILDLIFE COMMISSION

Regulation Issue Paper:

<https://cpw.state.co.us/Documents/Commission/2021/November/Item.19-W-10-Issue-Hazing.pdf>

Key Concepts:

- We support hazing of wolves as tool to reduce the potential for livestock depredation by wolves, and we also support the prohibition on causing injury to wolves.
- The regulation should make it clear that allowable activities are intended to reduce the immediate threat to livestock. Pursuing wolves for extended time or distance defeats the purpose of training wolves to avoid livestock, greatly increases the likelihood of harm to the wolves, and must be prohibited.
- Inadvertent injury or death caused by hazing could occur. The draft regulation considers such harm as a violation. Some SAG members feel that such unintended harm should not be considered a violation of the law; others feel that it should be a violation.
- Livestock guardian animals can potentially injure or kill wolves. The Mexican gray wolf program has language that addresses such circumstances and does not hold the guard animal's owner liable for an illegal take under those circumstances. The wording from the Mexican gray wolf 10(j) rule is as follows: "Take of Mexican wolves by livestock guarding dogs, when used in the traditional manner to protect livestock on Federal and non-Federal lands, is allowed."
- Most of the techniques permitted by the proposed regulation would clearly not cause injury to wolves. All permitted hazing techniques should be evaluated for their potential to cause injury to wolves with that information provided to the Commission for its consideration. The Commission should be provided with any information or evaluation of the potential for injury specifically from rubber bullets and rubber buckshot. Some SAG members feel that methods that have a high potential for injury should not be permitted.
- Aircraft use by the public should not be permitted for wolf hazing, but it may be a tool for agency use in limited circumstances.
- Horses should be included in the same category as vehicles (e.g., ATVs) to ensure that hazing by range riders or other employees or agents is a legal method. As Commissioner May noted at the November 18 Commission meeting, range riders moving wolves away from livestock could be viewed as a form of hazing and if so, should be explicitly included as an allowable technique; we suggest doing so by adding "horses" to the same section as ATVs and vehicles.

Our suggested specific modifications to the proposed regulation include:

- Adding “employees and agents” to “livestock owners” (Section 1) to make it clear they are authorized to use the hazing techniques.
- Adding “livestock guard animals” (Section 1) so that hazing to prevent injury to those animals by hazing wolves is permissible.
- Adding “including horses” after “ATVs and vehicles...” in Section 1.a.iv so that horseback hazing is specifically permitted.
- Inserting “...but not limited to...” after “such as” in Section 1.a.v to clarify that scare techniques other than those listed are permitted.

SUBMITTED BY THE VOTING MEMBERS OF THE COLORADO PARKS AND WILDLIFE WOLF RESTORATION & MANAGEMENT PLAN STAKEHOLDER ADVISORY GROUP:

- | | | |
|----------------|--------------------|--------------------|
| • Matt Barnes | • Dan Gates | • Brian Kurzel |
| • Donald Broom | • John Howard | • Hallie Mahowald |
| • Jenny Burbey | • Francie Jacober | • Jonathan Proctor |
| • Bob Chastain | • Lenny Klingsmith | • Gary Skiba |
| • Renee Deal | • Darlene Kobobel | • Steve Whiteman |
| • Adam Gall | • Tom Kourlis | |

Report on Livestock Compensation Recommendations

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Livestock Compensation Recommendations February 2022

This report summarizes Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) feedback on livestock compensation elements and alternatives discussed and developed between October 2021 and January 2022. Discussions resulted in:

- General consensus on desired outcomes and principles for a livestock compensation plan.
- Development, discussion, and voting on eight compensation plan alternatives.

Contents

Outcomes, Principles and Recommendations Across All Alternatives	2
SAG Vote Results on Livestock Compensation Plan Alternatives	3
Summary of SAG Discussion of Livestock Compensation Plan Alternatives	5
Cross-cutting discussion themes	5
Alternative 1: Current CPW game damage program	6
Alternative 2: 2004 Wolf Working Group recommendations	6
Proposed new confirmation standard for Alternatives 3, 4, and 5	7
Alternative 3: Simple compensation ratio for missing livestock	8
Alternative 4: Itemization for compensation of production loss and missing livestock	9
Alternative 5: Producer chooses between simple compensation ratio (Alternative 3) OR itemization (Alternative 4)	10
Alternative 6: Outcome-based compensation in addition to ex post (pay for performance)	11
Alternatives 7a and 7b: Outcome-based compensation parallel to ex post alternative 1 or 2 (pay for performance/practices)	12
Appendix A: Detailed Table of Livestock Compensation Plan Alternatives	14
Appendix B: About the Stakeholder Advisory Group	27

Outcomes, Principles and Recommendations Across All Alternatives

Desired outcomes of a livestock compensation plan

- Livestock owners are fairly compensated for losses and are not financially harmed.
- Conflicts are minimized.
- Wolves are restored.
- Trust and support are built across communities.

Principles of a livestock compensation plan

- Build trust, transparency, relationships, and good will with agricultural communities.
- Be consistent, equitable, fair, and robust.
- Value both fair compensation and personal responsibility.
- Be simple and straightforward.
- Provide opportunity for choice and options.
- Recognize different kinds of grazing contexts.
- Promote conflict minimization.
- Support with sustainable funding and capacity.
- Use State-Federal partnerships and public-private partnerships where appropriate for implementation and funding.
- Emphasize education and outreach.
- Maintain fiscal responsibility.

Education and outreach

- Education and outreach are important components of the delivery and communication of a livestock compensation program.
- Incorporate education and outreach for producers to ensure awareness and understanding of the program and administrative processes.
- Incorporate education and information for the public.

Conflict minimization & risk reduction program elements

SAG members recommend that any compensation plan be implemented in conjunction with a robust conflict minimization program. Some compensation plan alternatives considered by the SAG directly incentivize producers' use of nonlethal conflict risk reduction techniques. The SAG recommends a conflict risk reduction program with the following elements:

- Provide financial, technical, and operational assistance to promote and implement conflict minimization and risk reduction practices.
- Apply and update, as relevant, regulations to support nonlethal conflict minimization practices.
- Support both preventative and post-depredation nonlethal practice implementation; emphasize and implement proactive actions where possible and reactive actions as needed.
- Emphasize context specificity.
- Recognize that not all efforts will prevent loss, while encouraging and supporting implementation and innovation.
- Emphasize producer education and outreach, leveraging experiences and lessons of other producers.
- Provide sufficient agency capacity and funding for implementation.
- As necessary based on resources, prioritize support for those that have experienced losses or are likely to in the near future.
- Use public-private partnerships to support CPW in funding, education, and implementation.

SAG Vote Results on Livestock Compensation Plan Alternatives

SAG members developed and discussed eight compensation plan alternatives. Descriptions of and SAG feedback for each alternative are provided in the subsequent sections of this report. SAG members voted at their January 2022 meeting to indicate their preferred alternative as well as their level of support or objection on a consensus scale defined in the SAG charter. The votes of individual members are included in the table on the next page.

In summary:

- **There was not consensus support for any one alternative** (i.e., all members in support of or without objection to an alternative).
- **SAG-developed alternatives for ex post (*after the fact*) compensation had the greatest number of voting SAG members supporting or not objecting:**
 - *Alternative 4: Itemization for compensation of production losses and missing livestock* (15/17 SAG members supporting/not objecting)
 - *Alternative 3: Simple compensation ratio for missing livestock* (14/17 SAG members supporting/not objecting)
 - *Alternative 5: Producer chooses between simple ratio (Alternative 3) or itemization (Alternative 4)* (13/17 members supporting/not objecting)
 - **Alternative 5 had the highest number of SAG members selecting it as their preferred alternative** (11/17 members preferred it over all other options; no other option was preferred by more than 2 SAG members).
- **SAG-developed alternatives for ex ante or outcome-based compensation had a majority of voting SAG members supporting or not objecting:**
 - *Alternative 6: Outcome-based compensation in addition to ex post Alternative 1* (11/17 SAG members supporting/not objecting)
 - *Alternative 7a: Outcome-based compensation parallel to ex post Alternatives 1 and 2* (9/17 SAG members supporting/not objecting)
 - *Alternative 7b: Outcome-based compensation parallel to ex post alternatives 3, 4, and 5* (9/17 SAG members supporting/not objecting)
- **Existing ex post compensation alternatives had the lowest number of voting SAG members supporting or not objecting:**
 - *Alternative 1: Current CPW game damage process* (8/17 SAG members supporting/not objecting)
 - *Alternative 2: 2004 Wolf Working Group recommendations* (7/17 SAG members supporting/not objecting)

SAG Voting Results on Livestock Compensation Plan Alternatives

SAG Livestock Compensation Alternatives Voting Record Sheet - January 27, 2022

Record level of support 1-5 based on consensus scale below*; consensus support exists if everyone is a 1, 2, or 3.

First Name	Last Name	What is your PREFERRED alternative (1-7b?)	Alternative 1: Current Game Damage Process (i.e., preponderance of evidence standard):	Alternative 2: 2004 Wolf Working Group's Recommendations (100% FMV for confirmed, 50% FMV for probable):	Alternative 3: Simple Compensation Ratio for Missing Livestock (\$ stand alone)	Alternative 4: Itemization for Compensation of Production Loss and Missing Livestock (stand alone)	Alternative 5: Producer chooses between simple compensation ratio (Alternative 3) OR itemization (Alternative 4)	Alternative 6: Outcome-based compensation in addition to ex post (pay for performance)	Alternative 7a: Outcome-based compensation parallel to ex post alternative 1 or 2 (pay for performance/practices)	Alternative 7b: Outcome-based compensation parallel to ex post alternative 3, 4, or 5 (pay for performance/practices)
Matt	Barnes	6	2	3	5	4	5	1	1	5
Donald	Broom	5	4	4	2	2	1	4	4	4
Jenny	Burbey	5	4	4	2	2	1	5	4	4
Bob	Chastain	5	3	3	3	3	1	3	3	3
Renee	Deal	5	5	5	2	1	1	5	4	2
Adam	Gall	5	4	4	2	2	2	3	3	3
Dan	Gates	3	2	2	1	3	2	4	5	5
John	Howard	5	5	4	2	2	1	3	4	3
Francie	Jacober	2	2	1	3	3	3	3	3	3
Lenny	Klingesmith	5	5	5	3	1	1	4	5	4
Darlene	Kobobel	1	1	3	4	3	5	2	2	3
Tom	Kourlis	5	5	5	3	3	1	5	5	5
Brian	Kurzel	5	3	4	2	3	2	3	3	4
Hallie	Mahowald	5	4	5	2	2	1	3	4	2
Jonathan	Proctor	5	2	3	3	3	2	3	3	3
Gary	Skiba	7a	2	3	4	3	5	2	1	4
Steve	Whiteman	3	4	5	1	4	4	3	3	3
Total support/no objection (1, 2, or 3)			8	7	14	15	13	11	9	9
Total objections (4 or 5)			9	10	3	2	4	6	8	8
Total SAG members that preferred a specific alternative			1	1	2	0	11	1	1	0
* Consensus scale:										
1	Enthusiastically support									
2	Support									
3	Can abide by or live with; do not object									
4	Object									
5	Strongly object									

Summary of SAG Discussion of Livestock Compensation Plan Alternatives

An overview of each alternative is provided below, followed by a summary of SAG feedback (rationale for support, opposition, and additional considerations).¹ Appendix A includes a more detailed description of each alternative, inclusive of a description of the method of confirmation of depredation events; compensation and eligibility for missing losses, indirect/production losses, ex ante compensation; and additional considerations.

Each alternative assumes the SAG-developed desired outcomes, principles, and conflict minimization and education elements described above. In addition, the alternatives assume the following regarding program administration and funding:

- The livestock compensation program is administered by CPW's game damage program.
- Funding is through appropriations as enumerated in 33-2-105.8 C.R.S.
- Colorado Department of Agriculture has exclusive jurisdiction over depredating animals per 35-40-101 C.R.S.
- Administration and funding for ex ante/outcome-based alternatives 6, 7a, and 7b are to be determined.
- The livestock compensation program should be periodically evaluated and updated if needed (specific recommendations for evaluation of certain alternatives are also offered in the detailed appendix).

Cross-cutting discussion themes

The following cross-cutting themes emerged during SAG member discussions of the alternatives (these themes were recurrent, although not necessarily reflective of full consensus):

- Emphasis on desired outcomes and principles (e.g., fairness and no financial harm, nonlethal conflict minimization, wolf restoration, trust and relationships, simplicity, choice, personal responsibility, funding and fiscal responsibility, etc.; see page 2).
- Importance and interpretation of existing statute.
- Emphasis on basing compensation on best available science.
- Need for a robust conflict minimization program along with a compensation plan.
- Recognition of different values and perspectives regarding grazing, wildlife and public lands.
- Interest in compromise and collaboration across different perspectives.
- Concern regarding the impact of a compensation plan (whether perceived as too generous or too conservative) on producer tolerance and/or public trust.
- Recognition of the range of economic losses caused by wolves to producers.
- Recognition of the role of working lands in supporting habitat and biodiversity.
- Concern regarding unduly blaming wolves for livestock losses and/or creating perverse incentives; concern with lack of discussion of positive impacts of wolves.
- Recognition that details of specific alternatives will need to be further developed.
- Recommendation for periodic evaluation of any compensation plan.
- Interest in further consideration of outcome-based compensation options in the future.
- Interest in harmonization of compensation programs for different predators.
- Likely need to develop new intergovernmental agreements or memoranda of understanding with Tribes to address sovereignty and jurisdiction-related issues such as participation in the State's compensation program and Tribal leadership and/or partnership in investigations of losses on Tribal lands.

¹ SAG meeting summaries from October 2021 through January 2022 may also be referenced for additional discussion of livestock compensation plan elements and alternatives. SAG discussions were also informed by feedback of the Technical Working Group (TWG) to Colorado Parks and Wildlife regarding the technical merit of potential compensation plan elements; see separate TWG report.

Alternative 1: Current CPW game damage program

Overview

CPW's current game damage program used for big game, including carnivores such as black bear and mountain lion, provides 100% Fair Market Value (FMV) for confirmation under a preponderance of evidence standard.

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 1

- Consistency with the existing program is fair and easily administered.
- Support for a program that compensates for verified death and injury and not additional losses and/or unverified losses.
- Wolves should be treated similarly to bears and mountain lions regarding compensation programs. Compensation for unverified losses and/or other losses (above that provided in Alternative 1 or 2) may create conditions where wolves receive undue blame for losses.

Rationale for opposition to Alternative 1

- Alternatives 1 and 2 do not recognize the real economic challenges faced by the agricultural community and do not account for all losses that wolves have been documented to cause, such as missing livestock and production losses. Some suggest that the law requires that these other losses must be covered.
- This alternative does not support outcomes of building trust and keeping livestock producers from being financially harmed. Concern that a compensation plan that is too conservative will impact social tolerance of wolves by producers.

Additional considerations for Alternative 1

- CPW's existing game damage program could be a baseline for compensation, and the other alternatives could be additions to gain social support from the agricultural community.
- Consider the importance and interpretation of existing statute in selecting a compensation program for wolf depredation.
- Regardless of the original intent of the law or the existing program, recommendations developed through the wolf management and planning process may help establish new precedents for livestock compensation due to wolves.
- There is interest in receiving an official attorney general's office opinion about the interpretation of 33-2-105.8 with regards to the State needing to "pay fair compensation to owners of livestock for any losses of livestock caused by gray wolves."

Alternative 2: 2004 Wolf Working Group recommendations

Overview

The 2004 Colorado Wolf Management Working Group developed recommendations to compensate for confirmed losses due to wolves at 100% FMV and at 50% FMV for probable losses.

SAG Feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 2

- Support for the concept of compensating probable losses in addition to confirmed losses.
- Support for a program that compensates for verified death and injury and not additional losses and/or unverified losses, generally consistent with the compensation program for bear and mountain lions.

Compensation for unverified losses and/or other losses (above that provided in Alternative 1 or 2) may create conditions where wolves receive undue blame for losses.

Rationale for opposition to Alternative 2

- Alternative 2 cannot be harmonized with Colorado's existing game damage program because it proposes a different standard for verification.
- While compensating for probable losses due to wolves, this alternative does not fairly compensate producers for all losses, such as missing livestock and production losses, due to wolves.
- Concern that a compensation plan that is too conservative will impact social tolerance of wolves by producers.

Additional considerations for Alternative 2

- Alternative 2 requires definitions and standards for verification for 'confirmed' and 'probable' losses. There are questions as to whether probable losses are already effectively covered within the existing preponderance of evidence standard.

Proposed new confirmation standard for Alternatives 3, 4, and 5

Overview

Alternatives 3, 4 and 5 propose a new standard for the confirmation or verification of depredation events. Specifically, the proposal is for 100% FMV for a depredation event (death or injury) for livestock (including guard and herding animals) that the investigating officer reasonably determines is the result of a wolf depredation, resolving any unknowns in the producer's favor.

SAG feedback on the proposed alternative confirmation (individual comments, not necessarily reflecting consensus):

Rationale for support for new confirmation standard

- The new standard was proposed by some SAG members based on producers' input to them that proving loss and entitlement for compensation for disturbed carcasses and missing animals is impossible under a preponderance of evidence standard because disturbed, scavenged, or lost animals cannot fulfill the burden of proof required of producers.
- The alternative standard was suggested to mitigate the burden of proof, avoid penalizing producers, and resolve unknowns in their favor regarding disturbed/scavenged carcasses and missing animals.
- The new standard was also suggested to keep the process simple for CPW, to maintain positive relationships between CPW and producers, and to enhance social acceptance of predators on the landscape.
- The new standard would allow investigators flexibility to address varying scenarios of depredation investigation and confirmation, offering a more practical approach to allow investigative officers to make a reasonable determination based on their training and experience, including about disturbed carcasses or missing animals.

Rationale for opposition to a new confirmation standard

- Opposition to compensation of full market value (or greater, in the case of a compensation ratio) on less than a preponderance of evidence standard (which requires greater than 50% certainty).
- The new standard may create conditions where wolves receive undue blame for losses.
- The new standard would be inconsistent with the confirmation standard for bears and lions and may impact the ability for compensation programs for wolves and other depredators to be harmonized in the future.

Additional considerations regarding an alternative standard

- A new standard for determining wolf depredation requires additional legal scrutiny and potential statutory change independent of a compensation plan.
- The new standard could be considered in the specific circumstance that CPW or APHIS-WS are not able to respond to a claim in a timely manner.

Alternative 3: Simple compensation ratio for missing livestock

Overview

SAG members developed an alternative to compensate for depredations (death and injury) at 100% FMV confirmed according to the proposed new standard above *and* to compensate for missing livestock (sheep, calves and yearlings) up to a capped compensation ratio. Under the alternative, there must be a depredation event due to gray wolves to claim missing livestock, and the number claimed cannot exceed actual documented livestock loss. A two-tiered approach would provide a higher ratio for producers that employ nonlethal conflict mitigation measures. Compensation for confirmed depredation of livestock (including guard and herding animals) is for any livestock; the compensation ratio for missing animals is only for sheep, calves, and yearlings.

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 3

- Support for compensating for losses that wolves have been documented to cause, including missing livestock.
- Support for a compensation ratio that could account for some additional production losses.
- Support for a simple option for compensation without being overly burdensome to agency capacity or producers.
- Support for two tiers of a compensation ratio to incentivize the use of nonlethal conflict minimization tools.
- Supports outcomes of building trust with the livestock community and keeping livestock producers from being financially harmed.
- Support that the approach compensates for actual losses to the producer because claims are limited to actual documented missing livestock.

Rationale for opposition to Alternative 3

- A ratio may be too generous; some losses are the cost of doing business.
- The alternative may result in compensation for losses that are not due to wolves and may cause wolves to receive undue blame for missing livestock.
- A compensation ratio will create perverse incentives such that sick or injured livestock may be allowed to be taken by large game predators in order to claim a missing livestock compensation ratio; this in turn may disincentivize nonlethal mitigation of conflict and does not achieve desired outcomes.
- Producers should be responsible for verifying the location of livestock to avoid and confirm all losses.
- Nonlethal conflict minimization and mitigation tools are not adequately valued in this alternative as they are not required to receive the lower ratio.
- Compensation for loss on public lands should consider that public lands grazing lease costs are low, with impacts to the environment.
- Does not adequately compensate for production losses.

Additional considerations for Alternative 3

- The rates originally proposed by SAG members were a ratio of 5 for sheep and calves (2.5 for yearlings), increased to a ratio of 7 for sheep and calves (3.5 for yearlings) if the producer employs nonlethal conflict mitigation measures. These rates were proposed based on a literature review specific to "missing" animals (resulting in an average of 5 and a maximum of 7 using six studies that referenced specific numerical values for missing animals or detection rates); review of other states' programs; and consideration for building relationships and tolerance for wolves.
- SAG discussion resulted in revising the proposal to include a two-tier ratio without specified rates, with the recommendation that compensation ratio rates should be determined by a team of experts based on the best available science.
- There is concern about the limited amount of literature on compensation ratios and disagreement among studies regarding appropriate compensation rates. There is concern about basing compensation ratios on other states' programs, such as Wyoming.
- A compensation ratio could also be used to account for some production losses. The ratio might under limited circumstances account for some production losses, such as in cases where some missing livestock may not be due to wolves and producers may still claim them according to eligibility and the proposed cap. However, the ratios discussed (7 and below) were based on studies that only consider missing livestock; one study suggests that compensation ratios would need to be 2 to 3 times larger than the 7:1 ratio used in Wyoming to offset indirect/production impacts.
- Consider an average statewide deduction to account for other losses not caused by wolves and potentially covered by the ratio.
- As an alternative to requiring that a depredation occur in order to claim missing livestock, consider using affidavits or contracts to verify presence of wolves in a herd.
- The use of the term "compensation ratio," rather than "multiplier," better conveys the limitations of compensation within a predetermined cap.
- There is concern that verification of nonlethal conflict mitigation practices to confirm eligibility for a higher ratio could result in a 'check the box' exercise; CPW officers could verify practices onsite when investigating depredations.

