

REINTRODUCTION OF GRAY WOLVES (*Canis lupus*) TO COLORADO: TOPICS TO CONSIDER AND IMPACTS TO LA PLATA COUNTY



Wolf tracks in NW Colorado (Colorado Parks and Wildlife 2020)

LA PLATA COUNTY LIVING WITH WILDLIFE ADVISORY BOARD



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EXECUTIVE SUMMARY

Colorado Ballot Initiative #107 has qualified for the 2020 General Election Ballot in November, which asks Colorado citizens to vote on restoring gray wolves (*Canis lupus*) to the state through their reintroduction on designated lands in Colorado west of the Continental Divide. La Plata County's Living With Wildlife Advisory Board (LWAB) compiled this document to provide the La Plata County Board of County Commissioners with relevant background facts, issues, and concerns related to reintroducing gray wolves to Colorado.

LWAB is not recommending a position on this issue, instead choosing to focus on available research-based source materials to summarize topics in an attempt to deliver an unbiased, balanced perspective on the benefits and challenges of restoring wolves to Colorado and La Plata County. LWAB identified benefits and challenges of wolf reintroduction for this document by 1) researching state and federal laws, reports, and recommendations, 2) examining advocacy literature and scientific journal articles, 3) reviewing state and county resolutions, and 4) hosting presentations and open meeting discussions by local wolf reintroduction advocates and opponents. LWAB organized our research on wolf reintroduction impacts to Colorado into the following five topics:

- 1) Regulations/protections/guidance influencing wolf management:** Endangered Species Act and Colorado State Law mandates, Colorado Wolf Management Working Group recommendations, and Colorado Parks and Wildlife Commission and Colorado County Resolutions
- 2) Ecological benefits:** ecosystem restoration benefits, health of deer and elk populations, gray wolf evolutionary connectivity, and expansion of gray wolf range
- 3) Economic issues:** impacts to hunting, outfitters, and livestock/agriculture industry, values and impacts to tourism industry
- 4) Human/wolf conflicts:** human and pet safety concerns, hydatid disease facts
- 5) Social attitudes toward wolves:** Colorado polling data results and lessons learned from international wolf reintroduction efforts

LWAB is comprised of members whose voices represent the diverse array of viewpoints of La Plata County residents on this topic and have dedicated a comprehensive, year-long process to compiling an abundance of source materials and providing fact-based perspectives on this subject. Our board's hope

is that this effort will benefit our La Plata County Commissioners by supporting informed decision-making for their constituents when considering the issue of wolf reintroduction to Colorado.

I. INTRODUCTION

A. Purpose

At the request of the La Plata County Board of County Commissioners, La Plata County's Living With Wildlife Advisory Board (LWAB) compiled this document to provide our County Commissioners with relevant background facts, issues, and concerns related to reintroducing gray wolves to Colorado. The intent of this document is not to advocate a position, but rather to deliver La Plata County Commissioners a fact-based summary of topics associated with wolf reintroduction in Colorado to make informed decisions for the La Plata County community. The debate on reintroducing wolves to Colorado can provoke passionate arguments by advocates and opponents which at times can be based on unsubstantiated assumptions rather than fact-based evidence. Therefore, in preparing this document LWAB focused on available research-based source materials to summarize topics in an attempt to deliver an unbiased perspective on the benefits and challenges of restoring wolves to Colorado.

B. Background: Gray Wolf Extirpation, Reintroductions And Current Range

Once widespread across the vast majority of the United States, gray wolves (*Canis lupus*) were extirpated from the contiguous U.S. by the middle of the 20th century, with the exception of a small portion of northern Minnesota and Isle Royale in Michigan (USFWS 2019, Colorado Wolf Management Working Group 2004; Figure 1). Gray wolf populations were essentially eliminated from Oregon, Washington, and the northern Rocky mountain states of Montana, Idaho, Wyoming, Utah, and Colorado by the 1930s due to poisoning, unregulated trapping and shooting, and the public funding of wolf extermination efforts (Young and Goldman 1944, USFWS 2018). Wolves from Canada occasionally dispersed south and successfully began recolonizing northwest Montana in 1986 (USFWS 2019).

In 1995 and 1996, 66 wolves from southwestern Canada were reintroduced into Yellowstone National Park and central Idaho (USFWS 2019). At the time of reintroduction, the U.S. Fish and Wildlife Service (USFWS) designated these wolves as nonessential experimental populations to increase management flexibility and address local and state concerns (USFWS 2018). However, the reintroduction of wolves to Yellowstone National Park and central Idaho greatly expanded the numbers and distribution of wolves in

the northern Rocky Mountains of the U.S. Because of this reintroduction effort, wolves soon became established throughout central Idaho and the Greater Yellowstone Area, eventually dispersing into portions of Montana, Washington, Oregon, and northern California (USFWS 2018). By the end of 2000, this northern Rocky Mountain population had more than 300 wolves, expanding to 663 wolves by 2003 (USFWS 2018).

Today, the vast majority of wolves in the lower 48 states exist as two large, stable or growing populations totaling more than 6,000 individuals that are broadly distributed across the northern portions of three states in the Great Lakes area (Michigan, Wisconsin and Minnesota; 4,400 individuals) and portions of six states in the northern Rocky Mountains population (Montana, Idaho, Wyoming, eastern Oregon and Washington and northern California 1,700 individuals) (USFWS 2019; Figure 1). Lone long-distance dispersing wolves have been reported in California, North Dakota, South Dakota, Utah, Colorado, Nevada, Missouri, Indiana, Illinois, Nebraska, and Kansas, with numbers of confirmed records in each of these states, since the early 2000s, ranging from one in Nevada to at least 27 in North Dakota (USFWS 2019). According to Colorado Parks and Wildlife (CPW), wildlife officials have confirmed six individual wolf sightings in Colorado since 2004, but as of 2019 CPW biologists had found no wolf packs, dens or other evidence that wolves exist at a population level in Colorado (Blumhardt 2019). However, in January 2020, CPW officials confirmed that a pack of at least six wolves had moved into Moffat County of northwest Colorado, making this the first documented wolf pack residing in Colorado since wolves were extirpated in the 1930s (CPW 2020).

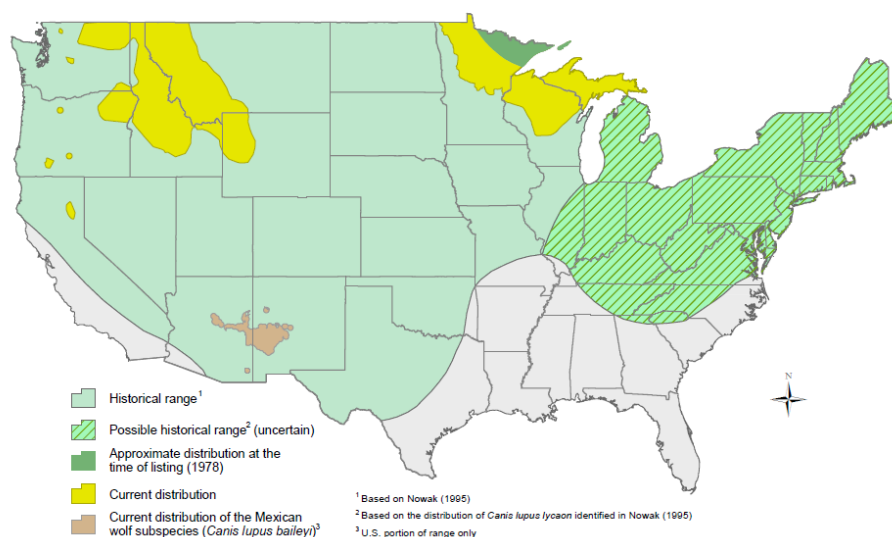


Figure 1. Historical range and current distribution of the gray wolf (*Canis lupus*) in the lower 48 United States (USFWS 2018).

II. REGULATIONS AND PROTECTIONS THAT INFLUENCE MANAGEMENT OF THE GRAY WOLF IN COLORADO

A. Endangered Species Act Listing And USFWS Proposed Rule To Delist

Gray wolves were listed as endangered under the Endangered Species Act (ESA) when the Act was created in 1973, and today remain listed as endangered species in the contiguous United States and Mexico, with the exception of gray wolves in Minnesota where they are listed as threatened, and in the Northern Rocky Mountains (Montana, Idaho, Wyoming, eastern Washington and Oregon, and north-central Utah), where they have been delisted from the ESA in 2011 and 2012 (USFWS 2019; Figure 1). This federal protection under the ESA extends to wolves that naturally migrate into Colorado (CPW 2016). The ESA protects endangered species such as gray wolves from “take”, which makes it illegal to “harass, harm, pursue, hunt, shoot, wound, kill trap, capture, or collect, or to attempt to engage in any such conduct” (United States 1983).

On March 15th, 2019, USFWS announced a proposed rule to delist the gray wolf currently listed as endangered in the contiguous United States and Mexico under the ESA (USFWS 2019). This proposal is specific to the gray wolf (*Canis lupus*) and does not include the separate endangered ESA listing of the Mexican wolf subspecies (*Canis lupus baileyi*) (USFWS 2019). The rule also does not address wolves in the Northern Rocky Mountains, which are already delisted due to recovery and remain under state management (USFWS 2019). The USFWS argues that delisting of the gray wolf is warranted due to recovery efforts in the Northern Rocky Mountains and Great Lakes Area, and that gray wolves are no longer in danger of extinction or at risk of becoming so in the foreseeable future throughout all or a significant portion of the species’ range (USFWS 2019). Opponents to the USFWS delisting proposal argue that the proposed rule does not address the lack of gray wolf populations in most of the species’ historic range (including Colorado), and that gray wolves need ESA protections to repopulate remaining suitable habitat identified by scientists in the western and northeastern U.S. (CFGC 2019, Sierra Club 2019). There is also concern that current wolf populations and ranges are not adequate to maintain genetic diversity or ensure long-term survival of the species due to potential local/regional population declines or collapses (CFGC 2019, Sierra Club 2019).

The ESA requires the USFWS to make a final determination on the proposed rule to delist gray wolves within one year of its announcement, which occurred on March 15, 2019 (USFWS 2019). The delisting

proposal involved a public comment period, which concluded on July 15th, 2019, in which 837,637 comments were received (USFWS 2019). Also required under the ESA is a peer review process that will seek the expert opinions of at least three appropriate and independent specialists regarding scientific data and interpretations contained in this proposed rule to ensure that USFWS decisions are based on scientifically sound data, assumptions, and analyses (USFWS 2019).

B. Colorado Laws And Wolf Management Plan

USFWS manages species that are listed as endangered under the ESA, which includes gray wolves that occur in Colorado (Colorado Wolf Management Working Group 2004). However, if gray wolves are delisted from the ESA, management authority for wolves will return to state governments (Colorado Wolf Management Working Group 2004). The Colorado Parks and Wildlife Department (CPW) is the resource agency charged under Colorado state statute with the responsibility to manage resident wildlife, which would include gray wolves if they are removed from the endangered species list (Colorado Wolf Management Working Group 2004).

The State of Colorado has an obligation to conserve and manage native wildlife in its borders and will implement programs to make sure that wolves are included as a part of its wildlife heritage (Colorado Wolf Management Working Group 2004). The state law that mandates this obligation is Colorado Law 33-2-102, which states,

“The general assembly finds and declares that it is the policy of this state to manage all nongame wildlife, recognizing the private property rights of individual property owners, for human enjoyment and welfare, for scientific purposes, and to ensure their perpetuation as members of ecosystems; that species or subspecies of wildlife indigenous to this state which may be found to be endangered or threatened within the state should be accorded protection in order to maintain and enhance their numbers to the extent possible; that this state should assist in the protection of species or subspecies of wildlife which are deemed to be endangered or threatened elsewhere; and that adequate funding be made available to the division annually by appropriations from the general fund.”

In order to fulfill this obligation, if gray wolves are delisted under the ESA and management responsibility falls to the state, a wolf management plan has been developed by the Colorado Wolf Management Working Group, appointed by the Colorado Division of Wildlife and comprised of four livestock producers, four wildlife advocates, two wildlife biologists, two sportsmen, and two local

government officials to create a wolf management plan for Colorado (Colorado Wolf Management Working Group 2004). This wolf management plan recognizes that wolves can have both positive and negative impacts in Colorado, and asserts that migrating wolves should be allowed to live with “no boundaries” where they find habitat and managed according to the following four principles (Colorado Wolf Management Working Group 2004):

- Impact-Based Management: Address positive and negative impacts of wolf presence.
- Adaptive management: Learn by doing, monitor, and apply new knowledge.
- Monitoring: Use various methods to track and understand wolf populations, livestock depredation, wild ungulate populations, and human attitudes.
- Damage Payments/Proactive Measures: Compensate for losses and encourage methods to minimize livestock-wolf conflicts.

The wolf management plan adopted by CPW does not include wolf reintroduction to the state as a management strategy, instead focusing on naturally migrating wolves from already established population areas such as the northern Rockies.

III. COLORADO BALLOT INITIATIVE TO REINTRODUCE WOLVES TO COLORADO AND RESPONSE RESOLUTIONS

A. Colorado Ballot Initiative #107

On June 5, 2019, the Colorado Secretary of State’s Ballot Title Setting Board approved Ballot Initiative #107 for circulation, which would enact 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 (Colorado Ballot Initiative #107 2019). The ballot initiative would also require the Colorado Parks and Wildlife Commission to develop and implement a plan to restore and manage gray wolves using the best scientific data available as well as input from statewide hearings that acquire information on scientific, economic, and social considerations (Colorado Ballot Initiative #107 2019). The ballot initiative also prohibits the commission from imposing any land, water, or resource use restrictions on private landowners to further the plan, requires the commission to fairly compensate owners for losses of livestock caused by gray wolves, and dictates that the Colorado General Assembly make appropriations as necessary to fund wolf management and livestock compensation programs (Colorado Ballot Initiative #107 2019).

On January 6, 2020, the Elections Division of the Colorado Secretary of State's office announced that Ballot Initiative #107 had qualified for the 2020 General Election Ballot, receiving more than 110% of the required 124,632 signatures (Colorado Secretary of State 2020).