Alternative 4: Itemization for compensation of production loss and missing livestock

Overview

SAG members developed an alternative to compensate for depredations (death and injury) at 100% FMV confirmed according to the proposed new standard above *and* to compensate for itemized missing livestock and production losses. Missing livestock claimed (sheep, calves and yearlings only) cannot exceed actual documented livestock loss and would factor in a baseline (pre-wolf reintroduction) loss rate. General considerations are provided for how a producer might itemize production losses (losses unaccounted for by direct depredation, such as decreased weaning weights and decreased conception rates) with reference to baseline data. The alternative suggests that a depredation incident is required to itemize losses, however other eligibility criteria could be considered. Conflict minimization practice implementation is not a requirement but could be considered as an additional incentive for compensation.

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 4

- Support for compensating for losses that wolves have been documented to cause, including missing livestock and additional production losses. Fair compensation includes direct and indirect losses.
- Provides an opportunity for producers to prove and be compensated for actual impacts and losses due to wolves, including depredation, missing livestock (without a cap on the actual number of missing

livestock that can be claimed), and verified production losses such as decreased weaning and/or conception rates.

- The alternative best compensates the losses that occur once wolves are depredating livestock by paying the difference between the normal cost of doing business prior to wolf depredation and the additional losses that occur following wolf depredation.
- Supports outcomes of building trust with the livestock community and keeping livestock producers from being financially harmed.

Rationale for opposition for Alternative 4

- Lack of simplicity for producers and for agency staff.
- Potential fiscal impacts of a program that allows compensation for all missing livestock and production losses due to wolves.
- Compensation of production losses is too generous; some losses are the cost of doing business.
- Nonlethal conflict mitigation tools are not adequately valued in this alternative.
- The alternative may result in compensation for losses that are not due to wolves (including those due to other predators and to other conditions such as climate change); this may cause wolves to receive undue blame for livestock impacts.

Additional considerations for Alternative 4

- Examples provided within the alternative for how a producer might itemize losses are general considerations; details would need to be further refined. Some concerns were offered regarding how to construct baseline averages (including how many years are included; the role of drought years in the average; and the impact of operational size on interannual baselines).
- Consider inclusion of mature cattle, goats and other livestock in itemizing missing livestock.
- Some losses, such as loss of forage, were considered by some as outside the scope of a compensation program; others supported that they could be addressed through the stipulation for consideration of other losses on a case-by-case basis.

Alternative 5: Producer chooses between simple compensation ratio (Alternative 3)

OR itemization (Alternative 4)

Overview

SAG members developed an alternative to compensate for depredations (death and injury) at 100% FMV confirmed according to the proposed new standard above *and* to allow producers to choose between receiving a simple compensation ratio for missing livestock (Alternative 3) or itemizing to claim missing livestock and production losses (Alternative 4).

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 5

- Provides producers with choices to better meet different needs and capacity to itemize losses.
- See rationales for Alternatives 3 and 4 regarding support for compensating for missing livestock and production losses via compensation ratio or itemization.

Rationale for opposition to Alternative 5

- See rationales for Alternatives 3 and 4 regarding opposition to compensating for missing livestock and production losses via compensation ratio or itemization.

Additional considerations for Alternative 5

- A compensation ratio may not need to be as high nor as precise in reflecting missing livestock rates when combined with the opportunity to instead itemize losses.

Alternative 6: Outcome-based compensation in addition to ex post (pay for performance)

Overview

SAG members developed an alternative to compensate producers for depredations at 100% FMV for confirmation under a preponderance of evidence standard (current game damage program; Alternative 1) *and* to provide conservation performance payments for wolf survival, independent of direct or indirect impacts. Conservation performance payments would be allocated by algorithm, based on a points system considering wolf pack home ranges, overlap with ranches and livestock exposure/risk, wolf survival to end of year, and implementation of nonlethal preventative conflict minimization practices.

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 6

- This alternative creates a market-like program that incentivizes desired outcomes: wolf restoration and presence on the landscape, maintenance of working lands and wildlife habitat, livestock production, and implementation of nonlethal conflict minimization.
- Provides compensation both for confirmed depredations and additional economic support for the outcomes noted above. See rationale for support for Alternative 1 for ex post compensation.
- Incentivizes prevention of conflict without requiring any specific strategies or tools.
- Incentivizes finding carcasses in time to get them investigated and compensated for confirmed depredations.
- Economic approaches suggest that it is more effective to reward the outcomes that society values (both livestock and wolves staying alive) than to pay for undesired outcomes (i.e., depredation and loss).

Rationale for opposition to Alternative 6

- The outcome-based alternatives lack social and economic certainty to garner adequate buy-in at the outset of reintroduction.
- The lack of economic data needed to appropriately and meaningfully fund pay for presence limits the potential effectiveness of the strategy.
- Concern about fairness in distribution of pay for presence funds vs. the actual impacts; wolves could be present but not depredating in some operations while they are present and depredating in others.
- The alternative does not compensate for all losses that wolves have been documented to cause, such as missing livestock and production losses. Some suggest that the law requires that these other losses must be covered. See rationale for opposition to Alternative 1 for ex post compensation.
- Would require increased agency capacity and monitoring.

Additional considerations for Alternative 6

- Continue developing outcome-based alternatives for the future. Outcome-based compensation could be considered as future program alternatives when more Colorado-specific wolf-livestock compensation and socioeconomic costs and benefits are available.
- Like all alternatives, cost will increase with wolf population, however individual wolf value can decrease with population increase.

Alternatives 7a and 7b: Outcome-based compensation parallel to ex post alternative 1, 2, 3, 4, or 5 (pay for performance/practices)

Overview

SAG members proposed an alternative to compensate for nonlethal conflict mitigation practices under which producers could bid competitively to opt out of a parallel ex post program. The producer bid would include proactive practices as well as the amount the producer would accept to opt out of ex post; proposals would be reviewed by a board and ranked based on wolf presence, risk, practices, and bid. This alternative can be complementary to other financial and technical assistance programs for nonlethal conflict minimization. The approach was suggested by an economist and is based roughly on the competitive bidding process in the USDA Conservation Stewardship Program.

The distinction between Alternatives 7a and 7b is the parallel ex post program from which the producer bids to opt out. In 7a, the parallel ex post compensation program is either Alternative 1 or Alternative 2 (compensation for confirmed death or injury). In 7b, the parallel ex post compensation program is Alternative 3, 4, or 5 (inclusive of compensation for confirmed death or injury, missing livestock, and some production losses).

SAG feedback (individual comments, not necessarily reflecting consensus):

Rationale for support for Alternative 7a and/or 7b

Arguments supporting both options

- The alternative creates a market-like program that incentivizes desired outcomes: wolf restoration and presence on the landscape, maintenance of working lands and wildlife habitat, livestock production, and implementation of nonlethal conflict minimization.
- Economic approaches suggest that it is more effective to reward the outcomes that society values (both livestock and wolves staying alive) than to pay for undesired outcomes (i.e., depredation and loss).
- Incentivizes prevention of conflict, including creative and pooled practices, without requiring any specific strategies or tools.

Arguments supporting Alternative 7a only

- Providing Alternative 1 or 2 as the parallel ex post program keeps costs lower and provides a stronger incentive for a producer to bid to opt out in order to receive funding for preventative practices.
- See Alternatives 1 and 2 for rationale for support for these ex post compensation programs.

Arguments supporting Alternative 7b only

- Providing Alternative 3, 4, or 5 as the parallel ex post program gives the producer a choice to opt in or out of a program that compensates for missing livestock and production losses.
- See Alternatives 3, 4, and 5 for rationale for support for these ex post compensation programs.

Rationale for opposition to Alternative 7a and/or 7b

Arguments opposing both options

- The outcome-based alternatives lack social and economic certainty to garner adequate buy-in at the outset of reintroduction.
- The lack of economic data needed to appropriately and meaningfully fund this alternative limits the potential effectiveness of the strategy.
- Increased burden of agency staff in tracking wolf activity and reviewing bid proposals.

- Concern about fairness in distribution of pay for performance/practice funds vs. the actual impacts; wolves could be present but not depredating in some operations while they are present and depredating in others, including those that implement conflict minimization.

Arguments opposing 7a only

- See Alternatives 1 and 2 for rationale for opposition to these ex post compensation programs.

Arguments opposing 7b only

- See Alternatives 3, 4, and 5 for rationale for opposition to these ex post compensation programs.
- Providing Alternative 3, 4, or 5 for the ex post compensation program is more costly; the funding for the pay for performance program would need to be scaled to match the funding of the ex post program.
- By covering additional losses (missing livestock, production losses) in the ex post option, the alternative decreases the incentive for producers to opt out of ex post and to implement preventative practices.

Additional considerations for the Alternatives 7a and 7b

- Continue developing outcome-based alternatives for the future. Outcome-based compensation could be considered as future program alternatives when more Colorado-specific wolf-livestock compensation and socioeconomic costs and benefits are available.
- Available funding would need to be adequate to incentivize opting out of ex post.
- Like all alternatives, cost will increase with wolf population; ranking of bids should evolve as wolf population spreads.

Appendix A: Detailed Table of Livestock Compensation Plan Alternatives

Program Components	Alternative 1: Current Game Damage Process (i.e., preponderance of evidence standard):
Confirmation of depredation events	Depredations compensated at 100% FMV for confirmation under preponderance of evidence standard if no sales receipts/contracts. Livestock injured/killed by wolves will be compensated up to fair market value of animal or \$5k limit. CPW/WS-APHIS has investigative authority.
Compensation rate for missing livestock?	No compensation for missing livestock, closest is running age ewes (1.5 times lamb price).
Eligibility requirements for claiming/compensating missing livestock?	No compensation for missing livestock.
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)	N/A
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	N/A
Eligibility for ex ante?	N/A
Additional considerations? (phasing, program evaluation, etc.)	
Documented Peer Reviewed Case Studies	

Program Components	Alternative 2: 2004 Wolf Working Group's Recommendations (100% FMV for confirmed, 50% FMV for probable):
Confirmation of depredation events	<ul style="list-style-type: none"> * Confirmed kills paid at 100% FMV (up to 5k/head). * Probable kills paid at 50% of market value. * Livestock injured/killed by wolves will be compensated up to fair market value of animal or \$5k limit. * CPW/WS-APHIS has investigative authority.
Compensation rate for missing livestock?	No compensation for missing livestock, closest is running age ewes (1.5 times lamb price).
Eligibility requirements for claiming/compensating missing livestock?	No compensation for missing livestock.
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)	N/A
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	N/A
Eligibility for ex ante?	N/A
Additional considerations? (phasing, program evaluation, etc.)	Requires definitions for 'confirmed' and 'probable.'
Documented Peer Reviewed Case Studies	

Program Components	Alternative 3: Simple Compensation Ratio for Missing Livestock (Stand alone)
Confirmation of depredation events	<p>*100% FMV for depredation event (death or injury) that the investigating officer reasonably determines is the result of a wolf depredation resolving any unknowns in the producer’s favor.</p> <p>*Document level of confidence (based on criteria TBD, e.g., highly confident, confident, reasonably confident) it was clear evidence to help inform other management options.</p> <p>*Livestock (including guard and herding animals) injured/killed by wolves will be compensated up to fair market value of animal or \$5k limit (per statute 33.3 - 101a) - this limit needs to be updated if necessary.</p> <p>*CPW/WS-APHIS has investigative authority.</p>
Compensation rate for missing livestock?	<ul style="list-style-type: none"> • A or B Compensation ratio for missing sheep & calves. • (.5)A or (.5)B Compensation ratio for missing yearlings. • Proposed 2-tier compensation ratio: <ul style="list-style-type: none"> • Compensation ratio of A for missing sheep and calves ((.5)A for yearlings). • Increased to compensation ratio of B for missing sheep and calves ((.5)B for yearlings) if the producer employs conflict mitigation measures. • Rate A and B should be two different rates determined by best available science. • Initially proposed rate: A = 5 and rate B = 7: see references for rationale.
Eligibility requirements for claiming/compensating missing livestock?	<ol style="list-style-type: none"> 1. Must have a depredation event (death or injury) due to gray wolves. 2. Missing livestock claimed for compensation ratio must be sheep, calves, or yearlings. 3. Losses are reported by the producer; lead with trust and further investigate missing livestock claims as appropriate. 4. Missing livestock claimed cannot exceed actual documented livestock loss (following the procedure set forth in Wyoming's compensation ratio program). 5. Investigator may consider role of topography/vegetation. 6. Conflict minimization is not a requirement for damage compensation at a ratio of A. 7. Increase ratio to B if conflict minimization is employed. <ol style="list-style-type: none"> a. Consider verification of nonlethal techniques during initial depredation confirmation.

Program Components	Alternative 3 (continued): Simple Compensation Ratio for Missing Livestock (Stand alone)
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)	<p>Compensation ratio for missing livestock attempts to account for some production losses: some missing livestock may not be due to wolves and producers may claim according to eligibility and proposed cap.</p> <p>An alternative consideration is that a state average baseline for missing livestock loss rate (pre-wolf reintroduction) should be subtracted from actual missing number of livestock, to determine an adjusted number to be claimed. Under this mechanism, the ratio likely does not cover some additional production losses.</p>
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	See ex ante program components
Eligibility for ex ante?	Covered in ratio differences
Additional considerations? (phasing, program evaluation, etc.)	<p>Collect pre-implementation baseline data as well as data on losses, claims and payments for first 3-5 years of implementation; evaluate program after that timeframe and adjust missing livestock compensation rate and types of animals covered as appropriate. Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough. Consider operation of a compensation program in partnership with CO Department of Ag and/or Wildlife Services to leverage existing relationships with producers.</p> <p>Once wolf status is changed to delisted, harmonize the program into an overall big game compensation program to avoid unintended consequences.</p>
Documented Peer Reviewed Case Studies	Literature on numerical ratios: Oakleaf, 2003; Bangs & Shivak, 2001; Somers, 2010, Switaski, 2002; Lehmkuhler, 2007; DSEIS, 2021 (USFWS)

Program Components	Alternative 4: Itemization for Compensation of Production Loss and Missing Livestock (stand alone)
Confirmation of depredation events	<p>*100% FMV for depredation event (death or injury) that the investigating officer reasonably determines is the result of a wolf depredation resolving any unknowns in the producer’s favor.</p> <p>*Document level of confidence (based on criteria TBD, e.g., highly confident, confident, reasonably confident) it was clear evidence to help inform other management options.</p> <p>*Livestock (including guard and herding animals) injured/killed by wolves will be compensated up to fair market value of animal or \$5k limit (per statute 33.3 - 101a) - this limit needs to be updated if necessary.</p> <p>*CPW/WS-APHIS has investigative authority.</p>
Compensation rate for missing livestock?	This alternative compensates for missing livestock via itemization.
Eligibility requirements for claiming/compensating missing livestock?	<ol style="list-style-type: none"> 1. Must have a depredation incident (death or injury) to itemize. <ol style="list-style-type: none"> a. Consider removal of this requirement or alternative eligibilities, such as documented depredation for other producers or presence of wolves. 2. Missing livestock claimed for compensation ratio must be sheep, calves, or yearlings. 3. Losses are reported by the producer; lead with trust and further investigate missing livestock claims as appropriate. 4. Missing livestock claimed cannot exceed actual documented livestock loss (following the procedure set forth in Wyoming's compensation ratio program). 5. No topography requirement for eligibility. 6. Practice implementation is not a requirement for itemized damage compensation. <ol style="list-style-type: none"> a. Consider developing a mechanism to incentivize the use of nonlethal conflict risk reduction techniques. For example, producers qualify for a type or percentage of losses with nonlethal tools, and all available production losses if nonlethal tools are used.

Program Components	Alternative 4 (continued): Itemization for Compensation of Production Loss and Missing Livestock (stand alone)
<p>Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)</p>	<ul style="list-style-type: none"> • Losses are proven by application and documentation as follows (this can apply for one or more of the following options). The following are general considerations, with details to be developed: <ol style="list-style-type: none"> 1. Missing animals: Baseline death loss is submitted with percentages over a minimum of 3 years pre-wolf presence using production records. Additional losses beyond this baseline must be demonstrated to qualify for additional death loss. Consider calculating an average at a greater temporal scale that considers both production highs and lows, due to drought or other factors to eliminate variability. 2. Decreased weaning weights: Baseline weights over a minimum of 3 years must be submitted along with current year weights. Data can be submitted via weight tickets, production records, or sales records. 3. Decreased conception rates: Baseline conception rates over a minimum of 3 years must be submitted along with current year rates. Data can be submitted via production and/or vet records. <ul style="list-style-type: none"> • Additional losses can be considered on a case-by-case basis by the division. • Consider factoring size of operation and/or interannual changes in operation.
<p>Eligibility for 'indirect' loss compensation?</p>	<ol style="list-style-type: none"> 1. Depredation event (death or injury) automatically qualifies a producer to apply for production loss compensation. <ol style="list-style-type: none"> a. Consider removal of this requirement or alternative eligibilities, such as documented depredation for other producers or presence of wolves.
<p>Ex ante program components?</p>	<p>N/A</p>
<p>Eligibility for ex ante?</p>	<p>N/A</p>
<p>Additional considerations? (phasing, program evaluation, etc.)</p>	<p>Compile data from producers who file claims to report out the level of production losses experienced. Evaluate program after 3-5 years to identify whether there is a cleaner/easier way to cover the losses. Consider tweaking the process based on producer/CPW feedback on ease of application and administration and with considerations on the wolf population. OR consider going to a straight ratio that would be comparable to the actual losses that are demonstrated through this program (ease of use long-term). Once wolf status is changed to delisted, harmonize the program into an overall big game compensation program to avoid unintended consequences.</p>
<p>Documented Peer Reviewed Case Studies</p>	<p>Steele, 2013; Sommers, 2010; Lehmkuhler, 2007; DSEIS, 2021 (USFWS); Ramler, 2014; Widman, 2019; Cooke, 2013</p>

Program Components	Alternative 5: Producer chooses between simple compensation ratio (Alternative 3) OR itemization (Alternative 4)
Confirmation of depredation events	<p>*100% FMV for depredation event (death or injury) that the investigating officer reasonably determines is the result of a wolf depredation resolving any unknowns in the producer's favor.</p> <p>*Document level of confidence (based on criteria TBD, e.g., highly confident, confident, reasonably confident) it was clear evidence to help inform other management options.</p> <p>*Livestock (including guard and herding animals) injured/killed by wolves will be compensated up to fair market value of animal or \$5k limit (per statute 33.3 - 101a) - this limit needs to be updated if necessary.</p> <p>*CPW/WS-APHIS has investigative authority.</p>
Compensation rate for missing livestock?	Producer has option to choose between either simple compensation ratio (alternative 3) or itemization (alternative 4); producer may not do both.
Eligibility requirements for claiming/compensating missing livestock?	Eligibility requirements same as alternative 3 or 4, depending on which option the producer chooses.
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)	See alternative 3 or 4, depending which option the producer chooses.
Eligibility for 'indirect' loss compensation?	See alternative 3 or 4, depending which option the producer chooses.
Ex ante program components?	See alternative 3 or 4, depending which option the producer chooses.
Eligibility for ex ante?	See alternative 3 or 4, depending which option the producer chooses.
Additional considerations? (phasing, program evaluation, etc.)	Considerations in 3&4 should be evaluated along with also looking at which program is most widely used in an attempt to simplify the process after the evaluation time.
Documented Peer Reviewed Case Studies	See alternative 3 or 4

Program Components	Alternative 6: Outcome-based compensation in addition to ex post (pay for performance)
Confirmation of depredation events	See alternative 1 for ex post compensation.
Compensation rate for missing livestock?	N/A
Eligibility requirements for claiming/compensating missing livestock?	N/A
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning?)	N/A
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	<p>Payments based on wolf pack home ranges and overlap with ranches, and wolf survival to end of year.</p> <p>Payments based on an algorithm, similar to that used by the Mexican Wolf Livestock Council, where points are used to assign percentage of available funding.</p> <p>The following would be an example of that framework:</p> <ul style="list-style-type: none"> • Step 1: Core Area/2 points per core area + Territory/1 point per territory + Wolf Pups/1 point per pup = Subtotal A. • Step 2: Subtotal A is multiplied by 2 if applicant is implementing preventative practices = Subtotal B. • Step 3: The Number of Livestock (AU) (cow/calf is 1; yearling is 0.5) that are exposed to wolves is divided by 100 = Subtotal C. • Step 4: Subtotal B is multiplied by Subtotal C = Grand Total. <p>*Algorithm may be adjusted to reduce bias toward larger producers, e.g., by beginning with a minimum payment regardless of herd size.</p>
Eligibility for ex ante?	Livestock producer (in occupied wolf habitat). May need to enroll to determine ranch geography, number of livestock exposed, period of time, etc.

<p>Program Components</p>	<p>Alternative 6 (continued): Outcome-based compensation in addition to ex post (pay for performance)</p>
<p>Additional considerations? (phasing, program evaluation, etc.)</p>	<p>Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive is for producer to prevent livestock from being killed and to find any missing livestock.</p> <p>Conservation performance payments are for wolf survival, independent of direct or indirect effects. Incentive is for producer to prevent conflict.</p> <ul style="list-style-type: none"> * Like all alternatives, cost will increase with wolf population. * But individual wolf value can decrease with population increase. * Should include a sunset clause: expire, renew, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. *Would require increased agency capacity and monitoring. <p>Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.</p>
<p>Documented Peer Reviewed Case Studies</p>	<p>Conservation performance payments preferred by numerous authors and most economists (Nelson 2009; Breck et al. 2011; Dickman et al. 2011; Harris 2020; Macon 2020). Dickman et al (2011) recommended a combo with majority of funds to outcome-based and minority to ex post.</p> <p>Harris (2020) speculated that most benefits of performance-based could be captured by practice-based.</p> <p>Examples:</p> <ul style="list-style-type: none"> Mexican Wolf Livestock Coexistence Council (Strategic Plan 2014). Viviendo con los Gatos (rare cats in Sonora) (Nistler 2007). Sweden lynx & wolverine, with semi-domesticated reindeer (Persson et al. 2015).

Program Components	Alternative 7a: Outcome-based compensation parallel to ex post alternative 1 or 2 (pay for performance/practices)
Confirmation of depredation events	<ul style="list-style-type: none"> • <i>Depredations are investigated but have no bearing on compensation.</i> • Producers bid competitively to opt out of parallel ex-post program (Alternatives 1 or 2). <ul style="list-style-type: none"> o Bids include proactive practices as well as the amount the producer would accept to opt out of ex-post; reviewed by a board and ranked based on wolf presence, risk, practices, and bid. o Conceptually similar to USDA's Conservation Stewardship Program. o Allow pooled bids from multiple producers in a geographic area. o Can be complementary to other financial and technical assistance programs for conflict minimization
Compensation rate for missing livestock?	N/A
Eligibility requirements for claiming/compensating missing livestock?	N/A
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning)?	N/A
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	<p>Producer bids to opt out of all ex post compensation.</p> <ul style="list-style-type: none"> *May include proactive, preventative strategies (e.g., husbandry practices, guard animals, carcass removal) and/or tools (e.g., fences, light and noise devices). * Practices may be invented by livestock owners (rewards creativity). * Bids are reviewed by a board and ranked based on wolf presence, livestock risk, and bid amount.
Eligibility for ex ante?	Livestock producer (in occupied wolf habitat), by competitive bid.

<p>Program Components</p>	<p>Alternative 7a (continued): Outcome-based compensation parallel to ex post alternative 1 or 2 (pay for performance/practices)</p>
<p>Additional considerations? (phasing, program evaluation, etc.)</p>	<p>Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive is for producer to prevent livestock from being killed and to find any missing livestock.</p> <p>Conservation performance payments are for proactive practices and wolf survival, independent of direct or indirect effects. Incentive is for producer to prevent conflict.</p> <ul style="list-style-type: none"> * Like all alternatives, cost will increase with wolf population. * Ranking should evolve as wolf population spreads and needs change. * Should include a sunset clause: expire, renew, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. * Available funding would need to be adequate enough to incentivize opting out of ex post. Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.
<p>Documented Peer Reviewed Case Studies</p>	<p>Harris/MFWP (2020): Payment for practices may be simpler than payment for conservation performance per se. For bid process, none; but recommended by economist (Dana Hoag presentation) Conceptually similar to CSP.</p>

Program Components	Alternative 7b: Outcome-based compensation parallel to ex post alternative 3, 4, or 5 (pay for performance/practices)
Confirmation of depredation events	<p><i>Depredations investigated but have no bearing on compensation.</i></p> <p>Producers bid competitively to opt out of parallel ex-post program (Alts. 3, 4, 5).</p> <ul style="list-style-type: none"> * Bids include proactive practices as well as the amount the producer would accept to opt out of ex-post; reviewed by a board and ranked based on wolf presence, risk, practices, and bid. * Conceptually similar to USDA's Conservation Stewardship Program. * Allow pooled bids from multiple producers in a geographic area. * Can be complementary to other financial and technical assistance programs for conflict minimization.
Compensation rate for missing livestock?	N/A
Eligibility requirements for claiming/compensating missing livestock?	N/A
Compensation amount for other ('indirect') losses (i.e., pregnancy and weaning)?	N/A
Eligibility for 'indirect' loss compensation?	N/A
Ex ante program components?	<p>Producer bids to opt out of all ex post compensation.</p> <ul style="list-style-type: none"> * May include proactive, preventative strategies (e.g., husbandry practices, guard animals, carcass removal) and/or tools (e.g., fences, light and noise devices). * Practices may be invented by livestock owners (rewards creativity). * Bids are reviewed by a board and ranked based on wolf presence, livestock risk, and bid amount.
Eligibility for ex ante?	Livestock producer (in occupied wolf habitat), by competitive bid

<p>Program Components</p>	<p>Alternative 7b (continued): Outcome-based compensation parallel to ex post alternative 3, 4, or 5 (pay for performance/practices)</p>
<p>Additional considerations? (phasing, program evaluation, etc.)</p>	<p>Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive is for producer to prevent livestock from being killed and to find any missing livestock.</p> <p>Conservation performance payments are for proactive practices and wolf survival, independent of direct or indirect effects. Incentive is for producer to prevent conflict.</p> <ul style="list-style-type: none"> * Like all alternatives, cost will increase with wolf population. * Ranking should evolve as wolf population spreads and needs change. * Should include a sunset clause: expire, renew, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. * Available funding would need to be adequate enough to incentivize opting out of ex post. <p>Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.</p>
<p>Documented Peer Reviewed Case Studies</p>	<p>Harris/MFWP (2020): Payment for practices may be simpler than payment for conservation performance per se. For bid process, none; but recommended by economist (Dana Hoag presentation) Conceptually similar to CSP.</p>

SAG Livestock Compensation Plan Alternatives January 28, 2022								
Program Component	Alternative 1: Current Game Damage Process (i.e., preponderance of evidence standard)	Alternative 2: 2004 Wolf Working Group's Recommendations (100% FMV for confirmed, 50% FMV for probable)	Alternative 3: Simple Compensation Ratio for Missing Livestock (Stand alone)	Alternative 4: Itemization for Compensation of Production Loss and Missing Livestock (Stand alone)	Alternative 5: Producer chooses between simple compensation ratio (Alternative 3) OR Itemization (Alternative 4)	Alternative 6: Outcome-based compensation in addition to ex post (pay for performance)	Alternative 7a: Outcome-based compensation parallel to ex post alternative 1 or 2 (pay for performance/practices)	Alternative 7b: Outcome-based compensation parallel to ex post alternative 3, 4, or 5 (pay for performance/practices)
Confirmation of depredation events	Depredations compensated at 100% FMV for confirmed and 50% FMV for probable of evidence standard if no sales receipt/contract. Livestock itemized/verified by wolves will be compensated up to fair market value of animal or ISA limit. CPWV/WS APHS has investigative authority.	Confirmed kills paid at 100% FMV (up to \$50k). Probable kills paid at 50% of market value. Livestock itemized/verified by wolves will be compensated up to fair market value of animal or ISA limit. CPWV/WS APHS has investigative authority.	100% FMV for depredation event (death or injury) but the investigating officer reasonably determines the result of a wolf depredation resulting any circumstances in the producer's favor. "Document level of confidence based on criteria 1B, e.g., highly confident, confident, reasonably confident (or) it was clear evidence to help inform other management options." Livestock (including guard and hearing animals) itemized/verified by wolves will be compensated up to fair market value of animal or ISA limit (per statute 33-3-101a). This limit needs to be updated if necessary. CPWV/WS APHS has investigative authority.	100% FMV for depredation event (death or injury) but the investigating officer reasonably determines the result of a wolf depredation resulting any circumstances in the producer's favor. "Document level of confidence based on criteria 1B, e.g., highly confident, confident, reasonably confident (or) it was clear evidence to help inform other management options." Livestock (including guard and hearing animals) itemized/verified by wolves will be compensated up to fair market value of animal or ISA limit (per statute 33-3-101a). This limit needs to be updated if necessary. CPWV/WS APHS has investigative authority.	100% FMV for depredation event (death or injury) but the investigating officer reasonably determines the result of a wolf depredation resulting any circumstances in the producer's favor. "Document level of confidence based on criteria 1B, e.g., highly confident, confident, reasonably confident (or) it was clear evidence to help inform other management options." Livestock (including guard and hearing animals) itemized/verified by wolves will be compensated up to fair market value of animal or ISA limit (per statute 33-3-101a). This limit needs to be updated if necessary. CPWV/WS APHS has investigative authority.	See alternative 3 for ex post compensation	Depredations investigated but have no bearing on compensation. Producers bid competitively to opt out of parallel ex-post program (Aha, 2 & 3). * Bids include proactive practices as well as the amount the producer would accept to opt out of ex post; reviewed by a board and ranked based on wolf presence, risk practices, and bid. * Conceptually similar to USDA Conservation Stewardship Program. * Allow pooled bids from multiple producers in a geographic area. * Can be complementary to other financial and technical assistance programs for conflict resolution.	Depredations investigated but have no bearing on compensation. Producers bid competitively to opt out of parallel ex-post program (Aha, 2, & 3). * Bids include proactive practices as well as the amount the producer would accept to opt out of ex post; reviewed by a board and ranked based on wolf presence, risk practices, and bid. * Conceptually similar to USDA Conservation Stewardship Program. * Allow pooled bids from multiple producers in a geographic area. * Can be complementary to other financial and technical assistance programs for conflict resolution.
Compensation rate for missing livestock?	No compensation for missing livestock, sheep is running age ewes (1.5 times lamb price)	No compensation for missing livestock, sheep is running age ewes (1.5 times lamb price)	A or B Compensation ratio for missing sheep & calves & 1.5B or 1.5B Compensation ratio for missing yearlings Proposed 2 tier compensation ratio: 1) Compensation rate of A for missing sheep and calves (1.5B for yearlings) 2) Increased compensation rate of B for missing sheep and calves (1.5B for yearlings) if the producer employs conflict mitigation measures.	This alternative is a way to itemize for missing animals and production losses.	Producer has option to choose between either simple/straight compensation ratio (Alternative 3) or itemization (Alternative 4); producer may not do both.	N/A	N/A	N/A
Eligibility requirements for claiming/compensating missing livestock?	No compensation for missing livestock.	No compensation for missing livestock.	1. Must have a depredation event (death or injury) by a wolf. 2. Livestock must be sheep, calves or yearlings. 3. Losses are reported by the producer. Lead with trust and further investigate missing livestock claims as appropriate. 4. Missing livestock claimed cannot exceed actual documented livestock loss. 5. Investigator may consider rule of thumb/estimation. 6. Conflict minimization is not a requirement for damage compensation at a ratio of 5. 7. Any the ratio for 3 of conflict minimization is employed (for further consideration, specific on what qualifies for the what the validation is).	1. Must have a depredation incident (death or injury) to itemize. "Consider whether it is always a requirement 2. Livestock must be sheep, calves or yearlings. 3. Losses are reported by the producer. Lead with trust and further investigate missing livestock claims as appropriate. 4. Missing livestock claimed cannot exceed actual documented livestock loss (following the producer set both in Wyoming's program). 5. No topography requirement. 6. Practice implementation is not a requirement for itemized damage compensation HOWEVER include an incentive for more compensation available if conflict minimization is applied.	Eligibility requirements same as alternative 3 or 4, depending on which option the producer chooses.	N/A	N/A	N/A
Compensation amount for other (wildlife) losses (i.e., pregnancy and weaning)?	N/A	N/A	1) Compensation ratio for missing livestock attempt to account for some production loss. Additional consideration: should there be subtraction of a state average baseline (pre-wolf reintroduction) loss rate from actual missing number to be claimed? However, this would mean that the ratio likely does not attempt to cover some additional production loss. 2. Decreased weaning weights. Baseline weights over a minimum of 3 years must be submitted along with current year weights. Further consideration: role of drought years? Data can be submitted as weight tickets, production records, or sales records. 3. Decreased conception rates. Baseline conception rates over a minimum of 3 years must be submitted along with current year rates. Data can be submitted as production and/or set records. 4. Additional losses can be considered on a case-by-case basis by the division. Consider "how to factor in operation/line changes year to year"	Proven by application and documentation for additional losses as follows (can apply for one or more of the following options)... The following are general considerations, with details to be developed: 1. Missing animals. Baseline death loss is submitted with percentages over a minimum of 3 years using production records. Loss above that must be substantiated with parity for additional death loss. 3 year is a pre-wolf reintroduction year baseline. 2. Decreased weaning weights. Baseline weights over a minimum of 3 years must be submitted along with current year weights. Further consideration: role of drought years? Data can be submitted as weight tickets, production records, or sales records. 3. Decreased conception rates. Baseline conception rates over a minimum of 3 years must be submitted along with current year rates. Data can be submitted as production and/or set records. 4. Additional losses can be considered on a case-by-case basis by the division. Consider "how to factor in operation/line changes year to year"	See alternative 3 or 4, depending which option the producer chooses.	N/A	N/A	N/A
Eligibility for "wildlife" loss compensation?	N/A	N/A	N/A	Eligibility for production loss compensation: 1. Depredation event (death or injury) automatically qualifies a producer to apply for production loss compensation. "Consider whether it is always a requirement for itemization of production losses?"	See alternative 3 or 4, depending which option the producer chooses.	N/A	N/A	N/A
Is ante program component?	N/A	N/A	Joined in ratio differences.	As an ante program is not part of this alternative, but can be a separate program available to the producers.	See alternative 3 or 4, depending which option the producer chooses.	Payments based on wolf past home range and overlap with ranches, and wolf survival to end of year. Payments based on an algorithm, similar to that used by the Mexican Wolf Livestock Council, where points are used to assign percentage of available funding. The following would be an example of the framework: * Step 1: Core Area / 2 points per core area - 1 territory/ * Step 2: Subtotal A is multiplied by 2 if applicable to implementing preventive practices - Subtotal B * Step 3: The number of Livestock (Aha) (row A) x 2, multiplied by 0.5) are exposed to wolves is divided by 100 - Subtotal C * Step 4: Subtotal B is multiplied by Subtotal C - Grand Total. * Aggregates may be adjusted to reduce bias toward larger producers, e.g., by beginning with a minimum payment regardless of herd size.	Producers bids to opt out of all ex post compensation. "May include proactive, preventative strategies (e.g., husbandry practices, guard animals, carcass removal) and/or tools (e.g., fences, light and noise devices)." * Practices may be incentivized by livestock owners (wards/treaties). * Bids are reviewed by a board and ranked based on wolf presence, livestock risk, and bid amount.	Producers bids to opt out of all ex post compensation. "May include proactive, preventative strategies (e.g., husbandry practices, guard animals, carcass removal) and/or tools (e.g., fences, light and noise devices)." * Practices may be incentivized by livestock owners (wards/treaties). * Bids are reviewed by a board and ranked based on wolf presence, livestock risk, and bid amount.
Eligibility for ex ante?	N/A	N/A	Joined in ratio differences.	As an ante program is not part of this alternative, but can be a separate program available to the producers.	See alternative 3 or 4, depending which option the producer chooses.	Livestock producer (in occupied wolf habitat). May need to result to determine ranch geography, number of livestock reported, period of time, etc.	Livestock producer (in occupied wolf habitat), by competitive bid	Livestock producer (in occupied wolf habitat), by competitive bid
Additional considerations? (phasing, program evaluation, etc.)	Require definitions for "confirmed and probable."	Collect pre-implementation baseline data as well as data on losses, claims and payments for first 2-5 years of implementation; evaluate program after the first 5 years and adjust missing livestock compensation rate and types of animals covered as appropriate. Implement in conjunction with robust conflict minimization program which would be evaluated to determine techniques that have merit and whether the program is robust enough. Consider operation of a compensation program in partnership with CPW Department of Endless Wildlife Service to leverage relationships with producers. Once wolf status is changed to delisted, harmonize the program into an overall big game compensation program to avoid unintended consequences.	Complete data from producers who file claims to support bid level of production losses experienced. Consider asking the process based on producer/CPW feedback as an ease of application and administration and with considerations on the wolf population. OR consider going for a straight ratio that would be comparable to the actual losses that are demonstrated through this program (base of use long term). Once wolf status is changed to delisted, harmonize the program into an overall big game compensation program to avoid unintended consequences.	Considerations in 3&4 should be evaluated along with also looking at which program is most widely used in an attempt to simplify the process after the selection time.	Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive for producer to prevent livestock from being killed and to find any missing livestock. Conservation performance payments are for wolf survival, independent of direct or indirect effects. Incentive for producer to prevent conflict. * Like all alternatives, cost will increase with wolf population. * Bidding should include a wolf population spread and needs change. * Should include a smart disease, epizootic, zoonotic, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. * Available funding would need to be adequate enough to incentivize opting out of ex post. Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.	Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive for producer to prevent livestock from being killed and to find any missing livestock. Conservation performance payments are for proactive practices and wolf survival, independent of direct or indirect effects. Incentive for producer to prevent conflict. * Like all alternatives, cost will increase with wolf population. * Bidding should include a wolf population spread and needs change. * Should include a smart disease, epizootic, zoonotic, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. * Available funding would need to be adequate enough to incentivize opting out of ex post. Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.	Conservation performance payments are for wolf survival, independent of depredations or missing livestock. Incentive for producer to prevent livestock from being killed and to find any missing livestock. Conservation performance payments are for proactive practices and wolf survival, independent of direct or indirect effects. Incentive for producer to prevent conflict. * Like all alternatives, cost will increase with wolf population. * Bidding should include a wolf population spread and needs change. * Should include a smart disease, epizootic, zoonotic, or revise based on time (e.g., 5-10 yr) and/or wolf state endangered status change. * Available funding would need to be adequate enough to incentivize opting out of ex post. Implement in conjunction with robust conflict minimization programs which would be evaluated to determine techniques that have merit and whether the program is robust enough.	
Documented Peer Reviewed Case Studies		Literature on numerical ratios: Oatland, 2003; Bang & Shink, 2002; Somers, 2010; Swanson, 2002; Lehman, 2007; O'Shea, 2007; O'Shea, 2011 (PWS)	Shink, 2010; Somers, 2010; Lehman, 2007; O'Shea, 2007; O'Shea, 2011 (PWS); Ramer, 2014; Wideman, 2019; Cwikle, 2011	See alternative 3 or 4	Conservation performance payments gathered by various authors and most estimates (Harris 2002; Beck et al. 2011; Dickner et al. 2011; Harris 2002; Mason 2008; Dickner et al. (2011) recommended a combo with varying of funds to outcome based and minority to ex post. Harris (2002) speculated that most benefits of performance-based could be captured by practice-based. Example: Mexican Wolf Livestock Coexistence Council (Strategic Plan 2014) Haviland can los Gatos (rare cats in Sonora) (Nisler 2007) Haviland, Lynn & Wootton, with semi-domesticated member (Peterson et al. 2011)	Harris/MPWP (2002) Payment for practices may be simpler than payment for conservation performance per se. For bid process, none, but recommended by economist (Dana Hoag presentation). Conceptually similar to CDP	Harris/MPWP (2002) Payment for practices may be simpler than payment for conservation performance per se. For bid process, none, but recommended by economist (Dana Hoag presentation). Conceptually similar to CDP	Harris/MPWP (2002) Payment for practices may be simpler than payment for conservation performance per se. For bid process, none, but recommended by economist (Dana Hoag presentation). Conceptually similar to CDP
Program Administration, Funding Source, Etc.	Program Administered by CPW Game Damage Program Funding: Appropriations enumerated in 33-3-305.8 C.R.S. COA has exclusive jurisdiction over deprecating animals per 33-40-101 C.R.S.					Ex ante administration TBD	Ex ante administration TBD	Ex ante administration TBD
Conflict Minimization/Risk Reduction Assumptions/All Alternatives	Risk Reduction Program Elements: * Provide financial, technical and operational assistance to promote and implement conflict minimization and risk reduction practices. * Apply and update, as relevant, regulations to support non-lethal conflict minimization practices. * Support both pre-wildlife and post-depredation non-lethal practice implementation. * Encourage conflict specificity. * Recognize that not all efforts will prevent loss, while encouraging and supporting implementation and innovation. * Encourage producer education and outreach, knowledge experiences and lessons of other producers. * Provide sufficient agency capacity and funding for implementation. * As necessary based on resources, provide support for those that have experienced losses. * Use public-private partnerships to support funding, outreach, and implementation.							
Outcomes/Principles Across All Alternatives	Desired outcomes: * Livestock owners are fairly compensated for losses and are not financially harmed. * Conflicts are minimized. * Wildlife are restored. * Trust and respect are built across communities. Principles: * Build trust, transparency, relationships and good will with agricultural communities. * Be consistent, equitable, fair and robust. * Value both fair compensation and personal responsibility. * Be simple and straightforward. * Provide opportunity for choice and control. * Recognize different kinds of grazing contexts. * Promote conflict minimization. * Support with notifiable funding and capacity. * Use State-Federal partnerships and public-private partnerships where appropriate for implementation and funding. * Engage education and outreach. * Build trust, transparency, relationships and good will with agricultural communities. * Be consistent, equitable, fair and robust. * Value both fair compensation and personal responsibility. * Be simple and straightforward. * Provide opportunity for choice and control. * Recognize different kinds of grazing contexts. * Promote conflict minimization. * Support with notifiable funding and capacity. * Use State-Federal partnerships and public-private partnerships where appropriate for implementation and funding. * Engage education and outreach.							
Education and Outreach	Incorporate education and outreach for producers to ensure awareness and understanding of the program and administrative processes. Increase education and information for the public.							