B. Colorado Parks And Wildlife Commission Resolution

In anticipation of future federal rulings or a Colorado ballot initiative to reintroduce gray wolves to the state, the Colorado Parks and Wildlife Commission adopted a resolution in January 2016 that "opposes the intentional release of any wolves into Colorado" (Colorado Parks and Wildlife Commission Resolution 16-01, 2016). CPW explains that the commission's decision to oppose gray wolf reintroduction into Colorado is based on concerns that additions of wolves into southern Colorado would exasperate an already declining deer and elk population and would result in further reduction of deer and elk management populations and harvest objectives (CPW 2016). Another concern contributing to this resolution is how the cost of managing wolves would adversely impact farmers, ranchers, and sportspersons, and that CPW cannot afford to take on management responsibilities while also maintaining existing programs without additional funding (CPW 2016). However, the resolution also clarifies that the Colorado Parks and Wildlife Commission wholly accepts all recommendations in the 2004 Colorado Wolf Management Working Group report including accepting a wolf presence in the state upon naturally occurring migration, and that "migrating wolves into Colorado be allowed to live with 'no boundaries' where they find habitat" (Colorado Parks and Wildlife Commission Resolution 16-01, 2016).

C. Colorado County Resolutions

After the Colorado Parks and Wildlife Commission formally opposed wolf reintroduction in Colorado with Resolution 16-01, at least 26 Colorado counties adopted similar resolutions in support of this decision. These Colorado counties used similar language in their resolutions stating that they oppose wolf reintroductions, as well as stating their support of Colorado Parks and Wildlife Commission Resolution 16-01 and the Colorado Wolf Management Working Group's recommendations. These county resolutions also emphasize the negative impacts that wolf reintroduction could have on deer and elk populations and the local domestic livestock industry, as well as posing a danger to pets and people due to predation and the transmission of diseases.

D. Ute Mountain and Southern Ute Reservation Lands

Currently, neither the Ute Mountain Ute Tribe nor the Southern Ute Indian Tribe have stated an official position on wolf reintroduction in Colorado. However, it should be stated that these two tribes have sovereign control over extensive parts of the San Juan Basin, including large parts of La Plata County, and therefore should be included in any talks or planning concerning future wolf management in southwest Colorado.

IV. ECOLOGICAL BENEFITS

A. Benefits to Riparian Areas and Aspen Regeneration

Riparian zones are extremely important for the survival of multiple wildlife species, providing migration corridors, habitat diversity, and water quality, and are especially critical in the southwest U.S. due to overall arid conditions. One argument for the restoration of wolves into Colorado is the benefits they could have on maintaining and restoring this important ecosystem. The ecological premise is that predation of ungulates by apex predators such as wolves keeps ungulate populations in check, as well as altering their behavior so that they do not linger in and degrade any one ecosystem (Ripple et al. 2014). As a result, wolf presence in the riparian ecosystem creates a “trophic cascade”: multiple benefits, both direct and indirect, including improved biodiversity of plants and animals and sustained hydrology in these areas (Ripple et al. 2014; Figure 2). Research studies in Yellowstone, Olympic and Zion National Parks have indeed shown that the removal of wolves resulted in non-sustainable browsing pressure on woody plants such as willow and aspen (Bechta and Ripple 2011). Follow-up research conducted in the 15 years after wolves were reintroduced into Yellowstone National Park demonstrated an improvement in woody browse species such as willow, aspen, and cottonwood, initiating a restructuring of northern Yellowstone’s ecosystems (Ripple and Bechta 2011). These findings support similar research results from Wisconsin, Alberta, and Wind Cave and Olympic National Parks, and suggest that the recovery of gray wolves may provide passive restoration that helps maintain the resiliency of wildland ecosystems (Ripple and Bechta 2012).

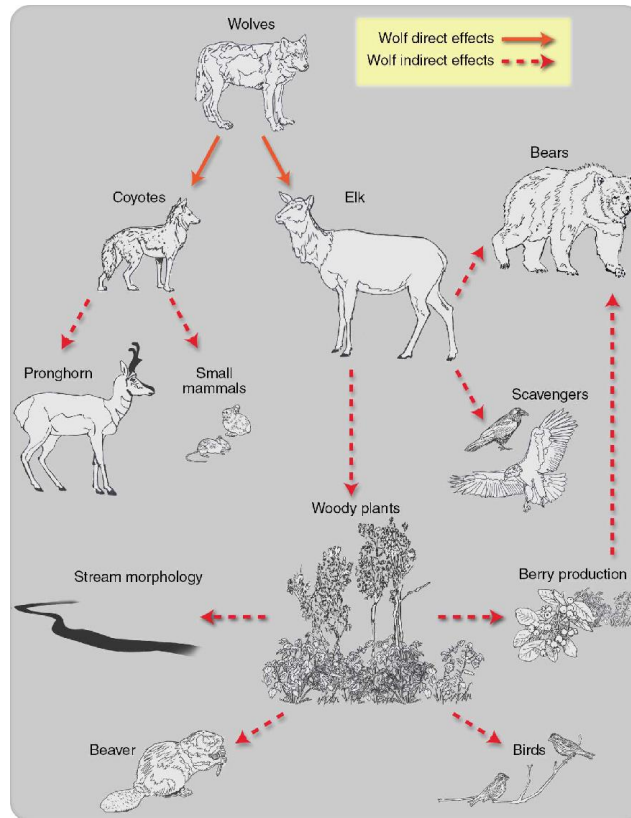


Figure 2. Trophic cascades: conceptual diagram showing direct (solid lines) and indirect (dashed lines) effects of gray wolf reintroduction into the Greater Yellowstone ecosystem (Ripple et al. 2014).

Simply restoring wolves to an ecosystem, however, may not quickly repair the damage that has been done by removal of the species many decades ago (Marshall et al. 2013). A 10-year study in Yellowstone National Park demonstrated that wolf reintroduction there has not uniformly restored the historical state of riparian areas to what they were before extirpation of the wolf (Marshall et al. 2013). Ecological dynamics are not linear in cause and effect, and there are multiple influences and adaptations that are in constant change from predator loss in an ecosystem, such as the influence of already altered stream flow or the presence of beavers on the landscape (Marshall et al. 2013).

As for benefits to riparian areas in La Plata County specifically, discussions with biologists from the San Juan National Forest, CPW, and other riparian biologists reveal that riparian degradation in our area is not primarily caused by deer and elk (Chris Shultz, Jim White, Corey Sue Hutchinson, personal communication, 2019). Instead, with the exception of some isolated locations in alpine areas where elk can cause some damage, cattle are the biggest factor to the riparian vegetation and stream bank

erosion on private and public lands in La Plata County. Therefore, studies demonstrating the value of wolves to riparian areas within national parks, where cattle grazing is not allowed, may not directly apply to La Plata County area ecosystems. Assuming wolves will prey primarily on elk in Colorado (Colorado Wolf Management Working Group 2004), it is doubtful their presence would have a significant influence, one way or the other, on riparian area health in La Plata County.

B. Benefits To Health Of Elk And Deer Populations

Because it is hard work for wolves to tackle and kill a large healthy animal, they tend to predate on the weaker prey – the old, sick and young - if possible (USFWS 2006). For example, one study from Yellowstone National Park found that wolves tend to select calves and older animals as prey, and adult elk killed by wolves were on average seven years older than elk killed by hunters (Wright et al. 2006). Recent research also suggests that wolf predation on sicker prey could substantially reduce prevalence of chronic wasting disease (CWD) in deer and elk populations (Wild et al. 2011). Thus, the culling of sick and weak prey by wolves over time may provide a healthier, more resilient ungulate population in Colorado, though more research is needed to confirm specific effects.

C. Evolutionary Connectivity Between Wolf Populations In Their Western Range

Proponents of wolf reintroduction to Colorado argue that wolf presence in the southern Rocky Mountains is the key to maintaining evolutionary flexibility for the species and necessary for maintaining viable and sustainable wolf populations (Sierra Club Colorado 2019, Gary Skiba, personal communication, 2019). Biologists argue that essential to the long-term survival of gray wolves is maintaining protected corridors of connectivity within Colorado and between wolf populations in the Northern Rockies and southwestern U.S. (Carroll et al. 2014; Figure 3). Advocates of restoring wolves to Colorado also contend that due to climate change impacts within wolf habitat, the ability for wolves to disperse and exchange genetic material is essential to enable adaptation to changing ecosystems (Sierra Club Colorado 2019). However, proponents of the Colorado wolf reintroduction effort also emphasize that this population connectivity is highly unlikely to originate from naturally occurring wolf migrations, in large part due to the state of Wyoming's allowance of the killing of wolves in 88 percent of the state including areas directly north of the Colorado state line (Grimes 2018).

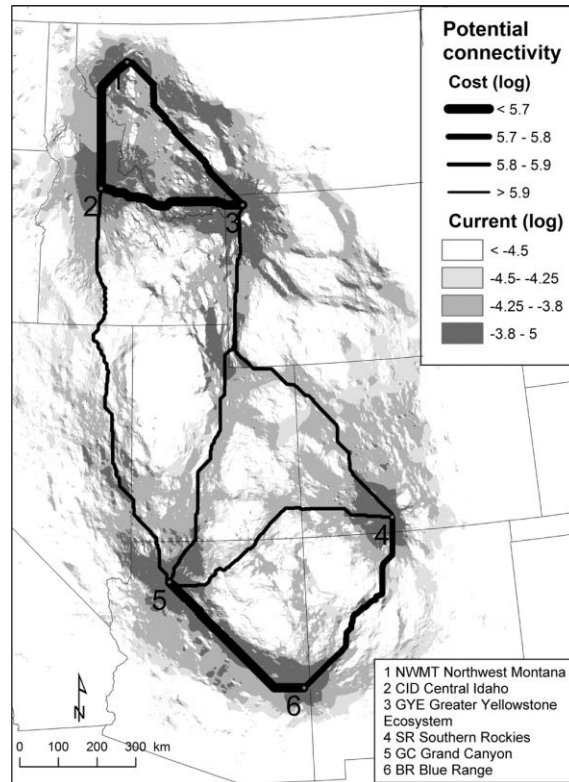


Figure 3: Potential habitat linkages between six existing or potential wolf-population core areas in the western United States (thickest lines, linkages with lowest least-cost distance; darkest gray shading, areas with highest importance for connectivity (Carroll et al. 2014).

D. Expansion of Gray Wolf Range and Benefits to Recovery

Many biologists believe suitable habitat exists that would allow for expansion of the gray wolf's distribution back into parts of its historic range, especially in the western U.S. (Carroll et al. 2014, Weiss et al. 2014). Multiple studies have identified extensive wolf habitat in regions where wolves have not yet recovered (Carroll et al. 2014, Weiss et al. 2014; Figure 4). In the western United States, this includes the central and southern Rocky Mountains in both Colorado and Utah, the Grand Canyon and surrounding areas in northern Arizona, the Olympic Peninsula in Washington, the Cascade Mountains in Washington and Oregon, and portions of California (Figure 4). Approximately 530,000 square miles of suitable wolf habitat in the lower 48 have been identified, of which 171,000 square miles are currently occupied, meaning wolves have recovered only 30% of known suitable habitat. Although not all studies estimated the number of wolves that could be supported, research suggests that at least another 5,000 wolves could populate the Northeast, southern Rockies, West Coast and Southwest, nearly doubling the wolf

population and creating a network of interconnected populations bolstering genetic security (Weiss et al. 2014).

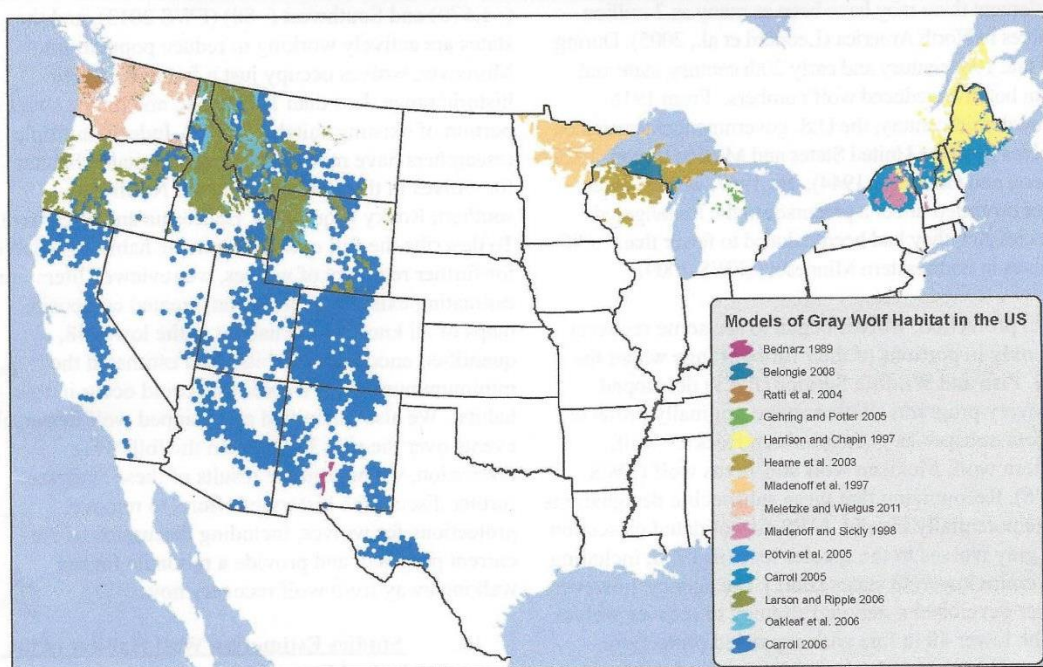


Figure 4. Suitable gray wolf habitat in the contiguous United States as identified in 14 modeling studies (Weiss et al. 2014).