Note: This table is for digital viewing only due to font size. Wolf Plan Appendix C-45

Appendix B: About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Dan Prenzlów, Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Report on Impact-Based Management Recommendations

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Impact-based Management Recommendations June 2022

Overview

This report summarizes Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) feedback on impact-based management recommendations discussed and developed between January 2022 and May 2022.

Discussions resulted in **SAG consensus on impact-based management assumptions** that support flexibility through an adaptive management framework. The assumptions include:

- The presence of wolves in Colorado will have both positive and negative impacts.
- Wolves will be left wherever they are if they are not causing problems.
- If wolves show up in places where conflict is likely (e.g., in proximity to livestock), practical measures should be taken to avoid problems through the use of non-lethal methods.
- If wolves are causing problems, manage to resolve the problem. When negative impacts occur, they should be addressed on a case-by-case basis utilizing a combination of appropriate management tools, including education, non-lethal conflict minimization, lethal take of wolves, and damage payments. Proactive and reactive nonlethal conflict minimization should be encouraged and explored as a first line of defense, with consideration of individual and community-level approaches. Lethal management should not generally be a first line of defense, however there may be certain conditions under which lethal take may be used first to support effective conflict management.

The assumptions also discuss engagement, outreach, and capacity to address impact-based management. The entire list of consensus assumptions is presented in this report.

The SAG also developed and reached consensus on a variety of elements within an **impact-based management framework for different Phases of wolf reintroduction in Colorado**. Phase 1 correlates with state endangered status; Phase 2 correlates with state threatened status; and Phase 3 correlates with state delisted, nongame status. Management recommendations are provided for when state authority is in place (i.e., the species is federally delisted); all management actions will be consistent with state and federal regulations.

A summary of the framework recommendations is provided here. See the report's details for specific permitting, reporting, and investigation requirements; additional considerations; and SAG rationale for support or opposition for various techniques. Where consensus was not reached, a roll call vote was documented.

Cross-cutting consensus:

- Allow education across all Phases and scenarios.
- Allow nonlethal, non-injurious and potentially injurious conflict minimization techniques, across all Phases and management scenarios.

Livestock interactions:

- **Consensus:**
 - Allowance of lethal control by state and federal agents and by producers or their agents for wolves caught in the act of biting, wounding, grasping, or killing livestock or working dogs. State statute CRS 33-2-106.4 requires permits for lethal control of a state listed species (in Phases 1 and 2), as well as reporting and investigation.
 - Discretion to CPW to make determination as to whether a situation is characterized as chronic depredation, and if so, what management actions should be taken, including whether lethal take should be allowed.
 - Allowance of lethal control of chronically depredating wolves following depredation event(s), after evaluation of circumstances, by state and federal agents across all Phases and by producers with limited duration permits in Phase 3 (correlating with state delisted, non-game).
 - No allowance of translocation of wolves when present but not causing conflict or when livestock depredation occurs.
- 14 out of 15 SAG voting members supported or did not object to the following; 1 objected:
 - Allowance of lethal take of chronically depredating wolves by a producer or agent with a limited duration permit in Phases 1 and 2 (state endangered and threatened).
 - Allowance of lethal control by state/federal agents for wolves caught in the act of chasing in all Phases, and by producers or their agents, with permit and prior depredation in area required in Phases 1 and 2.

Other wildlife species interactions:

- **Consensus:** Allowance for consideration of translocation of wolves in Phases 1, 2, and 3, with considerations, when ungulate populations are significantly below objectives in a geographic unit or area (i.e., data analysis unit, or DAU) and/or for impacts to other species of concern (e.g., grouse, lynx, etc.).
- **Other items:** SAG members did not have consensus regarding lethal control of specific wolves or wolf packs confirmed by CPW to be having an unacceptable impact on wild ungulate populations in a geographic unit or area (i.e., a DAU) or to be significantly reducing or likely to extirpate other species of concern (see discussion and Appendix B for voting results).

Other situations

- **Consensus:**
 - Allow lethal control of wolves involved in attacks on humans.
 - Allow removal of a wolf pack denning within municipal boundaries or high-density population areas.
 - Do not allow regulated public hunting of wolves in Phases 1, 2, and 3.
 - Allow additional provisions for agency operations, typically involving agreements and arrangements where state and federal wildlife agencies work in cooperation towards wildlife management activities.
- **Other items:** Regarding lethal control of wolves attacking pets and/or hunting dogs, an informal poll reflected mixed preferences among SAG members across different Phases and options.

Contents

Overview	1
Impact-Based Management Assumptions	4
Table 1: Impact-Based Management Techniques Allowed During Various Phases of Wolf Management in Colorado	6
SAG Consensus/Voting Outcomes and Discussion for Impact-Based Management Recommendations	9
Cross-cutting education and nonlethal conflict minimization themes	9
Livestock interactions	10
Other wildlife species interactions	14
Other situations	16
Appendix A: SAG Vote Results for Non-Consensus Impact-based Management Recommendations	17
Appendix B: About the Stakeholder Advisory Group	21

Impact-Based Management Assumptions

The SAG developed **consensus** impact-based gray wolf management assumptions, which were adapted from those provided by the 2004 Wolf Working Group.

Consensus is defined as general agreement that is shared by all the people in a group. It reflects a recommendation, option, or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option, or idea that all can live with.

The management plan is predicated on managing wolves in Colorado using “impact-based” management within an adaptive management framework that will allow the state the maximum flexibility to manage wolves. The assumptions inherent in this impact-based approach are as follows:

Goals and Range of Impacts

- a) Goals of impact-based management include restoration of wolves, minimization of conflicts, minimization of lethal take, and building of trust across communities. Impact-based management should consider biological, ecological, social, agricultural, and economic dimensions of wolf management and should recognize and consider diverse perspectives on these topics.
- b) The presence of wolves in Colorado will have both positive and negative impacts.
- c) Impacts will vary in intensity and location based on a variety of factors including wolf distribution, density, and behavior; distribution, species, and density of livestock and wild ungulates; and land ownership patterns. Some impacts, such as the possibility of increased tourism, may be viewed as negative or positive by different stakeholders and communities.
- d) Negative impacts can include but are not limited to: depredation and harassment of livestock; loss of pets, herd dogs, and guard animals; dispersal of wild ungulates and possible resulting property damage; changes in hunting or viewing opportunities; changes in hunting license sales that could decrease revenue for wildlife management; and declines below management objectives in ungulate populations and/or in ungulate recruitment rates. Some negative impacts may be low on a statewide scale but can be acute on a local or individual scale, with social and economic impacts for those that are affected.
- e) Positive impacts, where they occur, should be recognized and utilized, and may include, but are not limited to: an additional tool for managing ungulates in management units where they are overpopulated; dispersal of wild ungulates resulting in habitat improvement due to less pressure on the landscape, especially in riparian areas; a decreased possibility of disease transmission and/or prevalence (including but not limited to Chronic Wasting Disease) from ungulate overpopulation and concentration; and social, economic and/or non-monetary values, such as intrinsic value, existence value, and other possible values for present and future generations.

Managing Impacts

- f) Wolves will be left wherever they are if they are not causing problems.
- g) Monitoring of wolf populations, livestock, wild ungulates, other wildlife species, hunter opportunity and success, and human attitudes is an essential aspect of impact-based management. Monitoring of other biological, economic and social dimensions may also be conducted by other actors beyond CPW.
- h) If wolves show up in places where conflict is likely (e.g., in proximity to livestock), practical

measures should be taken to avoid problems through the use of nonlethal methods. CPW and Wildlife Services – in partnership with Tribes in the case of problems on the sovereign lands of Tribal nations – will work with livestock producers to investigate, assess the situation, and take appropriate action. Public and private organizations may also provide support for conflict minimization.

- i) If wolves are causing problems, manage to resolve the problem. When negative impacts occur, they should be addressed on a case-by-case basis utilizing a combination of appropriate management tools, including education, nonlethal conflict minimization, lethal take of wolves, and damage payments. Proactive and reactive nonlethal conflict minimization should be encouraged and explored as a first line of defense, with consideration of individual and community-level approaches. Lethal management should not generally be a first line of defense, however there may be certain conditions under which lethal take may be used first to support effective conflict management.
- j) Flexibility in the array of management tools is essential to accommodate changing circumstances over time and to allow discretion for managers to consider biological and social context on the ground.
- k) Where the state has jurisdiction, management must be in compliance with federal and state regulations. Use of management of tools may be phased based on state listing status, balancing consistency across phases with specific legal considerations.
- l) Successful wildlife management includes both public and private lands; provide consistency of management across land jurisdiction where possible.
- m) As with any wildlife management program, the wolf management program will evolve through time; creative and adaptive management should be applied.

Engagement, Outreach & Capacity to Support Impact-Based Management

- n) CPW may, at its discretion, reconvene the Stakeholder Advisory Group and/or Technical Working Group or other advisory group. This group would assist in finding resolution to unexpected or non-routine developments that are likely to occur.
- o) A high degree of cooperation and coordination among management agencies within the state, among states, among state and federal partners, and between the state and Tribes is necessary to ensure that management actions and damage payments are efficient and timely. Cooperation and coordination between management agencies and the private sector can be beneficial to support conflict minimization.
- p) Education and outreach to foster shared learning and understanding of issues, management actions, and consequences is a key component of successful wolf management in Colorado. Effectiveness of education and outreach is impacted by coordination and agreement on messaging. It is important to provide producers and their agents clarity on allowable actions, legal parameters, and required permits and/or verifications.
- q) Sufficient funds and capacity should be made available to implement all aspects of this plan.

Table 1: Impact-Based Management Techniques Allowed During Various Phases of Wolf Management in Colorado

This plan is predicated on managing wolves in Colorado using "impact-based" management within an adaptive management framework that will allow the State the maximum flexibility to manage wolves. The assumptions inherent in this impact-based approach are that the presence of wolves in Colorado will have both positive and negative impacts. The positive impacts of having wolves on the landscape will be recognized and utilized without having to implement direct wolf management practices. The negative impacts of wolves may involve direct intervention. Negative impacts can include but are not limited to: depredation and harassment of livestock; loss of pets, herd dogs and guard animals; and declines below management objectives in ungulate populations and/or in ungulate recruitment rates. This table describes what the intervention may be implemented to address the negative impacts of having wolves on the landscape. **The management descriptions below will be in compliance with federal and state regulations.**

(Note: not all impacts can be predicted, allow flexibility where specific impacts and actions not prescribed)

Final language discussed and voted upon by the Wolf Plan Stakeholder Advisory Group on May 25, 2022.

Color coding added after the vote to reflect the following:

Full consensus of the SAG.
14 out of 15 SAG voting members supported or did not object; 1 objected.
Other vote result or no formal vote.

Impact	Management tools	Phase 1 (correlating w/Endangered status)	Phase 2 (correlating w/Threatened status)	Phase 3 (correlating with delisted, non-game)	Additional /other considerations across phases	
Livestock interactions						
Present but not biting, wounding grasping or killing or chasing; no prior attacks	Education	Allowed	Allowed	Allowed	This is an important and effective tool both proactively and reactively to depredation events	
	Non-injurious, Nonlethal Conflict Minimization Practices (e.g., fladry, range riders, livestock guardian dogs)	Allowed	Allowed	Allowed	Non-injurious harassment of wolves includes scaring off an animal(s) by making loud noises (e.g., confronting the animal(s) without doing bodily harm). If known injury or death of a wolf occurs, CPW must be notified within 48 hours. Training will be provided by CPW staff at the time of deployment of materials.	
	Potentially injurious hazing techniques (Rubber buckshot, rubber slugs, etc.)	Allowed	Allowed	Allowed	Non-lethal injurious harassment means scaring off a wolf (or wolves) without killing but with potential for minor injury to the wolf and includes rubber bullets, bean bag projectiles. Not currently allowed under CPW regulations, previous 10(j) rules have allowed.	
	Translocation	Not applicable	Not applicable	Not applicable		
	Lethal take	Not Allowed	Not Allowed	Not Allowed		
Observed in act of biting, wounding, grasping or killing -OR- Observed in the act of chasing	Non-injurious, Nonlethal Conflict Minimization Practices (e.g., fladry, range riders, livestock guardian dogs)	Allowed	Allowed	Allowed	Non-injurious harassment of wolves includes scaring off an animal(s) by making loud noises (e.g. confronting the animal(s) without doing bodily harm). If known injury or death of a wolf occurs, CPW must be notified within 48 hours. Training will be provided by CPW staff at the time of deployment of materials.	
	Potentially injurious hazing techniques (Rubber buckshot, cracker shells, etc.)	Allowed	Allowed	Allowed	Non-lethal injurious harassment means scaring off a wolf (or wolves) without killing but with potential for minor injury to the wolf and includes rubber bullets, bean bag projectiles. Not currently allowed under CPW regulations, previous 10(j) rules have allowed.	
	Lethal Control for wolves caught in the act of BITING, WOUNDING, GRASPING or KILLING livestock or working dogs <i>Nonlethal tools should be explored and encouraged before lethal; lethal management should not generally be a first line of defense.</i>	Allowed by State/Fed agents	Limited duration permit for lethal take may be issued to producer or agent on private or public land; proof of attack required following lethal take - <i>requires reporting, and investigation demonstrating evidence to justify act.</i>	Allowed by State/Fed agents	Allowed by a producer or agent without a permit on private and public lands, permissible for producers to take action on wolves when biting, wounding, grasping, or killing - <i>requires reporting, and investigation demonstrating evidence to justify act.</i>	While the likelihood of observing a wolf in the act of biting, wounding grasping killing or chasing is rare and the likelihood of implementing lethal control in this context is also rare, this management approach provides producers with tools to respond, should the situation occur. Nonlethal tools should be explored and encouraged before lethal; lethal management should not generally be a first line of defense. There may be certain conditions under which lethal take may be used sooner or first to support effective conflict management and a successful recovery (e.g., specific scenarios, situations where non-lethals are less likely to be effective, etc.); managers should consider context on the ground (biological and social considerations for population growth, pack dynamics and distribution of wolves, recent and proximal depredations, etc.). Such scenarios where lethal control is implemented must be reported within 24 hours and injured or dead livestock or dogs or physical evidence that would lead a reasonable person to believe that an attack would occur at any moment on livestock or dogs must be evident to verify the wolf attack.
	Lethal take for wolves in the act of CHASING (necessary to prevent depredating animals from inflicting death or injury to livestock or damaging agricultural products or resources) <i>Nonlethal tools should be explored and encouraged before lethal; lethal management should not generally be a first line of defense.</i>	Allowed by State/Fed agents	Limited duration permit for lethal take may be issued to producer or agent on private or public land based on a prior depredation event (your livestock or in area) - <i>requires reporting, and investigation demonstrating evidence to justify act.</i>	Allowed by State/Fed agents	Allowed by a producer (or agent) without a permit on private and public lands, permissible for producers to take action on wolves when chasing - <i>requires reporting, and investigation demonstrating evidence to justify act.</i>	Permit required under state law CRS 33-2-106.4. Upon good cause shown and where necessary to alleviate damage to property or to protect human health, endangered or threatened species may be removed, captured, or destroyed but only pursuant to permit issued by the division and, where possible, by or under the supervision of an agent of the division. Provisions for removal, capture, or destruction of nongame wildlife for the purposes set forth in this subsection (4) shall be set forth in regulations issued by the commission pursuant to section 33-2-104(1). Issuance of a permit accompanied by information and encouragement of nonlethal tools. Definition of CHASING is from CRS 35-40-100.2(5) as part of "Pose a threat" <i>Note that sufficient evidence must be available following lethal control for wolves chasing livestock such that a law enforcement officer has the ability to determine wolves were in the act of chasing livestock. Without sufficient evidence, lethal control is not justified for wolves chasing livestock.</i>

Impact	Management tools	Phase 1 (correlating w/Endangered status)	Phase 2 (correlating w/Threatened status)	Phase 3 (correlating with delisted, non-game)	Additional /other considerations across phases
Management following confirmed depredation(s) (death of livestock)	Education	Allowed		Allowed	This is an important and effective tool both proactively and reactively to depredation events
	Non-injurious Nonlethal Conflict Minimization Practices (e.g., fladry, range riders, livestock guarding dogs)	Allowed		Allowed	Non-injurious harassment of wolves includes scaring off an animal(s) by making loud noises (e.g., confronting the animal(s) without doing bodily harm). If known injury or death of a wolf occurs, CPW must be notified within 48 hours. Training will be provided by CPW staff at the time of deployment of materials.
	Potentially injurious hazing techniques (Rubber buckshot, cracker shells, etc.)	Allowed		Allowed	Non-lethal injurious harassment means scaring off a wolf (or wolves) without killing but with potential for minor injury to the wolf and includes rubber bullets, bean bag projectiles. Not currently allowed under CPW regulations, previous 10(j) rules have allowed.
	Translocation, post depredation	Not Allowed		Not Allowed	Translocation will not be used if animals are known or suspected to have depredated on livestock or pets.
	Lethal Control of Chronically Depredating Wolves following depredation event(s) <i>Nonlethal tools should be explored and encouraged before lethal; lethal management should not generally be a first line of defense.</i>	Allowed by State/Fed agents (consistent with federal law) after evaluation of circumstances.	Limited duration permits for lethal take may be issued to producer or agent on public or private land after evaluation of circumstances. Evaluation will consider status and number of wolves in the state, among other considerations (Column F). Only issued if state/federal agencies do not have the resources to implement on-the-ground lethal control actions - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>	Allowed by State/Fed agents (consistent with federal law) after evaluation of circumstances. Limited duration permits for lethal take may be issued to producer or agent on public or private land after evaluation of circumstances. Evaluation will consider status and number of wolves in the state, among other considerations (Column F). Only issued if state/federal agencies do not have the resources to implement on-the-ground lethal control actions - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>	SAG recommends [by consensus] that it should be left to the discretion of CPW to make determination as to whether a situation is characterized as Chronic Depredation, and if so, what management actions should be taken, including whether lethal take should be allowed. This evaluation of circumstances will include considerations such as the status and number of the wolves in the state, documented repeated depredation and harassment in a limited geography caused by wolves, previously implemented practices to minimize/reduce depredation, likelihood of additional and continued wolf related mortality will continue if control is or is not implemented, intentional use of attractants that may be luring or baiting wolves to the location. Discretion is addressed at a programmatic or leadership level; it is not a field-level determination. Permit required under state law CRS 33-2-106.4. Upon good cause shown and where necessary to alleviate damage to property or to protect human health, endangered or threatened species may be removed, captured, or destroyed but only pursuant to permit issued by the division and, where possible, by or under the supervision of an agent of the division. Provisions for removal, capture, or destruction of nongame wildlife for the purposes set forth in this subsection (4) shall be set forth in regulations issued by the commission pursuant to section 33-2-104(1)
Other Wildlife Species Interactions					
Wolves present, no apparent population level negative impacts to other wildlife species observed	No direct wolf management necessary	Education and outreach		Education and outreach	
Ungulate populations significantly below objectives in a geographic unit or area (i.e., DAU)	Translocation	Allowed, with considerations		Allowed by state/federal agents with considerations In addressing appropriate management response to wild ungulate impacts, CPW will require: 1) data or other information indicating that wolves are a major cause of ungulate herds not meeting objectives; and will consider: 2) ability to address the situation through non-lethal means; 3) the level and duration of wolf removal necessary to achieve management objectives; 4) ability to measure ungulate response to management actions; and, 5) identification of other potential major causes of an ungulate population not meeting objectives and attempts made to address them.	Unacceptable impact is defined as an impact to an ungulate population or herd where CPW has determined that wolves are one of the major causes of the population or herd not meeting established state management goals. Wolf removals must not contribute to reducing the wolf population in the state below 150 wolves. There may be additional unit areas (i.e., specially managed GMUs or research areas) that are also considered.
Impacts to other species (grouse, lynx, etc.)	Translocation	Allowed, with considerations			Though not expected, potential that wolf population at higher levels (Phase 3) may have some impact on sustainability of species of concern. Per TWG input, not expected that wolves will have any impact on grouse or lynx populations.
	Lethal control of specific wolves or wolf packs confirmed by CPW to be significantly reducing or likely to extirpate other species of concern	Not allowed		Potentially allowed by state/federal agents, with same consideration as described in row describing ungulate management.	