V. ECONOMIC ISSUES

A. Impacts To Hunting, Outfitters, and Agriculture

Opponents to the active reintroduction of wolves to Colorado such as the Rocky Mountain Elk Foundation raise concerns about how wolves may reduce elk populations where they are introduced into the state, negatively impacting hunters and outfitters (RMEF 2019). Although CPW has recently stated that Colorado's elk population remains stable at around 286,000 animals for 2019, the southwestern portion of the state from the Uncompahgre Plateau to Durango to Alamosa has seen low cow-calf ratios for some time (Wheaton 2019). Because elk populations in southwest Colorado are already struggling and researchers are still working to find the cause of poor calf recruitment and low elk numbers, RMEF argues that a forced reintroduction of wolves would be catastrophic to this work and the established elk and deer herds in the area (RMEF 2019). Wolf reintroduction efforts may also redirect already limited wildlife management resources available to CPW (RMEF 2019).

Another concern raised by opponents to wolf reintroduction is how wolves will cause changes in elk behavior that may negatively impact specific outfitter operations in Colorado. Because elk range spans from low shrub/brush country to high elevation alpine parks, shifts in movement patterns and use of habitats may affect certain hunters and outfitters whose hunting permits are in areas where wolf presence has caused elk to vacate. For example, a study using annual aerial survey data for northern Yellowstone elk in Montana and Wyoming from 1987–2009 demonstrated that the proportion of elk occupying upper elevations decreased following wolf restoration and increased snowpack, while the proportion of elk occupying lower elevations increased following wolf restoration and increased snowpack at higher elevations (White et al. 2012). Study results also suggested group sizes increased in lower elevations after wolves were restored (White et al. 2012). Researchers conducting this study proposed that these changes resulted primarily from the attrition of elk from high snow areas in Yellowstone National Park due to wolf predation, and increased survival and recruitment of elk in lower snow areas outside Yellowstone National Park in Montana following a substantial reduction in hunter harvest (White et al. 2012). These documented effects of wolf presence on elk movement and usage patterns demonstrate how outfitters dependent on specific elevations and habitat types may see reductions of elk numbers on their hunting permits, potentially causing significant negative economic impacts to portions of the outfitting industry in Colorado.

Changes in elk movement patterns and habitat use due to wolf presence may also have a negative impact on the agricultural community of southwest Colorado, including in La Plata County. Elk are hungry grazers, eating between 15 to 21 pounds of food a day. In summer, these ungulates prefer to stay in the high country, feeding on grasses, forbs and shrubs, but in winter, small bands tend to coalesce into large herds to spend the cold months feeding at lower elevations in areas often now occupied by farms and ranches (Romeo 2018). Consequently, it is not uncommon that elk cause a fair amount of damage to fields and crops and compete with livestock (Romeo 2018). These impacts may be exacerbated if wolves force even more elk to lower elevations, as described by White et al. 2012's research above. Also, if the western Colorado agricultural community sees heightened negative impacts from elk damage, farmers and ranchers may pressure CPW to reduce area elk numbers, as occurred in the late 1990s (Romero 2018). Then, the Colorado Division of Wildlife issued a virtual free pass for killing cow elk, but the culling of too many females also began to kill the animal's potential to reproduce. Romeo (2018) states "at the height of the uncontrolled culling, a total of 3,500 hunting tags were issued in 1996 for the cow harvest in two herds around Durango. In the San Juan herd, which ranges from the

Animas River east to Wolf Creek Pass, about 23,000 elk were cut down to about 17,300. In the Hermosa herd, a population of about 6,500 was reduced to 4,100.” With an already reduced elk population in southwestern Colorado, increased pressures by wolf reintroduction on these herds may force future management decisions impacting elk herds in an attempt to control agricultural damage.

CPW has announced a series of public meetings for southwest Colorado in 2020 to obtain public input on the planning for elk management (Romero 2020). The plan will assist in setting population objectives for elk and then adjust management practices such as issuance of hunting tags on an annual basis. Romeo (2020) reports that CPW is reviewing high elk-calf mortality rates and may be limiting hunting tags particularly to those which can disrupt breeding habits. CPW is also looking at ways to offset habitat loss due to development and recreation which is encroaching into remaining wild areas for elk habitat. The effects of a changing climate may bring on drought conditions which would also impact the elk population (Romero 2020). These issues stated by CPW which could potentially limit hunting tags in the La Plata County area further highlights current pressures on southwest Colorado elk herds, and the impacts already being absorbed by hunters and outfitters may be compounded by wolf presence as described above.

B. Impacts To Ranchers/Livestock Industry

Wolf predation on livestock (depredation) is a primary reason for many groups to oppose wolf conservation in the western U.S. (Muhly and Musiani 2009). Livestock depredation by wolves is a cost of wolf conservation borne entirely by livestock producers, which creates conflict between producers, wolves and organizations involved in wolf conservation and management. Research by Muhly and Musiani (2009) report that livestock killed by wolves cost producers in Idaho, Wyoming, and Montana approximately \$11,076.49 per year between 1987 and 2003, and that costs increased linearly as wolf populations increased. Each year, however, such costs accounted for only 0.01% of the annual gross income from all livestock operations in the region (Muhly and Musiani 2009). Thus, although wolf depredation has a relatively small economic cost to the livestock industry as a whole, it may be a significant cost to affected producers as these costs are not equitably distributed across the industry.

Research involving wolf reintroduction impacts on the livestock industry have also focused on the effects of wolf populations on cattle production, particularly cattle producers utilizing public lands for grazing. Steele et al. (2013) researched wolf presence effects on cattle production and compensation

models provided to producers for mitigating cattle loss due to wolf predation on public lands. Their research demonstrated the costs of large carnivore conservation in the upper Rocky Mountain region are disproportionately borne by local livestock producers, and thus have increased conflicts between livestock production and wolf conservation (Steele et al. 2013). These results demonstrate a need to review the current compensation models for wolf damage to reduce conflicts and mediate negative attitudes toward these predators.

Wolf recolonization in the upper Great Lakes region has also seen wolf populations expand into agricultural areas with an increasing concern for conflicts with livestock. Research on wolf interactions in the Upper Peninsula of Michigan demonstrated that wolf presence has historically conflicted with human interests and posed serious management problems, especially in rural areas where livestock production occurs (Edge et al. 2011). Research on wolf interactions in this area revealed that between 1996 and 2008, 121 recorded wolf predation events occurred including 87 of livestock and 34 of domestic dogs (Edge et al. 2011). These researchers also state that for every additional 100 wolves in the population, there will be about eight additional livestock predation events (Edge et al. 2011). These researchers indicated the proven methods of limiting wolf predation include management of birthing dates to limit exposure of young, herding vulnerable animals at night, combining herds as to not spread livestock across pastures, and locating birthing of young within barns (Edge et al. 2011). They also reported that excluding wolves from livestock areas containing young animals using electric fencing also reduces attacks (Edge et al. 2011). Use of an integrated management approach that emphasizes prevention methods and includes prompt responses to predation events and judicious use of compensation may help decrease predation events, increase tolerance, and alleviate economic losses caused by wolf predators.

Wolves were reintroduced into Yellowstone and central Idaho in the mid-1990's, and research in this region has revealed valuable insight into wolf/livestock interactions that may inform improvements to a wolf management plan in Colorado. For example, Oakleaf et al. (2003) report the overall impact of wolves was not significant on either calf survival or behavior in their study of interactions between wolves and domestic calves within a grazing allotment in central Idaho during the 1999 and 2000 grazing seasons. The study indicates that calf survival was high (over 95%) with 13 calf mortalities including four by wolf predation (Oakleaf et al. 2003). These researchers state that managers may be able to minimize the spatial overlap of wolves and cattle by implementing a system to move cattle away from wolf core

areas during periods of intensive activity (Oakleaf et al. 2003). They also indicate that carcass detection rates were low in the study which suggests the current compensation procedures in the western United States may require adjustment to fully cover losses from wolf predation (Oakleaf et al. 2003).

Although wolf presence has been shown to have multiple negative impacts on ranching operations, one potentially positive impact is the effect that wolf reintroduction may have on the coyote population, a predator currently impacting Colorado ranches. One study demonstrated that although mortality of coyotes resulting from wolf predation was low, wolves were responsible for 56% of transient coyote deaths in their Wyoming study area and Yellowstone National Park (Berger and Gese 2007). Coyote densities were 33% lower at wolf-abundant sites and declined 39% in Yellowstone National Park following wolf reintroduction (Berger and Gese 2007).

Rancher compensation programs

Predation losses are very real and can determine the success of a ranching operation. Current compensation programs only consider the direct effects of wolf predation, while the indirect effects such as wolf impacts on weaning weights and conception rates may also reduce profitability (indirect effects described in detail in next section below). For example, research on the rancher compensation program in Wyoming indicates that if indirect effects on ranching losses are included, the compensation ratio (i.e. number of calves compensated per confirmed depredation) necessary to fully offset the financial impacts of wolves would need to be two to three times larger than the current 7:1 compensation ratio used (Steele et al. 2013).

Programs to compensate ranchers for losses are also expensive and difficult to manage. Losses have to be verified which is extremely difficult where cattle are ranged on public lands grazing permits. Losses may also not be compensated to ranchers in cases where missing cattle or calves cannot be found. Officials with the Montana Department of Livestock believe that for every “verified” wolf kill, most of which must be verified by a DNA lab if any remains are found, another seven head of livestock killed by wolves go unreported (Lyon and Graves 2014). Often compensation programs are funded based on reported cases, but if compensation reflected actual losses funding may be not be sufficient. For example, Montana Wildlife Services (MWS) confirmed the loss of 71 livestock to wolves during 2018 including 64 cattle and seven sheep, which were comparable to totals during 2013-2017 (Inman et al 2019). During 2018, the Montana Livestock Loss Board paid \$82,959 for livestock that were confirmed

by MWS as killed by wolves or probable wolf kills (Montana Livestock Loss Board 2018). The Montana Livestock Loss Board is funded annually at only \$200,000 to compensate for predation by bears, mountain lions, and wolves, and therefore would be vastly unsupported if compensation is fully realized as described by the Montana Livestock Loss Board (2019).

The state of Idaho's compensation program may provide a better template for securing adequate funding. In Idaho, hunters, anglers and trappers provide the funding used for the prevention and compensation program for crop and livestock loss due to wildlife. This funding is generated by the Access/Depredation fee (\$5 for residents, \$10 for nonresidents) and \$3.50 of the price of each deer, elk, and pronghorn tag. The State of Idaho also contributes \$200,000 from overall state tax dollars to the fund which in 2018 had a balance of more than \$600,000 (Russell 2019).

The U.S. Department of Agriculture Wildlife Service program has a mission to provide federal leadership and expertise to resolve wildlife conflicts and allow people and wildlife to coexist (USDA Wildlife Services 2020). This includes the deliverance of wolf damage management programs which comprises of the investigation of injured and dead livestock, the capture and radio-collaring of wolves for research and other information-gathering purposes, and the direct removal of depredating wolves to resolve conflicts. This is a federally funded program for use by livestock producers, and the discussion of compensation for wolf depredation as part of the overall economics for the Colorado livestock industry should incorporate this already funded public service.

Indirect costs of wolf presence on ranching operations

Beyond livestock predation losses, indirect effects may actually more greatly impact livestock producers. Indirect effects of wolves on livestock range-use patterns can impact foraging efficiencies, disposition and stress levels, and could cascade to affect cattle diet quality, nutritional status and disease susceptibility (Clark et al. 2009). In 2009, researchers in Idaho demonstrated these indirect effects on livestock by comparing wolf GPS tracking logs with locations of known predation sites. They could see tight spiral patterns in the wolf movements that occurred at those sites, illustrating potential prey-appraisal or pursuit events (Clark et al. 2009). Furthermore, ten GPS-collared cattle in the same Idaho study area encountered a GPS-collared wolf 783 times at less than 500 meters during 137 days in the 2009 grazing season. At 100 meters there were 53 encounters; 52 at night. The ten collared cows were part of the larger herd of 450 cow-calf pairs, yet the data showed this wolf was within 500 yards of every

one of the ten collared cows many times throughout the summer (for a total of 783 contacts). These results demonstrate significant harassment by wolves that contribute to the indirect negative effects on livestock described above.

Wolf presence may also indirectly affect — and reduce — calf weaning weights and cow body condition in the fall season, resulting in increased veterinary care and supply costs and death loss to disease.

Clark et al. 2009 observed cows coming home having a full body score less than before wolf presence impacts. This translates into extra feed costs to get cattle through winter. The researchers also observed several calves with wolf bites during their study, causing significant injuries such as abscesses behind the shoulder and/or above the flank area (Clark et al. 2009). These calves may live through their wolf attack but would have to be doctored, adding to ranchers' costs.

Finally, Clark et al. (2009) saw how wolf presence and predation would change cattle use patterns on the range. Anxiety over wolves may prompt cows to shift from high-quality foraging areas to low-quality ones. If cattle are being bred on the range, all these factors work toward decreasing the number of cows that get bred on time. Late calves alter uniformity of the calf crop, which adversely affects the price received, and may also affect the number or quality of heifers a rancher is able to keep, adversely affecting the future productivity of the herd. Clark et al. (2009) also noted that the cattle would bunch up more against fences, which the wolves used to corner them. Finally, wolf presence caused changes in cattle temperament, such as cows becoming aggressive and more difficult to handle, making it difficult to use herd dogs to move cattle in rugged country (Clark et al. 2009).

In summary, Colorado wolf reintroduction discussions and compensation program planning should consider the following indirect costs on ranching operations:

- increased time and labor for additional herd monitoring
- increased costs for fencing and other non-lethal wolf control methods
- increased costs for caring for injured livestock
- increased feed costs for cattle and sheep that return from summer range in poor body condition
- decreased weight gain for calves and lambs
- decreased conception rate for cows and ewes
- livestock getting trampled, severely injured, and killed stampeding from wolves

- livestock that have been harassed or attacked by wolves may become aggressive towards working dogs and the presence of wolves makes both cattle and sheep more difficult to herd
- wolves disrupt grazing patterns, which are designed to minimize the impact on vegetation. Cattle and sheep bunch up for protection, and excessive trampling of vegetation and overgrazing can occur.