Impact	Management tools	Phase 1 (correlating w/Endangered status)	Phase 2 (correlating w/Threatened status)	Phase 3 (correlating with delisted, non-game)	Additional /other considerations across phases
Other Situations					
Wolves present, no human health or safety risks posed	No direct wolf management necessary	Education and outreach		Education and outreach	
Human safety	Lethal control of wolves involved in the attack on humans	Allowed by any person in self defense		Allowed by any person in self defense	Unlikely/rare – allowance same according to state/federal law. Any person may take a wolf in self defense, only State/Federal agents may take wolves deemed to be a threat to human safety that are not involved actively attacking a person.
		Allowed by state/federal agent for animals not involved in actively attacking, but have attacked a person.		Allowed by state/federal agent for animals not involved in actively attacking, but have attacked a person.	
Pet attacked	Lethal control of wolves attacking (Biting, wounding, grasping, killing) pets	Alternative 1: Allowed by any person when attacking - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>		Alternative 1: Allowed by any person when attacking - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>	<i>To be consistent with current game damage, this would not be allowed</i>
	Non-lethal deterrence should be explored and encouraged before lethal	Alternative 2: Not allowed by any person when attacking		Alternative 2: Not allowed by any person when attacking	
Hunting dog attacked	Lethal control of wolves attacking (Biting, wounding, grasping, killing) hunting dogs	Alternative 1: Allowed by any person when attacking - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>		Alternative 1: Allowed by any person when attacking - <u>requires reporting, and investigation demonstrating evidence to justify act.</u>	<i>To be consistent with current game damage, this would not be allowed</i>
	Non-lethal deterrence should be explored and encouraged before lethal	Alternative 2: Not allowed by any person when attacking		Alternative 2: Not allowed by any person when attacking	
Wolves denning within municipal boundaries/in high density population area	Removal of pack by state or federal agents	Allowed		Allowed	Translocation will be considered and implemented if possible.
Limited Quota hunts	Regulated hunting of wolves	Not allowed		Not allowed	When the state wolf population meets appropriate criteria, limited quota hunts will be discussed as a management tool (Phase 4)
Additional provisions for agency operations	Per existing agreements with state and federal agencies, take (non-lethal and lethal) by state and federal agents is allowed for scientific purposes, to avoid conflict with human activities, to relocate a wolf to enhance survival and recovery prospects, to aid or euthanize sick, injured wolves, to salvage dead specimens, to aid in law enforcement investigations involving wolves, and to manage wolves with abnormal physical or behavioral characteristics.				

SAG Consensus/Voting Outcomes and Discussion for Impact-Based Management Recommendations

SAG members developed and achieved consensus on a variety of impact-based gray wolf management recommendations, as reflected in the table above and summarized in narrative form in this section. In the absence of full consensus, roll call votes were taken; the votes are recorded in the tables in Appendix A. For several items, as noted below, 14 out of 15 SAG voting members supported or did not object; 1 objected.

Phases refer to the following:

- Phase 1 correlates with state endangered status
- Phase 2 correlates with state threatened status
- Phase 3 correlates with state delisted, nongame status

The Technical Working Group (TWG) has developed *Technical Recommendations for Colorado State Listing/Delisting Thresholds and Phasing*, in which it provided feedback for specific population recovery thresholds corresponding to these Phases. The SAG was charged with developing recommendations regarding management within these Phases. Phases refer to state status, and management recommendations are provided for when state authority is in place (i.e., the species is federally delisted). All management actions will be consistent with state and federal regulations.

This section provides a brief summary of consensus or voting outcomes for items in the impact-based management table, along with brief discussion of rationale for support, opposition (where relevant), and/or additional considerations. *Specific rationales and/or additional considerations reflect a range of feedback from SAG discussion, and do not necessarily reflect consensus of all members.*

Cross-cutting education and nonlethal conflict minimization themes

Consensus items:

- Allow education across all Phases and scenarios.
- Allow nonlethal non-injurious and potentially injurious conflict minimization techniques, across all Phases and depredation conditions.

Discussion:

- SAG discussion frequently emphasized the impact-based management assumption (i) that proactive and reactive nonlethal conflict minimization should be encouraged and explored as a first line of defense, with consideration of individual and community-level approaches. Lethal management should not generally be a first line of defense, however there may be certain conditions under which lethal take may be used first to support effective conflict management.
- Discussion also emphasized the importance of outreach and education, particularly for producers and agents in order to explain what management actions are allowed, and with what permitting, reporting, and investigation requirements.
- Discussion also emphasized the importance of funding and capacity for wolf management.

Livestock interactions

Lethal control of wolves biting, wounding, grasping, or killing livestock and working dogs

The SAG had consensus for allowance of lethal control for wolves caught in the act of biting, wounding, grasping, or killing livestock or working dogs, as follows:

- Phase 1, 2, and 3: Allowed by state and federal agents
- Phase 1 and 2: Limited duration permit for lethal take may be issued to a producer or agent on private or public land; proof of attack required following lethal take - requires reporting, and investigation demonstrating evidence to justify act.
- Phase 3: Allowed by a producer or agent without a permit on private and public lands, permissible for producers to take action on wolves when biting, wounding, grasping, or killing - requires reporting, and investigation demonstrating evidence to justify act.

Rationale for support

- Allowance of lethal control of wolves caught in the act of biting, wounding, grasping, or killing livestock is simple to understand and communicate because of the stipulation that wolves must have 'teeth on' livestock or working dogs.
- While the feasibility of lethally firing on an attacking wolf is low, this allowance provides a range of tools for producers to respond to and defend livestock. This flexibility also creates good will and potentially increases trust.
- State statute CRS 33-2-106.4 requires permits for lethal control of a state listed species (i.e., Phases 1 and 2); allowing producers to lethally take a depredating wolf with no permit in Phase 3 reflects the change in value of individual wolves as wolf populations grow larger in Colorado.
- Emphasis on nonlethal conflict minimization as a first line of defense is reflected in the provision that issuance of a permit is accompanied by information and encouragement of nonlethal tools; education can also be incorporated into the investigation process to minimize future conflict.
- Consistency of rules on private and public lands provides clarity to producers and avoids difficulty of distinguishing land ownership type.

Additional considerations

- Lethal rounds may be more likely to be on hand than rubber buckshot when responding to caught-in-the-act depredation when no wolves were previously confirmed to be present. Other nonlethal tools may be limited and less effective when the wolf already has 'teeth on' livestock or working dogs.
- If wolves are known to be in the general area, the process for a producer to obtain a permit should be streamlined and efficient. Prior depredation is not recommended as a permit requirement for a wolf that is caught with 'teeth on.'
- There is some concern for burdensome verification requirements to confirm evidence of wolf depredation. Emphasize flexibility to allow use of video or photographic evidence when investigations cannot be conducted in a timely manner. There needs to be clarity of what evidence is acceptable.

Lethal control of wolves chasing livestock

14 out of 15 SAG voting members supported or did not object, and 1 objected, regarding allowance of lethal take of wolves in the act of chasing (necessary to prevent depredating animals from inflicting

death or injury to livestock or damaging agricultural products or resources). Refer to Appendix A, Table A-i for the vote results on the following:

- Phase 1, 2, and 3: Allowed by state and federal agents
- Phase 1 and 2: Limited duration permit for lethal take may be issued to producer or agent on private or public land based on a prior depredation event (your livestock or in area) - requires reporting, and investigation demonstrating evidence to justify act.
- Phase 3: Allowed by a producer or agent without a permit on private and public lands, permissible for producers to take action on wolves when chasing - requires reporting, and investigation demonstrating evidence to justify act.

Rationale for support

- While the feasibility of lethal control of a chasing wolf is unlikely, allowing producers to attempt to take chasing wolves may prevent depredation and also creates good will and potentially increases trust.
- State statute CRS 33-2-106.4 requires permits for lethal control of a state listed species (i.e., Phases 1 and 2); allowing producers to lethally take a depredating wolf with no permit in Phase 3 reflects the change in value of individual wolves as wolf populations grow larger in Colorado.
- The permit requirement of a prior depredation to a producer's livestock or in the producer's area in Phases 1 and 2 underscores that lethal take of chasing wolves in early Phases is intended to be directed to wolves that have already been involved in conflict.
- There is potential value in lethally controlling individual wolves who display emboldened behaviors in order to mitigate production losses to livestock and/or to prevent the whole pack from adopting these conflict behaviors.
- The experience of producers and agents in the field enables them to determine chasing behaviors and differentiate them from other behaviors.
- The Technical Working Group (TWG)'s proposed temporal requirements to move from state endangered to threatened and delisted status mean that wolf populations could be large while still listed as state endangered, supporting allowance of lethal take at earlier Phases.

Rationale for opposition

- Even with robust education, chasing and testing behaviors are difficult to discern in the field and in the moment of potential conflict.
- Allowance of lethal take for chasing would create a low bar for someone to use as an excuse for lethal take when other nonlethal techniques could be used. Chasing behavior provides an opportunity to train wolves away from livestock using nonlethal techniques.
- Allowance of lethal take for chasing wolves in early Phases may not support a self-sustaining population and may face public opposition.

Additional considerations

- Provide education to producers and their agents regarding nonlethal techniques that can be used to deter chasing behavior, and information to understand wolf body language and behaviors.
- There must be robust investigation to verify chasing if a wolf is taken. Use of existing statutory definitions and 'necessary to prevent' language would streamline and simplify standards for allowance and investigation of chasing.
- There was interest in a clearer definition for chasing to better capture a sense of "imminent threat;" this could be included in all Phases.
- The definition of a depredation 'event' may need to be clarified in the framework as including death, damage, or injury.

Lethal control of chronically depredating wolves

The SAG had consensus support regarding control of chronically depredating wolves following depredation event(s):

- It should be left to the discretion of CPW to make a determination as to whether a situation is characterized as chronic depredation, and if so, what management actions should be taken, including whether lethal take should be allowed.
- Allowance of lethal control of chronically depredating wolves following depredation event(s):
 - Phase 1, 2, and 3: Allowed by state/federal agents (consistent with federal law) after evaluation of circumstances.
 - Phase 3: Limited duration permits for lethal take may be issued to producer or agent on public or private land after evaluation of circumstances. Evaluation will consider status and number of wolves in the state, among other considerations (see Table 1 for details). Permits will only be issued if state/federal agencies do not have the resources to implement lethal control actions - requires reporting, and investigation demonstrating evidence to justify the act.

14 out of 15 SAG voting members supported or did not object, and 1 objected, regarding the following:

Refer to Appendix A, Table A-ii for the vote results on this topic.

- Allowance of lethal control of chronically depredating wolves following depredation event(s):
 - Phase 1 and 2: Limited duration permits for lethal take may be issued to producer or agent on public or private land after evaluation of circumstances. Evaluation will consider status and number of wolves in the state, among other considerations (see Table for details). Only issued if state/federal agencies do not have the resources to implement lethal control actions - requires reporting, and investigation demonstrating evidence to justify the act.

Rationale for support of agency discretion to determine chronic depredation

- Flexibility on a case-by-case basis will allow better development and maintenance of relationships and trust with livestock producers.
- Discretion allows context-specific evaluation of a variety of considerations such as the status and number of the wolves in the state, documented repeated depredation and harassment in a limited geography caused by wolves, previously implemented practices to minimize/reduce depredation, likelihood that additional and continued wolf related mortality will continue if control is or is not implemented, and intentional use of attractants that may be luring or baiting wolves to the location.
- Allowing discretion for the agency to determine chronic depredation would be more effective to deal with outlying or extreme cases of depredation. Chronic depredation may be the exception, rather than the norm.
- Fixed numeric thresholds (i.e., x depredation in y amount of time) may be too restrictive or too liberal; do not sufficiently allow for evaluation of the context and conflicts; have not been met with success in other states; and can damage relationships and trust between agencies and livestock producers.

Rationale for support of lethal take of chronically depredating wolves

- *Support for state and federal agency allowance:*
 - It is important to lead with trust in and flexibility for state and federal agents to lethally control chronically depredating wolves.

- The public may be more willing to trust state and federal agents to remove chronically depredating wolves in earlier stages of reintroduction.
- State and federal agents' abilities to investigate and track wolves may increase ability to target the wolves that are chronic depredators.
- *Support for producer or agent allowance:*
 - Agency capacity limitations may affect ability to address chronic depredation as the wolf population grows larger.
 - The Technical Working Group (TWG)'s proposed temporal requirements to move from state endangered to threatened and delisted status mean that wolf populations could be large while still listed as state endangered, supporting allowance of lethal take by producers at earlier Phases.
 - Although it is preferential, particularly in early Phases, for state and federal agents to remove chronic depredators, it is important to allow producers to lethally take wolves when state and federal agencies lack capacity to efficiently address problems.
 - It is important to trust agencies to give out permits to landowners judiciously, including in earlier Phases of reintroduction.
 - Landowners may be better situated to respond quickly to chronic depredation, particularly given the remoteness of their operations as well as the producers' and agents' knowledge of the terrain within which they operate.

Rationale for opposition of producer/agent lethal take of chronically depredating wolves in Phases 1 and 2

- Allowing livestock producers to take wolves that are state endangered or threatened would be met with significant public backlash.
- There is concern that producers will not be as effective at targeting chronic depredating individuals.
- State and federal agencies should be funded to provide capacity to manage chronic depredators at lower wolf populations.

Additional considerations

- Additional hiring of state and federal agency staff can mitigate capacity issues; adequate funding to address capacity issues to respond to depredation is needed.
- Clear communication between levels of agency leadership is important in addressing chronic depredation. Discretion for determining whether a situation meets the characteristics of being a chronic depredation circumstance, and if so, what management to apply, is addressed at a programmatic or leadership level; it is not a field-level determination.
- If permits are issued to producers or agents, close communication and coordination between producers/agents and state or federal agents could improve a landowner's certainty of effectively targeting wolves that are chronic depredators.
- Producer permits should be allowed only within defined proximity of investigated and confirmed livestock depredations.
- Evaluation criteria for defining chronic depredation and determining management actions should be used as examples within a holistic framework, rather than a prescriptive checklist.
- A policy statement on lethal control for chronic depredations could be crafted based on literature review, e.g., "Lethal control of wolves is appropriate when conflicts are likely to continue, nonlethal methods have been attempted and/or are unlikely to be successful, domestic animals were clearly killed by wolves, and there is no evidence of intentional feeding or unnatural attraction of wolves. If implemented, lethal control should be targeted to wolves involved in conflict, swift, effective, as humane as possible, and closely monitored."

- Do not consider translocation of wolves when present but not causing conflict. Translocation should also not be considered to displace depredating wolves to other areas where they may continue to cause conflict.
- The definition of a depredation ‘event’ may need to be clarified in the framework as including death, damage, or injury.

Other wildlife species interactions

The SAG had consensus for consideration of allowance of translocation of specific wolves or wolf packs confirmed by CPW to be having an unacceptable impact on wild ungulate populations in a geographic unit or area (i.e., a DAU) and/or for impacts to other species of concern (e.g., threatened and endangered species such as grouse, lynx, or other species of conservation need etc.).

The SAG discussed but did not have consensus for the following: Refer to Appendix A, Tables A-iii and A-iv for the vote results on these topics.

- Lethal control of specific wolves or wolf packs confirmed by CPW to be having an unacceptable impact on wild ungulate populations in a geographic unit or area (i.e., a DAU):
 - Not allowed in Phases 1 and 2. (10 out of 15 SAG voting members supported or did not object; 5 objected)
 - Allowed with considerations in Phase 3 (see table for details of considerations). (12 out of 15 SAG voting members supported or did not object; 3 objected)
- Lethal control of specific wolves or wolf packs confirmed by CPW to be significantly reducing or likely to extirpate other species of concern:
 - Not allowed in Phases 1 and 2. (8 out of 15 SAG voting members supported or did not object; 7 objected)
 - Allowed with considerations in Phase 3 (see table for details of considerations). (13 out of 15 SAG voting members supported or did not object; 2 objected)

Rationale for support for translocation of wolves:

- Translocation of wolves should be considered if wolves cause ungulate populations to decline to below objective in a given management area, or if other species of concern are impacted.
- Translocation would redistribute impacts of wolves to areas where ungulate herds or other species of concern are less likely to experience significant impact.
- Translocation of wolves for the above reasons may be more effective at earlier Phases of restoration and less effective when a larger population of wolves is widely dispersed throughout Colorado.

Rationale for support of lethal take of wolves impacting ungulates or other species of concern:

In any Phase:

- Flexibility of management tools to respond to impacts on ungulates should be similar to those available for livestock interactions.
 - Livestock producers have more options for addressing and/or being compensated for impacts than hunters or outfitters.
 - Short of translocating wolves, the primary option to relieve impacts on ungulates without lethal take of wolves is to decrease hunting opportunities.
- Impact-based management of wolves for impacts to ungulates should include ability to respond to local impacts that may be acute in one region even if there are not impacts across the state.

- Local impacts of concern could include decline in ungulate populations leading to decline in cow hunting licenses, upon which many Colorado families depend for an annual meat source.
- Ability to respond to local impacts with lethal control can also mitigate impacts to CPW's overall funding, which relies heavily on hunting licenses including from out-of-state hunters. There is concern for a decline in interest from out-of-state hunters due to perceived negative impacts from wolves on the landscape.
- Though unlikely to occur, flexibility to respond to impacts to other species of concern should be allowed in any Phase; Colorado has invested resources in a variety of species of concern.

In Phase 3 only:

- While likelihood of need for and use of lethal take to control wolf impacts to ungulates or other species may be low, higher wolf populations in Phase 3 support flexibility for lethal take, with considerations as described in Table 1. This flexibility would be accompanied by multi-year data or other information, collected through Phases 1 and 2, indicating that wolves are a major cause of ungulate herds not meeting objectives or of significant impacts to other species of concern.

Rationale for opposition of lethal take of wolves impacting ungulates or other species of concern:

In any Phase:

- Wolves are natural predators of ungulates and thus should not be managed for their natural behavior.
- Wolves' natural predation of ungulates should not be considered a negative impact; wolves may prey more frequently on elderly or sick elk, creating a healthier herd overall.
- There should be a high standard of evidence that wolves are the cause of decline of ungulate populations. Other environmental factors (e.g., climate and disease) contribute to impacts on ungulates and other wildlife species.

In Phases 1 and 2 only:

- Insufficient time to collect multi-year data on impacts of wolves to ungulates or species of concern, and lower wolf populations, would not support lethal take of wolves for impacts to ungulates or other species of concern early in restoration.

Additional considerations

- Use a standardized unit of area to guide evaluation of wolf impact. Specifically, use a data analysis unit (DAU), which has precedence guiding ungulate management objectives.
 - SAG members discussed whether DAUs apply to every management scenario in Colorado for which lethal take of wolves due to impacts on ungulates would be considered. Some suggested special management units may need to be considered as well to align with existing management and because wolf effects on ungulates may occur at scales smaller than a DAU.
 - Others suggested DAUs are the only appropriate metric. DAUs are the smallest scale at which CPW conducts sampling, surveying, and modeling for ungulates.
 - Detecting and measuring effects at smaller scales may be challenging because of animal movements within the DAU, and a special, targeted monitoring scheme, if designed, would not be consistent with how CPW manages other ungulate populations.
 - CPW should determine which unit area metrics are appropriate.
- There were calls to better understand:

- Impacts on elk herds like habitat loss from fires, population growth, and climate change, along with the number of elk a wolf is expected to take each year, and subsequent impacts on the number of elk licenses made available and declines in agency revenue.
- How quickly the agency would be able to respond to impacts that are measured through studies.
- SAG members discussed relevance of the North American model of wildlife conservation for these scenarios; some suggested the model could be interpreted to support management of wolves for impacts to ungulates; others expressed concern that this model is not suitable for wolf management because of the wolf's current status as an endangered species and because current law prohibits use of license fees for wolf management. Further, various stakeholders have differing views on the model's historic and present success.
- Consider additional activities to manage ungulates to proactively mitigate and/or avoid any potential significant declines to ungulate populations that could impact hunters, outfitters, livestock producers that use hunting/outfitters as an additional income source, and rural economies; and to mitigate the kind of social conflict ongoing in the Northern Rocky Mountain states. *More detailed discussion of opportunities for management of ungulates will occur separately.*

Other situations

The SAG had consensus on management for the following additional situations:

- Allow lethal control of wolves involved in attacks on humans.
- Allow removal of a wolf pack denning within municipal boundaries or high-density population areas.
- Do not allow regulated hunting of wolves in Phases 1, 2, and 3.
- Allow additional provisions for agency operations, including lethal and nonlethal take by state or federal agencies for scientific purposes, to avoid conflict with human activities, to relocate a wolf to enhance survival and recovery prospects, to aid or euthanize sick, injured wolves, to salvage dead specimens, to aid in law enforcement investigations involving wolves, and to manage wolves with abnormal physical or behavioral characteristics.

Regarding lethal control of wolves attacking pets and/or hunting dogs, no formal roll call vote was taken.

- An informal poll of SAG members' preferences was taken in lieu of robust conversation due to time constraints and SAG feedback regarding prioritization of this discussion topic. The informal poll reflected mixed preferences among SAG members across different Phases and options. Allowance of lethal take of wolves when attacking pets generally received more informal opposition and more responses of 'no preference' than allowance of lethal take for wolves when attacking hunting dogs.
- Brief discussion of considerations to allow lethal take of wolves attacking pets included:
 - Concern for a lower standard to allow take of wolves attacking pets compared to livestock (i.e., no permit required for take of wolves attacking pets); the existing standard for bear and lion does not allow lethal take when attacking pets, however there is potential for interspecies aggression among wolves and dogs; pets should be managed, rather than wolves, to avoid conflicts; and consideration of pets' role as 'family' members. Members suggested not allowing lethal take of wolves only chasing rather than biting/wounding/killing) pets.
 - Additionally, some members suggested a different allowance for lethal take when wolves attack hunting dogs, given hunting dogs' role in wildlife management and/or their role in and cost to hunters and hunting and outfitting businesses.

Appendix A: SAG Vote Results for Non-Consensus Impact-based Management Recommendations

Table A-i: Vote Results regarding wolves caught in the act of chasing

		Lethal take for wolves in the act of CHASING (necessary to prevent depredating animals from inflicting death or injury to livestock or damaging agricultural products or resources)		
Depredation Condition:				
Phase		1, 2,3	1 & 2	3
First Name	Last Name	Allowed by state/fed agents	Limited duration permit for lethal take may be issued to producer or agent on private or public land based on a prior depredation event (your livestock or in area) - requires reporting, and investigation demonstrating evidence to justify act.	Allowed by a producer (or agent) without a permit on private and public lands, permissible for producers to take action on wolves when chasing - requires reporting, and investigation demonstrating evidence to justify act.
Matt	Barnes	2	3	2
Donald	Broom	2	1	1
Jenny	Burbey	1	1	1
Bob	Chastain	2	3	2
Renee	Deal	1	1	1
Adam	Gall	Absent	Absent	Absent
Dan	Gates	1	2	1
John	Howard	Absent	Absent	Absent
Francie	Jacober	3	3	2
Lenny	Klinglesmith	1	1	1
Darlene	Kobobel	4	4	4
Tom	Kourlis	1	1	1
Brian	Kurzel	2	3	2
Hallie	Mahowald	1	1	1
Jonathan	Proctor	3	3	3
Gary	Skiba	3	3	2
Steve	Whiteman	2	3	2
Total support/no objection (1, 2, or 3)		14	14	14
Total objections (4 or 5)		1	1	1
Additional language relevant to each item is in the "Impact-Based Management Framework." Voting reflects this additional language, which includes considerations such as exploring and encouraging non-lethal techniques before lethal and additional considerations proposed by the SAG.				
*Consensus scale:				
1	Enthusiastically support			
2	Support			
3	Can abide by or live with; do not object			
4	Object			
5	Strongly object			

Table A-ii: Vote Results regarding limited duration permits for producer or agent for lethal take of chronically depredated wolves

Depredation Condition:		Lethal Control of Chronically Depredating Wolves following depredation event(s)
Phase		1 & 2
First Name	Last Name	Limited duration permits for lethal take may be issued to producer or agent on public or private land after evaluation of circumstances. Evaluation will consider status and number of wolves in the state, among other considerations (Column F). Only issued if state/federal agencies do not have the resources to implement on-the-ground lethal control actions - requires reporting, and investigation demonstrating evidence to justify act.
Matt	Barnes	3
Donald	Broom	1
Jenny	Burbey	1
Bob	Chastain	2
Renee	Deal	2
Adam	Gall	Absent
Dan	Gates	2
John	Howard	Absent
Francie	Jacober	2
Lenny	Klinglesmith	1
Darlene	Kobobel	3
Tom	Kourlis	1
Brian	Kurzel	3
Hallie	Mahowald	2
Jonathan	Proctor	4
Gary	Skiba	3
Steve	Whiteman	3
Total support/no objection (1, 2, or 3)		14
Total objections (4 or 5)		1
Additional language relevant to each item is in the "Impact-Based Management Framework." Voting reflects this additional language, which includes considerations such as exploring and encouraging non-lethal techniques before lethal and additional considerations proposed by the SAG.		
*Consensus scale:		
1	Enthusiastically support	
2	Support	
3	Can abide by or live with; do not object	
4	Object	
5	Strongly object	

Table A-iii: Vote Results regarding lethal control of wolves having an unacceptable impact on wild ungulate populations

		Lethal control of specific wolves or wolf packs confirmed by CPW to be having an unacceptable impact on wild ungulate populations in a geographic unit or area (i.e., a DAU)	
Depredation Condition:			
Phase		1 & 2	3
First Name	Last Name	Not allowed	Allowed by state/federal agents with considerations In addressing appropriate management response to wild ungulate impacts, CPW will require: 1) data or other information indicating that wolves are a major cause of ungulate herds not meeting objectives; and will consider: 2) ability to address the situation through non-lethal means; 3) the level and duration of wolf removal necessary to achieve management objectives; 4) ability to measure ungulate response to management actions; and, 5) identification of other potential major causes of an ungulate population not meeting objectives and attempts made to address them.
Matt	Barnes	1	4
Donald	Broom	3	1
Jenny	Burbey	5	2
Bob	Chastain	4	2
Renee	Deal	4	2
Adam	Gall	Absent	Absent
Dan	Gates	5	2
John	Howard	Absent	Absent
Francie	Jacober	1	1
Lenny	Klinglesmith	3	1
Darlene	Kobobel	1	5
Tom	Kourlis	5	1
Brian	Kurzel	3	1
Hallie	Mahowald	3	2
Jonathan	Proctor	2	3
Gary	Skiba	2	4
Steve	Whiteman	2	3
Total support/no objection (1, 2, or 3)		10	12
Total objections (4 or 5)		5	3
Additional language relevant to each item is in the "Impact-Based Management Framework." Voting reflects this additional language, which includes considerations such as exploring and encouraging non-lethal techniques before lethal and additional considerations proposed by the SAG.			
*Consensus scale:			
1	Enthusiastically support		
2	Support		
3	Can abide by or live with; do not object		
4	Object		
5	Strongly object		

Table A-iv: Vote Results regarding lethal control of wolves significantly reducing or likely to extirpate other species of concern

Depredation Condition:		Lethal control of specific wolves or wolf packs confirmed by CPW to be significantly reducing or likely to extirpate other species of concern	
Phase		1 & 2	3
First Name	Last Name	Not allowed	Potentially allowed by state/federal agents, with the same consideration as described in row describing ungulate management.
Matt	Barnes	3	2
Donald	Broom	4	1
Jenny	Burbey	5	1
Bob	Chastain	4	2
Renee	Deal	5	1
Adam	Gall	Absent	Absent
Dan	Gates	5	2
John	Howard	Absent	Absent
Francie	Jacober	2	2
Lenny	Klinglesmith	5	1
Darlene	Kobobel	1	4
Tom	Kourlis	3	1
Brian	Kurzel	3	2
Hallie	Mahowald	4	1
Jonathan	Proctor	3	2
Gary	Skiba	2	4
Steve	Whiteman	2	2
Total support/no objection (1, 2, or 3)		8	13
Total objections (4 or 5)		7	2
Additional language relevant to each item is in the "Impact-Based Management Framework." Voting reflects this additional language, which includes considerations such as exploring and encouraging non-lethal techniques before lethal and additional considerations proposed by the SAG.			
*Consensus scale:			
1	Enthusiastically support		
2	Support		
3	Can abide by or live with; do not object		
4	Object		
5	Strongly object		

Appendix B: About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse, and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research, or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klinglesmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Report on Ungulate Management Recommendations

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Ungulate Management Recommendations August 2022

This report summarizes consensus recommendations of the Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) regarding strategies to manage ungulate populations and hunter opportunities in the context of wolf reintroduction and management.

In conjunction with the recommendations made in this report, the SAG's report on impact-based management also provides insight on direct management of wolves in response to ungulate populations significantly below objectives that can be caused by wolf predation.

Discussion

Although impacts to outfitters and hunters are not addressed in Proposition 114, the SAG feels it is important to address them as part of the plan. A SAG member reported the concern that some members of the hunting community are not supportive of how their concerns have been addressed within the SAG process. Many SAG members are concerned that the tension and frustrations that have led to anti-wolf policies experienced in Idaho and Montana are beginning in Colorado. SAG members encourage the Commission to work early and proactively to address these tensions and frustrations.

The SAG understands that it is difficult to predict specific numerical impacts and location of impacts of wolves on ungulates. Wolves may bring about negative impacts at localized levels to certain ungulate populations while some herds may be largely unaffected with little to no impacts. Additionally, wolves may help certain populations become healthier through predation and altering habitat use.

While these outcomes will play out as wolves repopulate western Colorado, the real and perceived social and economic impacts are already present among the hunter/outfitter community. There is concern that wolves will reduce hunter opportunity due to declining herd numbers, deer and elk will be pushed out of designated permit areas that outfitters operate in and result in their businesses not being able to provide the services they are permitted to provide, and numerous other concerns. For more detailed descriptions on both the positive and negative impacts wolves may have on a localized level, the SAG recommends reviewing the impact-based management report.

Whether it's positive or negative impacts being discussed, the SAG recognizes there is some speculation involved about impacts in Colorado based on science and previous observations where wolves have been present. It would be beneficial for CPW and Colorado to develop proactive measures prior to wolf restoration that will address potential impacts to livestock producers or hunters and outfitters. Therefore, it is critical for CPW to develop a proactive approach to potential and perceived negative impacts that may stoke greater barriers to sustainable wolf populations and deliver clear and consistent messaging on the handling of wolf/ungulate interactions. In this way, CPW can create trust and buy-in

from the public and contribute to the long-term sustainability of both wolves and ungulate populations and ultimately individuals and communities living with them in Colorado.

Based on evidence and direct communication with biologists from the Northern Rockies, if and where impacts occur, they will be at a local level (in Colorado, likely at a DAU or GMU scale). Local level impacts on ungulates, both real and perceived, may have an outsized role in catalyzing opposition to wolves and may serve as one of the greatest long-term challenges to wolf sustainability. Monitoring will be key to understanding impacts and responding accordingly through impact-based management (see the SAG's impact-based management report for more on this topic).

The SAG understands that wolves alone are not the focus of ungulate management but another layer that must be incorporated into the current models. Ungulates face multiple stressors including but not limited to ever-increasing non-consumptive recreational impacts, multiple predators, habitat encroachment/loss, drought/aridification and more. With all these factors in mind, it is important to remember CPW's main tool for ungulate population management is through hunting. Managed hunting of ungulate game populations provides the backbone source of revenue for CPW, provides numerous outlets for economic activity, and provides an extremely valuable source of protein/food.

In closing, the SAG offers the following recommendations, understanding that there is not a collective assumption wolves will negatively impact ungulate herds. Rather, these recommendations are offered for consideration of how to manage already existing concerns and proactively address them should they occur in the future. The details of such recommendations would require further discussion.

Recommendations

- **Prioritize, ramp up and maintain monitoring of ungulate populations and actively manage for impacts at a local level.** Where consistent monitoring identifies localized impacts (cause-specific), integrate data into the planning and management strategies at the local level. Cause-specific factors could include habitat fragmentation, increased recreation, or drought, along with predation.
- **Continue growing ungulate herds.** The SAG recognizes that CPW is making efforts to bring certain ungulate populations that are currently below objective back within objective. In this vein, the SAG would suggest continuing these efforts, as well as proactively expanding efforts to grow ungulate herds on a GMU or DAU basis, particularly where wolves are predicted to occupy, and managing/maintaining these herds at the upper end of objectives. This approach could provide a win-win in the sense that an abundance of ungulates will provide a buffer against potential wolf-caused population decline, provide ample prey base for rapid and successful wolf population growth, and, if population declines fail to appear over time, the opportunity will exist to increase hunt-based ungulate management. Additionally, prioritize wolf release sites where ungulate populations are NOT under objective. This recommendation should be taken into consideration in addition to other ungulate management factors.
- **Develop and implement an Education and Outreach communications campaign.** A consensus recommendation from the SAG is to create an active communications campaign for target audiences. CPW should provide education and outreach that gives consistent baseline information for agency actions with respect to ungulate management (license allocation, quota

reduction, herd counts, etc.) and science around Colorado's wolves, in order to mitigate controversies with best available science and provide transparent, relevant, and easy-to-understand information to impacted communities. This recommendation hinges on a proactive approach to outreach by putting information into the hands of the public vs. the public needing to seek it out. In reference to this recommendation, CPW has stated the cost of \$1.7 million to pursue the next levels of outreach and social science driven education. More specific details on this communications campaign are provided in the attached addendum. Refer as well to the SAG's recommendations on outreach and education for more on these topics.

- **Consider a compensation program for affected outfitter businesses and/or clients. See attached documents on other state voucher/set aside programs.** There are a variety of options the SAG discussed with this recommendation. The basic premise revolves around outfitters whose permitted area shows a data-backed connection between declining ungulate herds and wolf predation. CPW may provide vouchers to these affected operators that could provide an alternate means of generating revenue for the outfitter, thereby keeping their business alive until a wolf/ungulate balance is achieved. Alternatively, CPW could create or support other compensation avenues for outfitter businesses that cannot provide services related to wolf presence. A separate compilation of data directly from the Northern Rockies' state wildlife agencies is being submitted separately but in conjunction with these recommendations. As a related concept, consider working with the US Forest Service, Bureau of Land Management, and private landowners, as applicable, to explore reserved common permits for outfitters.
- **Create new opportunities and promote current opportunities for the public to provide non-hunting income to support wolves and wildlife management.** This recommendation stems from the idea that those who voted for Proposition 114 and want wolves on the landscape should have the opportunity to provide financial support to CPW for the management of wolves, impacts on ungulate populations, and habitat to support both. Refer as well to the SAG's recommendations on funding for more on these topics.
- **Solidify robust and consistent funding.** The SAG recognizes that robust and consistent funding is necessary to accomplish the recommendations above. Solidifying reliable and adequate sources of additional funding to implement ideas such as a top-notch communications campaign and increased monitoring are paramount to the success and associated costs of Colorado wolves, while also maintaining the ungulate populations that CPW and hunter dollars have invested so much in already. In the 2022 budget, the General Fund provided \$2.1 million for wolf planning. A preliminary estimate for actual needs would be an amount of up to \$3 million annually for funding of directly related expenses; this number could potentially be more when considering adjacent expenses that are indirectly or partially related to wolf restoration and management, for example research and communications. Refer to the SAG's recommendations on funding for more on these topics.

Conclusion

The SAG recognizes the issue of ungulate management is challenging and highly variable. Ultimately, CPW staff and the CPW Commission are tasked to take actions that are best for a successful wolf recovery in conjunction with maintaining healthy ungulate populations and maintaining hunter opportunity.

Ungulate Management Report: SAG Member Level of Support

First Name	Last Name	Ungulate Management Report: Individual votes
Matt	Barnes	3
Donald	Broom	2
Jenny	Burbey	1
Bob	Chastain	2
Renee	Deal	2
Adam	Gall	2
Dan	Gates	Absent
John	Howard	3
Francie	Jacober	1
Lenny	Klinglesmith	2
Darlene	Kobobel	3
Tom	Kourlis	2
Brian	Kurzel	2
Hallie	Mahowald	2
Jonathan	Proctor	2
Gary	Skiba	2
Steve	Whiteman	2
Total support/no objection (1, 2, or 3)		16
Total objections (4 or 5)		0
*Consensus scale:		
1	Enthusiastically support	
2	Support	
3	Can abide by or live with; do not object	
4	Object	
5	Strongly object	

About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse, and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research, or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Appendix:

Avoiding Real and Perceived Loss of Hunting Opportunity and Montana/Idaho Outcomes

Additional input provided by Adam Gall and John Howard

Whether wolves will greatly impact hunting opportunity and/or success is difficult to determine due to the number of variables at play. In looking at data from the Northern Rockies, we believe the impacts will be at a localized level. Sometimes as specific as a particular creek drainage or basin where wolves might or will impact the presence of elk.

This presents an opportunity to take early proactive action in the field and in communications to avoid the Montana/Idaho Outcomes. To change the narrative.

Biologists in MT and ID report the failure to take more proactive action scaling back elk licenses in areas of predation (from many species) was a missed opportunity. It allowed a largely data free narrative to develop over time born out of the frustration with the absence of various state and federal actions and engagement. Working with the data and experiences from the Northern Rockies, these are a few suggestions for the Commission to proactively avoid the Montana/Idaho outcome:

- 1) **Continue growing the elk herds.** While efforts to do so have been under way for the past several years, we believe the hunting community fails to understand this effort. In addition, this conversation tends to be tags versus predators and now wolves. While reduction in cow elk harvest is an important lever in elk population growth, there are many factors: other predator control (lions in particular, bears in the spring), drought mitigation, conservation of calving and winter range, habitat improvement, **recreation planning and restraint**. CPW knows how to manage elk, but two public announcements we believe would cause immediate relief and support in the hunting community. We have trial tested these ideas with various leadership levels of major conservation groups in Colorado and received an overwhelmingly positive response.
 - a. *Raise the elk herd population goal publicly (consider deer and moose);*
 - b. *When the agency considers localized conditions within a DAU/GMU where wolves are present or likely present in the future, the agency will consider a larger population goal for that DAU/GMU.*
 - c. This comes at the expense of short-term loss of opportunity for hunters, potential for increased damage on livestock operators, and a decrease in revenue for CPW. However, the increased herd numbers should offer medium- and long-term greater hunting opportunity countering any actual or perceived narrative blaming wolves for elk population decline. If such a growth is unneeded in the future, CPW knows how to manage the population down.

- d. Such a strategy can unite the diverse stakeholders around greater food sources for wolves, preserving and perhaps expanding hunting opportunity, and most importantly avoiding the Montana/Idaho outcome.

2) Targeted Active Communications Campaign – The Critical Step

- a. CPW should retain a Colorado based advertising agency with experience in conservation. A model is GOCO's Generation Wild campaign, although on a much smaller and targeted scale;
- b. An advertising agency should be retained to work with agency staff to design a proactive communication plan with the following goals:
 - i. Provide a baseline of information for the agency's actions;
 - ii. Provide a baseline of information for science around Colorado's wolves;
 - iii. Address controversies with the best available science;
 - iv. Provide impacted communities with information in forms and format they accept and understand.
- c. Tactics
 - i. Target impacted communities;
 - ii. Receive back in real time effectiveness of such communication (this is not only possible in social media now, but also traditional media);
 - iii. Adjust immediately to real time feedback to improve communications;
 - iv. Explain transparently what actions the agency is taking;
 - v. Explain transparently the science from CPW's research;
 - vi. Lead the conversation, don't react to it;
 - vii. Always seek to target messages appropriately to different groups across the state – addressing not just what they want to hear but also what they do not want to hear, but on their terms.
- d. How is this different from CPW's current communications?
 - i. It's active – it takes particular messages out across multiple channels in a coordinated fashion;
 - ii. CPW is great at passive communication of data – “It's all up on the website”.
 - iii. Our proposal takes that mountain of data and shapes it into succinct messages – “wolves do not impact hunting” or “wolves do impact hunting locally, but our planning has accounted for it” or “elk populations are up and we are in a new golden age of hunting”.
 - iv. Not propaganda, but a compelling invitation for greater engagement with the facts on the ground.
 - v. GOCO could have put data on how the outdoors impacts kids and moms on a website. What made Generation Wild a success was the active engagement via media, games, contests, events, and other tactics that drove the message that Moms and Kids in the outdoors is key to health and a happy life.

Statement on Regulated Public Hunting of Wolves

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Statement on Regulated Public Hunting of Wolves July 2022

Overview & summary of key points

This report summarizes feedback from the Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) regarding regulated public hunting of wolves.

1. **The SAG does not have consensus on whether to allow regulated public hunting of wolves.** The SAG has not sought a formal vote nor consensus on this topic.
2. **The SAG recommends, by consensus, that a decision on regulated public hunting of wolves should not be made in the restoration and management plan to be finalized in 2023.** The SAG recommends that it is premature for a decision to be made on regulated public hunting in the upcoming 2023 plan. The SAG recognizes that any decision on this topic would only be relevant if wolves have achieved a self-sustaining population in Colorado as required by 33-2-105.8. The SAG further recognizes that these conditions will not be relevant, if at all, for many years. Some SAG members are concerned that a decision on regulated public hunting in the planning process may overshadow other key elements of the plan and that it should not be decided at this time. Other SAG members suggest that while they agree it should not be decided upon now, it is important for the Commission to discuss the topic prior to state delisting. Other SAG members believe public hunting of wolves should not be allowed.
3. **The SAG recommends, by consensus, that any future discussion and/or decision on regulated public hunting of wolves should be impact- and science-based, with consideration of biological and social science as well as economic and legal considerations.** The SAG anticipates that an abundance of biological, social, and economic data and information will be gathered when wolves are reintroduced to and are present in Colorado over time. The SAG recommends that this information be used to inform future decision making regarding regulated public hunting, along with consideration of interpretation of legal authorities relative to the definition of gray wolves in CRS 33-2-105.8. Some SAG members feel it is premature to detail the considerations that should inform a future decision.
4. **The SAG recognizes, by consensus, that the concept of regulated public hunting is distinct from targeted lethal control.** The SAG provided feedback on targeted lethal control of wolves in its June 2022 report on impact-based management. Within the consensus impact-based management assumptions in that report, the SAG recommended, ‘when negative impacts occur, they should be addressed on a case-by-case basis utilizing a combination of appropriate management tools, including education, non-lethal conflict minimization, lethal take of wolves, and damage payments.’ The SAG also offered consensus recommendations in that report regarding allowance of targeted lethal control in specific situations.

Final SAG Statement on Regulated Public Hunting, July 2022

About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Final SAG Statement on Regulated Public Hunting, July 2022

Report on Outreach and Education

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Outreach and Education August 2022

Overview and guiding recommendations

This report summarizes feedback from the Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) regarding outreach and education, including 1) consensus recommendations described on this page and 2) a compilation of suggestions for specific audiences and messages offered by each sector of the SAG.

The SAG offers, by consensus, the following priority recommendations regarding the value and need for outreach and education:

1. Targeted outreach and education are an essential component of a successful restoration and management program that can increase trust, transparency, and awareness.
2. Substantially increase funding for education and outreach; effective outreach and education requires robust agency capacity, dedicated funding, and resources.