C. Tourism Value Of Wolves – Ecotourism And Impacts To Outfitters

One argument expressed by wolf reintroduction advocates is an expected increase in tourism dollars as a result of wolf presence in western Colorado. Wolf reintroduction advocates point to the greater Yellowstone National Park area as an example, arguing that since wolves have been reintroduced to the area in 1995, their presence has stimulated significant economic activity by creating new demand for lodging, guided wolf-watching tours and a variety of wolf-related merchandise, thereby having a positive impact on the economy of the greater Yellowstone area (Defenders of Wildlife 2009). A visitor survey conducted at Yellowstone National Park in 2005 comparing pre-wolf visitation and post-wolf visitation supports this claim, indicating that the direct spending impact of wolf presence in the greater Yellowstone area amounted to about \$35.5 million annually (Duffield et al. 2008). It should be noted that when considering economic benefits of wolf presence, direct comparisons to the greater Yellowstone area may not be appropriate for western Colorado or La Plata County, as the area does not have a comparable visitor attractant to Yellowstone National Park.

Central Idaho may provide a better area comparison to western Colorado in determining potential economic benefits of wolf presence. Although no research exists quantifying actual tourism dollars brought to central Idaho following wolf reintroduction there in 1995, research has been conducted in this area regarding dollar value associated with wildlife viewing. This research demonstrated that in 2006, 746,000 people watched wildlife in Idaho and spent \$273 million while doing so (U.S. Department of Interior 2006). The USFWS' 2006 national survey of fishing, hunting, and wildlife-associated recreation determined that 39% of Idaho residents participated in wildlife viewing, compared to 11% who hunted (U.S. Department of Interior 2006). For comparison, the same survey reported 40% of Colorado residents participated in wildlife viewing, whereas 4% hunted (U.S. Department of Interior 2006). Although potential participation specific to wolf viewing from these figures is unknown, the Idaho Game and Fish Department conducted a random survey the same year to better quantify how wolf presence in Idaho may equate to increased wildlife viewing tourism activities (Idaho Fish and Game

Department 2008). Their survey indicated that 42% of non-hunters would travel to see a wolf and 20% of non-hunters would pay an average of \$123 to an outfitter to see a wolf (Idaho Fish and Game Department 2008). In the same survey, 20% of hunters said they would travel to see a wolf, and on average would pay \$115 to an outfitter to see one (Idaho Fish and Game Department 2008). These figures indicate that wolf viewing activities would likely contribute to La Plata County's tourism industry, creating new demands and bringing in new sources of tourism revenue. The Colorado Wolf Management Working Group (2004) echoes this notion, stating that due to Colorado's vast expanses of public lands, ecotourism associated with the gray wolf could provide a new opportunity for economic growth in the state.

While there may be economic benefits to communities where wolves are reintroduced, outfitters may see negative impacts. Changes in elk behavior attributable to wolves may impact specific outfitter operations negatively (Idaho Fish and Game Department 2008). For example, research on the impacts of wolves on elk hunting in western Montana from 1999—2010 demonstrated that although wolves did not have a significant effect on elk harvest totals, hunter applications shifted from areas near Yellowstone National Park, where wolf populations had increased, to areas farther away (Hazen 2012). Also of note is that, previous to wolf reintroduction in central Idaho, the USFWS determined that at wolf recovery goals, per year losses were estimated to be \$187,000-\$465,000 in hunter benefits and \$207,000-\$414,000 in potential reduced hunter expenditures (USFWS 1994). However, in contrast to their negative projections of hunter losses, the USFWS also estimated the existence value of wolves in central Idaho to be \$8,300,000 a year, suggesting that wolf ecotourism dollars may significantly offset outfitter losses for the state (USFWS 1994). No subsequent research could be found in other wolf inhabited areas that validates or refutes these projections for central Idaho.

VI. HUMAN/WOLF CONFLICTS

A. Human Safety

Wolf attacks on humans are extremely rare. Millions of people live, work, and recreate in areas occupied by wolves, yet attacks by wild wolves are very uncommon, and fatal attacks are even rarer (Fritts et al. 2003). For example, a study summarizing wolf attacks in Alaska and Canada (with a population of 59,000 – 70,000 wolves) revealed that between 1900 and 1969, only one unprovoked wolf aggression toward humans was recorded, and between 1969 and 2000, there were just 18 unprovoked attacks on

humans (McNay 2002, USFWS 2006). Of these 18 attacks, 11 were caused by habituated wolves (McNay 2002). Bites were inflicted in all the habituated wolf cases but in only two of the seven non-habituated cases, and all these bites were minor (McNay 2002). This data provides important perspective on just how low of a risk wolf attacks on humans are in areas densely populated by wolves, but also demonstrates the danger of allowing natural predators such as wolves to become habituated to places occupied by humans. Fortunately, this risk can be mitigated by adhering to “living with wildlife” practices such as maintaining a safe distance from wild animals and eliminating artificial food sources near homes (USFWS 2006).

B. Wolves and Pets

Based on rare instances in states where wolves reside, gray wolves in Colorado may present a danger to pets in certain situations, especially unrestrained or unsupervised dogs. Wolf attacks predominately occur to unsupervised dogs that stray from their owner’s homes or from their handlers into wolf territories (USFWS 2006). Rather than acts of predation, these attacks are usually related to wolves’ defense of pups at dens and rendezvous sites or defense of territories (USFWS 2006, Wiles et al. 2011). Therefore, dogs used for livestock guarding, herding, and hunting within wolf territories are the most vulnerable to attack (Wiles et al. 2011). Though wolf presence in the western U.S. has presented some risk to domestic dogs, reports of gray wolves killing dogs are rare. For example, comprehensive documentation of wolf kills in Idaho, Montana, and Wyoming from 1987 to 2010 reported a total of 144 dogs killed by wolves, an average of six dog deaths per year for these three states combined (Wiles et al. 2011).

Pet owners can mitigate the threat of wolves by following the same guidelines wildlife officials provide for protecting pets against other predators already occurring in Colorado such as coyotes, cougars, and black bears. For example, pets should always be carefully monitored by their owners in areas where they may encounter native wildlife, such as national forests or parks (USFWS 2006). Also, homeowners with dogs should not leave their dogs outside overnight unless they are kept in a sturdy kennel, and most importantly, not allow their dogs to roam at-large unrestrained by leash or voice command (Wiles et al. 2011).

Fortunately, La Plata County already has an ordinance in place to help deter the risks associated with unrestrained dogs. La Plata County’s Code of Ordinances, Chapter 10 on Animals makes it is unlawful

for the owner of a dog to permit it to run at-large (La Plata County, Colorado 2017). At-large has the following meanings in the code:

- *Within an enclave or on the Animas River Trail, a dog, including a working dog, shall be deemed at-large unless under direct physical restraint, as defined in these regulations.*
- *Outside of the Animas River Trail, an enclave or a dog park, a dog other than a working dog shall be deemed at-large when off the premises of the owner and not under physical restraint or immediate command of the owner.*

Responsible obedience of this ordinance by residents and visitors would provide a valuable safeguard against the rare threat of wolves to domestic dogs in La Plata County.