The following consensus recommendations should also guide outreach and education related to wolf management:

- Outreach and education should occur proactively, continuously, and reactively.
- General as well as audience-specific messages and mechanisms are needed; diverse audiences use and/or prefer different communications approaches and formats, including bilingual messaging.
- Include messaging about what is in the plan; agency actions and how the plan is being implemented; goals and expectations; and positive and negative impacts of wolves at various scales.
- Identify trusted messengers; consider where trust in the agency is strong or weak as a potential lever or barrier to effective communication.
- Common messaging should be amplified through partnerships; there is power in diverse stakeholders communicating similar messages to their sectors.
- Messaging can help build awareness and empathy for different perspectives; highlight how different stakeholders are working together across different points of view; and illustrate impacts with personal stories.
- Social science research can help inform outreach and education strategies and messages; the effectiveness of communications tools and messaging should be monitored to inform and adapt them for greater success.
- Outreach and communication should highlight opportunities for a variety of interests/stakeholders to support funding of the wolf plan.
- Balance information on wolves with other wildlife messaging; wolves are a member of the suite of native species in Colorado.
- Counter misinformation and misperceptions with best available science.

Key messages by audience

The SAG has discussed a variety of potential audiences for outreach and education. The following sections synthesize feedback on key messaging topics, by target sector. They are offered as a compilation of feedback from SAG discussion and *do not necessarily reflect SAG consensus on all points*.

Messages suggested for the agriculture, sportsperson, and wolf advocacy sectors reflect the compilation of feedback from breakouts of each of those sectors, respectively; they are not necessarily a reflection of SAG consensus nor consensus of the broader constituencies of each sector beyond those that participated in each of the SAG sector discussions. Messages suggested for outdoor recreationists, local and municipal decision makers, and the general public are a compilation of messages suggested by all SAG members; once again, they do not necessarily reflect consensus on all points.

Agricultural community *(messages suggested by SAG agriculture members)*

Key messages to provide to the agricultural community:

- Describe what the management plan says and relevant issues for livestock producers. Specifically, describe options available for compensation, conflict minimization, and use of nonlethal or lethal tools; the resources that are available and how to access them; and the reporting and investigation process.
- Producers are valued; ranching and open space benefits and ecosystem services are valued.
- Impacts will be local; impacts to specific producers can be significant while statewide impacts are small.

Key messages the agricultural community would like to get across:

- Ranching supports wildlife by providing connections and habitat across public and private lands; private lands are necessary for wildlife habitat, especially animals' winter range.
- Livestock producers do not hate wolves.
- Livestock producers want to keep livestock alive, healthy, happy, and safe; producers do not want to see livestock suffer.
- Livestock compensation does not cover all costs to producers; stress and mental health issues are real and significant; the agricultural community would like to understand what financial support others are willing to provide to support wolf restoration.

Sportspersons and outfitters *(messages suggested by SAG sportspersons/outfitters members)*

Key messages to provide to sportspersons and outfitters:

- There is a plan to manage wolves and the species' reintroduction.
- Impacts will be local, not statewide.
- There is a strategy to stabilize and maintain ungulate populations and to grow populations where possible, with consideration of all impacts, including to wolves.

Key messages the sportsperson and outfitter sector would like to get across:

- Sportspeople are the key component of financial support and physical support for science-based wildlife management.
- Over time, wolves should be managed like all wildlife.

Wolf advocates *(messages suggested by SAG wolf advocacy members)*

Key messages to provide to wolf advocates:

- There will be impacts to individuals and communities from wolves.
- It is important to understand the concerns of impacted individuals and local communities.
- There will be compensation for livestock losses by law, but producers sometimes are unsatisfied with the programs as they feel they do not compensate for all losses, leading to decreased tolerance for wolves.
- Wildlife management takes effort and money.

Key messages wolf advocates would like to get across:

- There are positive impacts of wolves, including restoring biodiversity and wildlife diversity; tourism and economic benefits from wolf-based tourism; and contributing to healthier riparian systems (e.g., more songbirds).
- Wolves will not decimate ungulate populations or the livestock industry.
- (Particularly for the agricultural community) Most wolves do not kill livestock; some do.
- Wolves do not pose a significant threat to human safety.
- Wolves should *not* be managed like all other wildlife (e.g., advocates do not have a favorable view of management of bears and cougars).
- Even when they are distributed throughout western Colorado, wolves will be far less common than coyotes, black bears, or cougars.

Outdoor recreationists *(The following messages are a compilation of messages suggested by all SAG members. The suggestions do not necessarily reflect consensus on all points.)*

Key messages to provide to outdoor recreationists:

- Historically, wolves do not attack people; wolves pose no significant personal danger to human safety.
- Wolves may approach you out of curiosity. Know what to do if approached.
- Your activity, presence, and pets have an impact on wildlife and habitat, including wolves.
- There will not be significant loss of recreation opportunity due to wolf reintroduction or their presence on the landscape.
- Be aware of wolves' impacts on lands used for recreation, including positive impacts such as the opportunity to wildlife watch and negative impacts such as potential closures due to denning sites.
- Recreation benefits from wildlife management; encourage recreationists to contribute directly to wildlife and wolf management and make options for contribution clear (i.e., emphasizing "donate now" opportunities on the CPW website).

Additional FAQ and best practice considerations for messaging to outdoor recreationists:

- What to do if you see a wolf.
- Leash your dog: it is safer on leash for wildlife and your dog.
- Wolves are wild animals: give them space and do not approach or feed them.
- It is illegal to chase or harass a federally endangered species.
- Don't handle wolf scat.
- Wolf pups likely aren't abandoned; leave wolf dens alone.

- How to report wolf sightings to local CPW offices.
- (For hunters) Lead bullet fragments left in carcasses [gut piles] can cause lead poisoning of scavengers; switching to copper bullets can help.
- Don't leave stock tied up in vulnerable areas.
- The difference between coyotes and wolves: e.g., tracks, scat (use pictures/graphics).
- Proper food storage practices.
- Include wolves in existing messaging for bears, cougars, etc.
- Provide information near wolf locations (i.e., at visitor centers and trailheads; use QR codes).

Local and municipal decision makers *(The following messages are a compilation of messages suggested by all SAG members; however, the suggestions do not necessarily reflect consensus on all points.)*

Key messages to provide to local and municipal decision makers:

- The benefits and costs to reintroduce and manage wolves in their area.
- General facts about wolf biology; the wolf reintroduction and management plan; plans for livestock compensation, ungulate management, and conflict mitigation.
- We are counting on decision makers for accurate messaging to the broader public.
- Wolf impacts tend to be more localized and may impact individual producers rather than entire regions; local decision makers can help messaging to have an appropriate scale.
- Facts about what resources are available to impacted constituents.

Additional considerations for messaging approaches to decision makers:

- Work with local leadership first; be proactive in their role in communicating with the broader public; emphasize the importance of local leadership in communication.
- Emphasize the importance of decision makers' partnership with CPW; leverage relationships between local CPW staff and leaders.
- Leverage existing groups (e.g., CCI, Club 20, Action 22) to hold workshops on wolf restoration and management.
- Use factsheets to make information accessible and easily digestible.
- Local leaders are an important source of information at the local scale and can communicate issues in their communities.

Key messages decision makers would like to get across:

- We are here to support our constituencies.
- We have/need the resources to support you.

General public *(The following messages are a compilation of messages suggested by all SAG members; however, the suggestions do not necessarily reflect consensus on all points.)*

Key messages to provide to the general public:

- The plan, timing, and process of wolf reintroduction (e.g., 'We are bringing wolves to Colorado by the end of 2023.')
- Why wolves are being reintroduced when they are already here and why the state is spending money on restoration efforts.
- We don't have to choose among ranching, hunting, and restoration.
- This is a historic moment for Colorado.

- General facts about wolf biology (wolves are a native species and being restored to the state).
- Funding for wolf restoration is currently being allocated from the general fund.
- We need funding to protect animals and reduce conflict with livestock.
- CPW is the authority of correct information; the agency is made up of experts on this topic.
- Management is impact-based and adaptive.
- Impacts from wolves may be positive or negative.
- The wolf planning process actively engages a diverse set of stakeholders to inform a plan that acknowledges and strives to address a variety of concerns.
- Ungulate populations are impacted by a variety of factors.

Additional considerations for messaging approaches to the general public:

- Focus on the middle ground; highlight personal stories; showcase intersectionality of interests.
- Highlight systems and processes in place for wolf issues.
- Direct delivery: local television, radio, businesses, professional sports teams, op-eds, news articles.
- Address myths about safety with education.
- Humanize CPW; increase agency transparency with the public.
- Review images and graphics to ensure they are accurate to the real world (e.g., photos of livestock guard dogs, not burros; pictures of livestock on the range and not dairy cows).

About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse, and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research, or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option, or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option, or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Report on Funding Recommendations

Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) to Colorado Parks and Wildlife (CPW)

Report on Funding Recommendations June 2022

The following funding recommendations reflect the consensus of the Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG).

The SAG recognizes that wolf restoration and management will be accompanied by both positive economic benefits and localized personal negative economic impacts, especially to our more rural neighbors. To the extent possible we all should try to equitably distribute those positive economic benefits and mitigate the negative impacts.

Short-term and long-term funding will be necessary for a variety of needs related to wolf restoration and management, including but not limited to: staff capacity, reintroduction logistics, management and conflict minimization materials and activities, depredation compensation, monitoring and research, and education and outreach. We urge all to remember that conservation and equity take time and consistent energy and funding.

Proposition 114 asks the General Assembly to ‘make such appropriations as are necessary to fund the programs authorized and obligations... and... may adopt such other legislation as will facilitate the implementation of the restoration of gray wolves to Colorado.’

The SAG is concerned that the ongoing costs of the wolf restoration and management program have not been fully anticipated by the [fiscal note](#) supporting CRS 33-2-105.8 in SB21-105, and that funding to address these costs has not been fully identified. Growth in future annual funding needs should be anticipated due to growth in the wolf management program.

The SAG recommends that opportunities for private donations be actively marketed through a communications campaign; that a full list of potential public and private funding sources that can be used for wolf restoration and management, along with their restrictions, be documented and maintained; and that funding sources that cannot be used for wolf restoration and management also be clearly communicated.

To support and sustain a successful wolf restoration and management plan that maximizes positive benefits and minimizes and mitigates negative impacts, the SAG urges full funding for the program.

Specifically, the SAG recommends:

1. **Annual Appropriations.** Until such time as a sustainable funding model is established, the SAG suggests that full funding be provided by the Colorado State Legislature; this number would be estimated annually by CPW based on wolf-related needs. A preliminary estimate would be an amount of up to \$3 million annually for funding of directly related expenses. This number could

potentially be more when considering adjacent expenses that are indirectly or partially related to wolf restoration and management, for example research and communications.

2. **Wolf Cash Fund or Wolf-Specific Account.** To provide long-term, sustainable funding, the SAG suggests exploration of the use of an existing cash fund, the creation of a new wolf restoration and management cash fund, or the creation of a wolf-specific account. Annual appropriations do not guarantee multi-year, long-term funding; establishment or leveraging of an existing cash fund or other wolf-specific account early in and/or prior to wolf reintroduction can help to secure public and private funding while interest is high, so that it can be available when needed in both the short- and long-term. The SAG suggests that this fund or account be provided initial seed funding by the Colorado State Legislature, and then be supported by a variety of public and private funding sources. Marketing of opportunities for private donations should be conducted through a communications campaign. CPW may consider opportunities for the fund or account to support both holistic, unrestricted funding needs as well as separate, program-specific needs for compensation and nonlethal conflict minimization. Any cash fund or account should not compromise CPW's enterprise status.

3. **External Endowment Fund.** To enhance opportunities to identify and fundraise from external sources, the SAG encourages support for the development of an external endowment that is managed and administered separately, but with input and partnership from Colorado Parks and Wildlife. The endowment fund would specifically support nonlethal aspects of wolf management, as well as other programs to explore and develop the projected positive economic benefits that can come with the restoration of a keystone wildlife species. The specific terms and governance of the endowment will need to be determined, including whether and how the fund provides supplemental funding to CPW and/or external entities for nonlethal wolf management and conflict minimization activities. Full funding for the agency's annual budget and programs should be provided directly to the agency through public funding and should not be reliant on the external endowment. Opportunities for private donations would be actively marketed through a communications campaign. SAG members are interested to support next steps for continued exploration and creation of an endowment.

About the Stakeholder Advisory Group

The Colorado Wolf Restoration and Management Plan Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. SAG members were selected by Colorado Parks and Wildlife (CPW) for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. The SAG is comprised of 17 voting members and 3 non-voting members. CPW is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations.

The SAG strives to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW. Per the SAG charter, consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with. Where consensus does not exist, a vote will be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views.

Stakeholder Advisory Group Members:

Voting Members:

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klinglesmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

Stakeholder Advisory Group report developed with third party facilitation from Keystone Policy Center.

Appendix A: Stakeholder Advisory Group Members

Stakeholder Advisory Group Members:

Voting Members

- Matt Barnes
- Donald Broom
- Jenny Burbey
- Bob Chastain
- Renee Deal
- Adam Gall
- Dan Gates
- John Howard
- Francie Jacober
- Lenny Klingsmith
- Darlene Kobobel
- Tom Kourlis
- Brian Kurzel
- Hallie Mahowald
- Jonathan Proctor
- Gary Skiba
- Steve Whiteman

Ex Officio Members:

- Dan Gibbs, Executive Director, Colorado Department of Natural Resources
- Les Owen, Division Director, Colorado Department of Agriculture (*designee of Kate Greenberg, Commissioner, Colorado Department of Agriculture*)
- Heather Dugan, Acting Director, Colorado Parks and Wildlife

The Stakeholder Advisory Group was supported with third party facilitation from Keystone Policy Center and with additional staff support from Colorado Parks and Wildlife.

Appendix B: Stakeholder Advisory Group Biographies

Matt Barnes

Matt Barnes is a range scientist and wildlife conservationist. He works with landowners and managers to improve rangeland stewardship, and to coexist with large carnivores such as grizzly bears and wolves. His work has also focused on resolving the long-standing debate in range science over rotational grazing. He is the owner of Shining Horizons Land Management and a research associate with the Northern Rockies Conservation Cooperative. He previously worked with the nonprofit People and Carnivores in Montana and Wyoming. Matt ran a holistically managed custom cattle grazing operation in western Colorado; served as President of the Colorado Section Society for Range Management; and served as a rangeland management specialist in the USDA Natural Resources Conservation Service, a prescribed fire manager with the USDI Bureau of Indian Affairs Branch of Forestry, serving five Tribes in northwestern Arizona; and as a grizzly bear technician for Idaho Fish and Game. He holds an M.S. in range science from Utah State University and a B.S. in wildlife ecology from the University of Arizona.

Donald Broom

Donald Broom is serving his first term as a Moffat County Commissioner. Donald is the commissioner liaison to several county boards including the community libraries, fair board, and the Moffat County Tourism Association. Donald manages Sombrero Ranches where he oversees the nation's largest herd of broke horses, supplying riding stables, movie scenes, and outfitters with rideable livestock. Donald has a strong background in agriculture, economic development, tourism, and has a broad understanding of the social and economic ties that comprise Moffat County, Colorado.

Jennifer Burbey

Jennifer Burbey is the Colorado Outfitters Association President with over 30 years of experience providing outfitting services in the backcountry of Southwestern corner of the state. When not in the backcountry she and her family raise hay, Quarter Horses, and Draft crosses in Breen, CO.

Bob Chastain

Bob Chastain became Cheyenne Mountain Zoo's President and CEO in 2005. However, he has been on staff at CMZ since 1995, first serving as Curator of Horticulture, then Director of Horticulture and Construction, and Vice President and COO. He earned a B.S. degree in public horticulture from Purdue University and a M.S. degree in environmental education and ecology from University of Wisconsin – Stevens Point. He has been the project leader for many of the improvements at Cheyenne Mountain Zoo including the African Rift Valley exhibit, which was awarded the 2003 Colorado Springs Partnership in Community Design Award and the 2004 AZA Exhibit Award; Rocky Mountain Wild and Encounter Africa, Australia and most currently the recently completed Africa: Water's Edge exhibit. Bob and his wife Antonia are residents of Penrose, Colorado and have two college-aged children. Among other pursuits, Bob has been a volunteer firefighter and a certified U.S. Forest Service Wildland firefighter and in his spare time enjoys hiking, mountain biking, and almost any outdoor activity.

Renee Deal

Renee Deal is a fourth-generation rancher from Somerset, Colorado. Her great-grandfather and grandfather ran cattle starting in the 1920s and her grandfather and father switched to sheep production in the 1970s. Deal's family has also been outfitting for big game since the 1940s and operate with an outfitting permit on the Gunnison National Forest. Deal left the ranch to pursue a degree in chemical engineering and worked as a biomedical engineer in Boulder and Arvada for ten years before

returning to the family sheep ranch with her husband and children in 2001, forming Sperry Livestock Corporation with her father. They feel very fortunate to have raised their family in rural western Colorado with its strong agricultural roots and values. In addition to working on the ranch, she taught preschool and secondary math for fifteen years but is now dedicated full-time to the ranching operation. Deal's three grown children now live throughout Colorado in Meeker, Pagosa Springs, and Boulder and she enjoys visiting them as often as she can. She is passionate about agriculture and recognizes the importance of bridging the gap between urban and rural communities through outreach and education. Deal recognizes that working with a diverse group of stakeholders is necessary to achieve the best possible outcome of wolf reintroduction to the western part of Colorado and would particularly like to represent the voices of those whose lives and livelihoods will be most directly affected by the effort.

Adam Gall

Adam Gall lives in Hotchkiss, CO with his family. He and his wife own and operate Timber to Table Guide Service and Dark Timber Outfitters, guiding elk hunts. Adam is a partner in a small craft brewery in Paonia called Chrysalis Barrel Aged Beer. He's been a long-time fishing guide in the Gunnison Gorge Wilderness with Black Canyon Anglers. Prior to this, Adam was a high school science teacher at Hotchkiss High School, a wolf biologist with the Nez Perce Tribe in Idaho and a US Forest Service wildland firefighter on the Clearwater National Forest. When he has a minute, he enjoys fly fishing, chasing elk with a bow, spending time outside with his wife and daughters, and being in the high country as much as possible.

Dan Gates

A lifelong sportsman, Dan dedicates a tremendous amount of time to conservation and wildlife management efforts. Sitting on national, regional, and state boards along with being the Chair of the Colorado Habitat Stamp Committee, sitting on the Colorado Wildlife Council, the Colorado Outdoor Partnership Executive Council, and many other working groups, he brings many different perspectives from diverse stakeholders and many wildlife related subjects and issues. For over three decades he has assisted and consulted in addressing and solving a variety of wildlife concerns and conflicts with a family-owned business that works with many sectors including public utilities, water resources, agricultural production, human health and safety, the defense department, transportation, recreation, aviation, and other commercial, industrial, and residential customers.

John Howard

John Howard is a lifetime sportsperson who fishes and hunts small game, waterfowl, and big game in Colorado. Former Chairman of the Colorado Parks and Wildlife Commission for two terms, he served a total of almost five years on the Commission from 2014 to 2019. Having graduated from CU Law in 1987, he spent five years in private practice before turning to a corporate career that took him around the world working on media, technology, and industrial companies as an executive and director. Since 2011, he has operated Bounds Green Crisis Management and Mediation, specializing in troubled companies, government agencies, and NGOs planning for and suffering through crisis as well as investing in troubled assets via Sleep Again Capital, LLC.

Francie Jacober

Francie Jacober is a Pitkin County Commissioner. She has lived in Colorado since 1965 when she first attended the University of Colorado. She has ranched with her family in Archuleta, Costilla, and Pitkin Counties. Francie taught middle school math, science, Spanish, and literature for over thirty years, including five years at Aspen Country Day and twenty-two years at Carbondale Community School. She worked at Colorado Outward Bound School while in college and was the first female instructor at

Hurricane Island Outward Bound. In addition, she founded and directed Colorado Wilderness Experience, an adventure program for teenagers. She led twenty-five-day courses which included rafting, kayaking, mountaineering, rock climbing, and mountain biking. Francie is the general manager at Fatbelly Burgers in Carbondale. She has four children and nine grandchildren. Her passions are respecting the natural environment, gardening, anything math, river running, and her family.

Lenny Klinglesmith

Lenny Klinglesmith is a second-generation rancher and landowner, born and raised in northwestern Colorado. Lenny currently owns and operates LK Ranch with his wife Jackie and their two daughters Lori Ann and Lila. The operation specializes in sustainably raising a commercial cow-calf herd with a grass-fed, stocker-yearling program. Along with raising cattle, Lenny has worked side-by-side with CPW, Colorado Cattlemen's Agricultural Land Trust, Habitat Partnership Program, and others to conserve land for wildlife and agriculture. Lenny has also worked with CPW in establishing a well-running Ranching for Wildlife, a big-game hunting program that provides private client, public drawing, and youth hunting opportunities. Lenny is hopeful his knowledge and experience on the land will be an asset to the planning process. In his spare time, he enjoys training horses and traveling with his family.

Darlene Kobobel

Darlene Kobobel rescued a wolfdog in 1993 from a kill shelter in Colorado, and credits this as her inspiration for becoming a voice for wolves. She started a sanctuary in Lake George, CO, and was in that location for ten years until being forced to evacuate due to the Hayman fire in 2002. Kobobel moved her sanctuary to Florissant and then made way to her final destination in Divide in 2006. This location is now the Colorado Wolf and Wildlife Center. This year marks twenty-eight years of Kobobel living with wolves, and teaching and being a voice for this iconic animal.

Tom Kourlis

Tom Kourlis is a respected sheep and cattle rancher and statewide leader in Colorado. Tom served as Colorado Commissioner of Agriculture under Governor Roy Romer for five years. He has been at the forefront of numerous statewide collaborative planning efforts between governmental agencies, private landowners, and interest groups, such as the CPW Habitat Partnership Program, the CDA Colorado Ag Council and the BLM Coordinated Resource Management Plan for NW Colorado. Tom has been named Citizen of the West, Woolgrower of the Year, been inducted into the Colorado Agriculture Hall of Fame and received awards from the Colorado Society of Range Management, CSU Integrated Resource Management Program, Colorado Corn Growers, and Colorado Wheat Growers. Tom believes we have a responsibility to manage natural resources in perpetuity for the benefit of the citizens of Colorado.

Brian Kurzel

Brian Kurzel is the Rocky Mountain Regional Executive Director for the National Wildlife Federation (NWF) and has more than twenty-five years of experience developing conservation policy, leading on-the-ground conservation efforts and actively engaging adults and youth in outdoor stewardship and education. Through his roles at NWF, and as Policy and Planning Supervisor at Colorado Parks and Wildlife and leading a statewide, science-driven natural areas program, Brian has worked effectively with ranchers, hunters, environmentalists, industry, land managers, and others to find collaborative solutions that help wildlife and people thrive.

Hallie Mahowald

As programs director for the Western Landowners Alliance, a landowner-led nonprofit advancing policies and practices to sustain working lands, connected landscapes, and native species, Hallie

manages people and strategy to support stewardship across the American West. At Western Landowners Alliance, Hallie oversees all programming including the Working Wild Challenge program, a landowner-led effort that recognizes the challenge of ranching with wildlife and facilitates constructive dialogue between wildlife managers and working land stewards to solve problems through peer learning, public policies, and increasing access to technical and financial assistance. Hallie also serves on the steering committee of the Conflict Reduction Consortium, a group of landowners, NGO partners, agency staff, and individuals focused on reducing the impacts of human-wildlife conflict while supporting working landscapes. Previously, Hallie worked for the Department of Energy where she handled compliance with the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA). She holds a B.A. in environmental science and a M.A. in international environmental policy. Hallie currently serves on the advisory board of CSU's Center for Collaborative Conservation and as board president for the Central Colorado Conservancy. In her free time, she enjoys mountain biking, paddling, and skiing with her husband and two children.

Jonathan Proctor

Jonathan Proctor is the Rockies and Plains Program Director for Defenders of Wildlife. He directs a staff of seven in Colorado, Montana, and Wyoming to improve policies and implement projects to conserve and restore imperiled wildlife across the Rocky Mountains and the Great Plains. Over his thirty-year career in conservation across the Rocky Mountains, Great Plains, and Northwest, Jonathan has worked as a wilderness ranger with the U.S. Forest Service and as a wildlife advocate with two nonprofit organizations. This has included conservation of wolves, bison, grizzly bears, prairie dogs, black-footed ferrets, wolverines, lynx, swift fox, and beaver. This work often focuses on collaboration and conflict prevention measures with willing landowners and wildlife managers including Tribal and state wildlife agencies, ranchers, rural homeowners, and land trusts. Jonathan is a co-founder of the Great Plains Conservation Network – a coalition working to restore the region's natural heritage – and co-founder of the Prairie Dog Coalition. He is co-author of *Ocean of Grass*, an ecoregion assessment of the Northern Great Plains, and four publications on prairie dogs. Jonathan received a B.A. in geography from Wittenberg University and a M.S. in environmental studies from the University of Montana.

Gary Skiba

Gary grew up in western Pennsylvania, just north of Pittsburgh. While eastern forests still hold a special place in his heart, the west is his home. He holds a B.S. in wildlife management from the University of New Hampshire (1978) and an M.S. in wildlife biology from Colorado State University (1981). His master's work focused on the bighorn sheep herd in Dinosaur National Monument in the northwest corner of Colorado. Gary worked as a wildlife biologist for the Colorado Division of Wildlife for twenty-five years, focusing on threatened and endangered species management. He retired from CDOW in 2010 and has since held positions with Great Old Broads for Wilderness, the La Plata County Humane Society, and New Mexico State Parks. He is currently the Wildlife Program Manager for the San Juan Citizens Alliance, a Durango-based environmental advocacy organization. He lives east of Durango with his wife, Kate Pickford, two whippets, and expects to soon have a Labrador puppy that he hopes to turn into a top-notch duck hunter. Gary is honored to serve on CPW's wolf Stakeholder Advisory Group.

Steve Whiteman

Steve Whiteman is in charge of wildlife resource management on the Southern Ute Indian Reservation in southwestern Colorado. Originally from California, Steve received his Bachelor of Science degree in fish and wildlife biology from the University of California at Davis in 1993. He worked briefly for the California Department of Fish and Wildlife out of Sacramento, as well as the U.S. Fish & Wildlife Service in western Alaska. Most of his career – over twenty-five years – has been spent working for the

Southern Ute Tribe, where he started as the Tribe's first Fisheries Biologist in 1996. In 2001, he moved into the Division Head position, where he has overseen the Tribe's programs in game and non-game management, fisheries, and parks. He has also served as the Tribe's acting Director of Natural Resources for the past year and a half. Steve has significant experience with threatened and endangered species policy and management, which includes participation on the Tribal Working Group for the federal Mexican Wolf Recovery Program. He is also well-versed on Native American sovereignty, treaty-reserved off-reservation hunting rights, and Ute Indian history.

Heather Dugan - Acting Director, Colorado Parks and Wildlife (Ex-Officio)

Heather Dugan is the Assistant Director for Law Enforcement and Public Safety for Colorado Parks and Wildlife. Heather oversees the boating registration program and law enforcement-related operations, including training and investigations associated with protecting Colorado's wildlife and providing a safe and enjoyable recreational experience for visitors at Colorado's state parks. Heather worked for six seasons in state parks while working to earn her Bachelor of Science degree in wildlife biology. After graduating from Colorado State University in 1992, Heather was hired as a full-time ranger and has since worked in several parks, as a training coordinator and instructor, and most recently as a region manager.

Dan Gibbs - Executive Director, Department of Natural Resources (Ex-Officio)

As Executive Director, Dan Gibbs leads the development and execution of the Department's initiatives for the balanced management of the state's natural resources. Dan works on an array of issues pertaining to all of Colorado's natural resources, including water, wildlife, state lands, oil and gas, and mining. Dan is a respected collaborator and a strong proponent of building partnerships across agencies, nonprofits, and private-sector organizations to improve the productivity and success of government operations and services. Prior to joining the Department of Natural Resources, Dan served as a Summit County Commissioner from 2010-2018. As County Commissioner, Dan successfully pushed for wildfire preparedness, affordable workforce housing, lower health insurance costs, and protection and improvements to transportation infrastructure. Prior to his tenure as a Commissioner, Dan served in the Colorado House of Representatives and in the Colorado State Senate where he served on the Senate Agriculture and Natural Resources Committee. His legislative accomplishments include securing funding for wildfire mitigation and forest health, creating the Colorado Kids Outdoors grant program, supporting watershed health initiatives, and increasing environmental protections for wildlife from oil and gas development. Dan is a certified wildland firefighter and is affiliated with the ROSS system, through which he is on call to fight wildfires throughout the United States. He chaired the statewide Wildland Fire and Prescribed Fire Matters Advisory Council and represented county governments on the Forest Health Advisory Committee. Dan has served on a variety of civic boards including Search and Rescue Advisory, Legislative Sportsmen's Caucus, Tourism Office, Youth Corps Association, Friends of the Dillon Ranger District and the Keystone Science School. Dan is a graduate of Western State Colorado University and completed the Harvard Kennedy School Senior Executives in State and Local Government Program. He is also a Marshall Memorial Fellow. Dan enjoys all that living in the high country has to offer, including skiing, running, mountain biking, hunting, and fishing. He is a resident of Breckenridge, Colorado, where he lives with his wife, Johanna; daughter, Grace; and son, Tate.

Les Owen, Conservation Services Division Director, Colorado Department of Agriculture (for Kate Greenberg, Commissioner of Agriculture, Colorado Department of Agriculture) (Ex-Officio)

Les Owen has been the Conservation Services Division Director with the Colorado Department of Agriculture since August of 2016. He provides oversight and coordination of the Department's efforts to protect and enhance the state's agriculture activities as they relate to land use and range management, conservation, soil and vegetation management, grazing on public lands, water quality and quantity,

wildlife habitat, and endangered species. The Division also provides administrative and financial assistance to the 74 conservation districts; and oversight and administration of the noxious weed, weed free forage, bio-control (insectary), water quality, chemigation, and renewable energy programs. Les moved here from New Mexico where he worked for the New Mexico Department of Agriculture on a variety of issues related to federal land management, threatened and endangered species, and other rules and regulations that affect natural resource management. He was raised near the small town of Corona, New Mexico where most of his time was spent working on the family ranch.

Appendix C: Stakeholder Advisory Group Meeting Dates and Locations

Date(s)	Location
June 25, 2021	Salida
July 27, 2021	Craig
August 25, 2021	Salida
September 22, 2021	Grand Junction
October 27, 2021	Glenwood Springs
November 15, 2021	Colorado Springs
December 14-15, 2021	Denver
January 26-27, 2022	Virtual
February 23-24, 2022	Glenwood Springs
March 23-24, 2022	Montrose
April 27-28, 2022	Meeker
May 25-26, 2022	Woodland Park
June 22-23, 2022	Denver
July 27-28, 2022	Durango
August 24-25, 2022	Glenwood Springs

Appendix D: Stakeholder Advisory Group Charter



**Colorado Wolf Restoration and Management Plan
Stakeholder Advisory Group
to Colorado Parks and Wildlife**

**Governance Charter
6/30/21**

I. Purpose and Scope of the Stakeholder Advisory Group

The Stakeholder Advisory Group (SAG) offers a broad range of perspectives and experience to inform the social implications of wolf restoration and management strategies for the Colorado Wolf Restoration and Management Plan. The SAG will receive information provided by Colorado Parks and Wildlife (CPW) and the Technical Working Group (TWG), will follow the development of management and restoration alternatives, and will have opportunities to review and provide input to CPW on plan alternatives and language throughout the process. SAG members are encouraged to collaborate with their broader networks of organizational and community members, sharing information about the process and opportunities for stakeholder and public engagement.

II. Governance

This document constitutes the SAG's governance charter. The charter is approved and may be amended by the CPW Director, including with consideration of input from the SAG.

III. Powers and Duties

Colorado Parks and Wildlife is responsible for writing the Wolf Restoration and Management Plan. The Parks and Wildlife Commission (PWC) serves as the decision-making body responsible for approving the Wolf Restoration and Management Plan. The SAG serves in an advisory capacity to Colorado Parks and Wildlife, offering non-binding input into the development of plan content. The SAG is not a decision-making body and has no authority on wolf management policy, research or operations.

IV. Operating principles and responsibilities

Operating principles and responsibilities of members include:

- a. Compliance with all aspects of this governance charter.
- b. SAG members have been selected for diversity in demographics, backgrounds, geographic regions, perspectives, and knowledge in order to constitute a vibrant, diverse and inclusive stakeholder voice in the planning process. Members will demonstrate

composure and respect working with those with different experiences, backgrounds and perspectives.

- c. Members will demonstrate the ability to engage productively and in good faith in the SAG's business and provide timely input.
- d. Members will demonstrate willingness and preparedness to engage SAG meetings.
- e. Members will demonstrate focus on the scope and charge of the group.
- f. Members will refrain from behavior or comments that denigrate other SAG members or others involved in wolf restoration management efforts, or are disruptive to the charge and progress of the group.
- g. Members will treat all draft documents and deliberative communications received or generated by the SAG and its members as confidential and will not disclose their contents except through the reporting procedures discussed below.

V. Membership and Participation

a. Members

Members of the SAG are appointed by the CPW Director.

Within the SAG, there are 17 voting members of the SAG and 3 non-voting, ex-officio members. Non-voting members include the Director of Colorado Parks and Wildlife, the Director of Colorado Department of Natural Resources, and the Commissioner of Colorado Department of Agriculture or their designees.

SAG members will represent themselves as individuals, not on behalf of a specific organization.

b. Resignation of SAG Members

Any member who is no longer able to participate on the SAG shall notify the CPW Director as soon as practicable.

c. Removal of SAG Members

A member may be removed from the SAG at the discretion of the CPW Director based on conduct or lack of participation.

d. Vacancies

If a vacancy occurs on the SAG, the CPW Director may appoint a member to fill the vacant position.

e. Quorum

A quorum for purposes of meetings is a simple majority (9) of the voting membership of the SAG.

f. Meeting attendance

Voting members may not appoint a delegate to represent them at any meeting.

SAG members shall make best efforts to attend SAG meetings in person when meetings are conducted in person, but may participate by telephone or virtual conference when necessary. Reasonable accommodation will be made to provide quality participation experience for remote participants.

VI. Consensus and Voting

a. Consensus

The SAG shall strive to make decisions based on the consensus of all voting members, where possible. Where the SAG is able to achieve consensus, its input will receive priority consideration by CPW.

Consensus is defined as general agreement that is shared by all the people in a group; it reflects a recommendation, option or idea that all participants can support or abide by, or, at a minimum, to which they do not object. In other words, consensus is a recommendation, option or idea that all can live with.

Final assessment of consensus: Level of agreement will be assessed and recorded on final recommendations, options or ideas. A quorum must be present, as defined above. When conducting a final assessment of level of agreement on a proposed recommendation, option or idea, each member will indicate whether they can support or abide by it, and do not object; if no participants object, then consensus exists and will be recorded, along with a summary of rationale and perspectives as relevant. If any participant objects, then there is not consensus, and a vote will be taken.

Informal assessment of consensus: When informally assessing level of agreement during the course of SAG discussions, the table below may be utilized to assess perspectives on a draft recommendation, option or idea. As relevant, the group will discuss whether, and if so how, the recommendation, option or idea could be improved and/or how concerns could potentially be better addressed. Informal assessment of support for a recommendation or alternative may be conducted iteratively throughout the process and will not be recorded.

	Consensus exists if <u>ALL</u> participants are at level 1-3:
1	I enthusiastically support this recommendation, option or idea.
2	I support this recommendation, option or idea.
3	I do not fully agree with the decision, however I can abide by or live with this recommendation, option, or idea; I do not object.
4	I object to this recommendation, option or idea.
5	I strongly object to this recommendation, option or idea; I cannot support, live with or abide by it.

b. Voting

Where consensus does not exist on a final recommendation, option, or idea, a vote shall be taken and the votes of individual members will be recorded along with a summary of the rationale for supportive and dissenting views. A quorum must be present, as defined above. Total vote counts, the votes of individual members, and the summary of rationale and views will be included in the report of the SAG to CPW.

c. Proxies

No member shall be permitted to vote by proxy or delegate.

d. Reports

A final assessment of the SAG's level of support for a recommendation, option, or idea will be conducted publicly and recorded in a report to CPW. The report will reflect the recommendations or options considered, level of agreement for each recommendation or option, and a summary of the rationale for both supportive and dissenting views. Interim reports on specific topics, options or alternatives may be provided by the SAG to CPW throughout the process. A final report authored by the facilitator with review by the SAG will compile interim and final feedback on all topics from the SAG to CPW.

VII. Meetings and Records

a. Regular Meetings

CPW shall establish a schedule for SAG meetings in consultation with the facilitators. The SAG shall meet one day a month on average. Additional meetings will be called as necessary by CPW.

b. Facilitation

The CPW Director will contract facilitators to facilitate the work of the SAG. CPW staff person(s) will be appointed to coordinate with facilitators in the development of schedules, agendas, materials, and processes for the SAG.

c. Conduct of Meetings

The facilitator will manage meetings of the SAG in the most informal manner possible. SAG votes will be conducted formally by roll call of the SAG.

d. Public Meetings

The SAG does not have authority to adopt rules or create policy and is not subject to the Colorado Open Meetings Law. Nonetheless, to support openness and transparency, all meetings of the SAG shall be open to public observation in person. Information about meetings will be provided publicly in advance. SAG members may discuss the work of the group with each other outside of SAG meetings.

e. Public Comment

Public comment opportunities will be offered at SAG meetings. CPW shall determine when opportunities for public comment will be offered, and in what format. Public comment opportunities at in-person meetings will be provided only to in-person attendees. Public comment opportunities at virtual meetings with no in-person meeting component will be provided to virtual attendees.

f. Minutes

Minutes shall be kept of all SAG meetings and shall include at least names of all SAG members present, the location of the meeting (physical location or virtual meeting), a summary of the issues or matters discussed, any public comment received, and the outcome of any formal votes taken; including the vote of individual SAG members when a vote is called. Minutes shall be kept by the facilitator and posted to the SAG website.

g. Open Records

Any records received by the SAG and/or CPW may be subject to the Colorado Open Records Act.

VIII. Communication

The CPW Director or his/her designee within CPW shall be the official spokesperson regarding the SAG process. The CPW Director or designee shall be responsible for managing the communications regarding the SAG, including to the media, legislators, the Governor and other policy makers.

SAG members are free to discuss the SAG's work with any interested party but in so doing must clarify they are speaking for themselves, and not the SAG, and must abide by the confidentiality provision above regarding draft and deliberative materials. SAG members are urged to use discretion when discussing the group. Consistent with operating principles, members will refrain from communications that denigrate other participants or are disruptive to the charge and progress of the group.

IX. Compensation

Members of the SAG may be offered a nominal stipend and reimbursement for necessary travel expenses incurred in the performance of their duties and in accordance with state government guidelines, when requested.



COLORADO

Parks and Wildlife

Department of Natural Resources

Director's Office
6060 Broadway
Denver, CO 80216
P 303.297.1192

To: Members of the general public; Members of the Parks and Wildlife Commission

From: Heather Dugan, Acting Director, Division of Parks and Wildlife

Date: June 15, 2022

RE: Amendment to the Stakeholder Advisory Group Governance Charter

Purpose of this amendment

This amendment to the Stakeholder Advisory Group Governance Charter prohibits the audio and or video recording of Stakeholder Advisory Group (SAG) proceedings and the livestreaming of such proceedings.

Background

On November 3, 2020, Colorado voters approved [Proposition 114](#), Reintroduction and Management of Gray Wolves. The law, now codified at § 33-2-105.8, CRS, requires the Parks and Wildlife Commission (Commission or PWC) to develop a plan to restore and manage gray wolves in Colorado and take the steps necessary to begin reintroduction of gray wolves by December 31, 2023.

On [January 14, 2021](#), the Commission adopted the Division of Parks and Wildlife's (Division's) "proposed [blueprint](#) for public involvement to inform the development of a Colorado Wolf Restoration and Management Plan." The blueprint contemplates the formation of advisory groups and states:

The PWC will convene two groups, in consultation with CPW, to support the management planning process: a Technical Working Group (TWG) and a Stakeholder Advisory Group (SAG; described below). These groups are advisory bodies to the PWC. They are not decision-making bodies and have no authority on wolf management policy, research, or operations. Blueprint, p. 2.

The SAG is comprised of 19 [individuals](#) "with a broad range of interests in wolves and wolf management and conservation." Blueprint, p. 3. The SAG has held numerous



meetings across the state and has made written recommendations to the Commission on the social considerations of wolf restoration, including payment of fair compensation to owners of livestock, wolf hazing, and wolf restoration logistics.

On June 30, 2021, the Division issued the SAG Governance Charter. The [Charter](#) explains the operating principles and responsibilities of SAG members and outlines procedures for reaching consensus recommendations. SAG meetings are to be conducted “in the most informal manner possible” and are “open to public observation in person.” Charter, p. 4.

The Division has recently learned that members of the public are using smart phones or other electronic devices to make audio or video recordings of SAG proceedings, specifically group deliberations and discussions. The purpose of this amendment is to expressly prohibit any person, including CPW staff, Keystone Policy Center staff, and members of the public from making audio and or video recordings of SAG discussions inside the meeting room and to prohibit any person from live streaming such meetings. This amendment does not prohibit still photography, stenography, or any other form of documenting the proceedings. This amendment only applies to proceedings in the meeting room and not to gatherings in the lobby or hallway outside such meeting room.

The SAG’s primary charge - to develop recommendations for the Commission regarding the social considerations of wolf restoration and management - touches on controversial and divisive topics. In order to promote candid discussion among SAG members on such topics, the Division, in consultation with the Chair of the Commission, has determined it is reasonably necessary to take the action described in this amendment.

Numerous SAG members have expressed concern that such recordings, if posted on social media or otherwise widely shared, could lead to undesirable outcomes, including threats, intimidation, and embarrassment, and otherwise chill participation. The Commission and Division appreciate the SAG members’ service, particularly that of the volunteer citizen members of the SAG, and believe such concerns are well founded.

Division staff shall post the attached notice on the meeting room for all future SAG meetings and the Colorado Parks and Wildlife website.



Heather Dugan

Acting Director, Division of Parks and Wildlife

NOTICE: AUDIO AND OR VIDEO RECORDING OR LIVE-STREAMING OF STAKEHOLDER ADVISORY GROUP PROCEEDINGS IS PROHIBITED

1. No person shall use any electronic device to make audio and or video recordings of Stakeholder Advisory Group proceedings inside this meeting room or live stream such proceedings.
2. This prohibition does not apply to still photography, stenography, or any other form of documenting the proceedings. This prohibition only applies to proceedings in the meeting room and not to gatherings in the lobby or hallway outside such meeting room.
3. Staff of the Colorado Division of Parks and Wildlife shall post this notice at all future SAG meetings.
4. Staff of the Division may take appropriate steps to enforce this policy by requesting that any person cease recording or live streaming, taking a recess, and, if necessary, clearing the public from the room for the remainder of the meeting.


Heather Dugan

Acting Director, Division of Parks and Wildlife