C. Wolves And Hydatid Disease

Cystic echinococcus (CE), also known as hydatid disease, is caused by the *Echinococcus granulosus* tapeworm and its genetic variants, which exists throughout the world (Moro and Schantz 2006). This extremely small tapeworm can live in the small intestine of dogs and a few related carnivores such as coyotes and wolves, and can be transmitted to domestic and wild animals such as cattle, sheep, pigs, deer, and moose that ingest vegetation contaminated with the carnivore host feces containing these tapeworm's eggs (Anderson and Ramsey 1987). *E. granulosus* appears to have been introduced to the U.S. through imported livestock hosts, particularly sheep and swine, with dogs having access to discarded viscera of the hosts, thus providing potential transmission from dogs to humans (Moro and Schantz 2006).

The gray wolf is a known carrier of *E. granulosus* in North America, though domestic dogs are primarily the definitive hosts, with domestic ungulates, especially sheep, as intermediate hosts (Anderson and Ramsey 1987). Therefore, hydatid disease is mainly associated with sheep-rearing areas in the southwestern United States (Arizona, Colorado, New Mexico, and Utah), but human cases are uncommon and are generally restricted to high-risk groups who have close contact with sheepherding dogs (Foreyt et al. 2009). In fact, it has been speculated that the origin of *E. granulosus* in the southwestern United States was due to a specific instance of Australian sheep dogs imported to Utah in 1938 (Foreyt et al. 2009). From Utah the infection apparently spread to adjoining states. The source of *E. granulosus* in Idaho and Montana is unknown, but several scenarios are possible including transmission from wolves that naturally colonized northwestern Montana from Alberta, Canada, and British

Columbia (Foreyt et al. 2009). However, because hydatid disease already exists in Colorado, restoration of wolves to the state does not pose any new threat of introducing this disease to our area.

VII. SOCIAL ATTITUDES TOWARDS WOLVES

A. Colorado Polling Data

In the spring of 2019, the bipartisan research team of Lake Research Partners (Democratic) and New Bridge Strategy (Republican) released the results of a Colorado voter survey assessing voter views for wolf restoration in western Colorado (Weigel and Meadow 2019). The results of the poll found 67 percent responding in favor of wolf restoration, 15 percent opposing restoration, and 18 percent having no opinion. The polling included 900 interviews of registered voters who were proportionally drawn from across the state and demographically representative of the Colorado electorate. The research poll findings were submitted with a 95 percent confidence level in the study results (Weigel and Meadow 2019).

Weigel and Meadow's (2019) results state that conceptual support extends to voting "Yes" on specific Colorado ballot proposals. Respondents were asked one of three various iterations of ballot language, but in all cases the vast majority indicated that if the election were being held today, they would vote "Yes" in favor of a wolf restoration proposal. In fact, the "Yes" vote stood at a striking 78 percent for the following ballot proposal:

"Shall there be an amendment to Colorado Revised statutes concerning the restoration of the grey wolf to Colorado, and connection therewith, requiring the Colorado Parks and Wildlife Commission to hold statewide hearings and then develop a science-based plan to reintroduce grey wolves on public lands west of the continental divide, and requiring the Commission to take steps necessary to reintroduce the grey wolf to Colorado by December 31, 2023."

The survey results indicated that 64% of those from households which derive their income from ranching and farming support the reintroduction of wolves to Colorado (Weigel and Meadow 2019). However, the subsequent public stance of the Colorado Cattlemen Association and the Colorado Farm Bureau against the reintroduction of wolves may have an impact on this particular survey result.

In another version of the ballot question which included the addition of a requirement for compensation for injury to livestock caused by wolf restoration, overall support was nearly as high (75 percent “Yes”), with particularly high support in Colorado’s Western Slope region (84 percent “Yes”) (Weigel and Meadows 2019).

In another recent poll, researchers at Colorado State University (CSU) conducted a state-wide online survey of 734 Coloradans in August of 2019 to understand public beliefs and attitudes related to wolf reintroduction and management (Niemic et al. 2020). The survey’s objectives were to determine 1) the level of public support for wolf reintroduction and various wolf management options, 2) how support varies by demographics, geography, and identification with interest groups, and 3) whether and how Coloradans believe wolf reintroduction will affect their lives (Niemic et al. 2020). Participants were recruited through the online Qualtrics platform and researchers obtained a stratified sample that represented the gender, age, and geographic distribution of the Colorado population.

The results of this CSU study suggest that an estimated 84.0% of Coloradans intend to vote for wolf reintroduction into the state, while 16.0% intend to vote against the ballot initiative (Niemic et al. 2020). Voting intentions were similar across the different regions of Colorado: 84.9% of Front Range residents, 79.8% of Western Slope residents, and 79.3% of Eastern Plains residents indicated they would vote in favor of wolf reintroduction (Niemic et al. 2020). The researchers found that support for wolf reintroduction was strong across specifically targeted demographic groups: voting intentions were consistently high (>80%) among those who both did and did not identify as gun rights advocates, property rights advocates, hunters, and ranchers (Niemic et al. 2020). Individuals who identified as wildlife advocates, animal rights advocates, and conservationists indicated greater support for reintroduction than those who did not, as did pet owners compared to those with no pets (Niemic et al. 2020).

B. International Wolf Reintroduction Efforts – Successes And Challenges

A number of countries other than the United States have engaged in wolf reintroduction efforts in past years and provide insight through their successes and challenges. Wolves have experienced a rapid population recovery in Germany, while also showing that wolves are avoiding people there and wolf attacks on humans are very rare (Ronnenberg et al. 2017). However, the subjectively perceived threat by wolves is considerable, especially as food-conditioned habituation to humans occurs sporadically

(Ronnenberg et al. 2017). In spite of this perception, research conducted in a high human population density area of Germany indicated that this region's wolves actually showed a preference for areas of low road density and low human population density (Ronnenberg et al. 2017). Instead, areas with higher prey abundance and areas with >20% forest cover were preferred wolf habitats (Ronnenberg et al. 2017). However, this research also revealed that avoidance of human density had decreased significantly over the time of the study, possibly due to increased food-conditioned habituation (Ronnenberg et al. 2017).

In the United Kingdom (UK), attitudes towards reintroductions and carnivores generally tend to be favorable amongst the general public, but negative amongst those most likely to be adversely affected (Wilson 2004). Fears for human safety and significant livestock predation with bears and wolves, respectively, suggest that reintroduction of these species is unlikely to be acceptable in the foreseeable future (Wilson 2004).

Further research in Sweden indicates as a result of management following national and international conventions, large carnivores have increased during the twenty-first century in human-dominated environments in Sweden as well as in the rest of Europe (Linkowski et al. 2017). This research also found that traditional knowledge of how to protect livestock from carnivores was lost during the twentieth century, but that new developments in summer ranching practices used in forested areas where carnivores reside have proved valuable in reducing human-wolf conflicts (Linkowski et al. 2017).

Wolves have recently recolonized the Western Alps through dispersal from the Italian Apennines, representing one of several worldwide examples of large carnivores increasing in highly human-dominated landscapes (Marucco and McIntire 2010). In hopes for successful wolf conservation efforts in this region, researchers studying this recolonization have identified a need to understand and predict the expansion of this wolf population due to its direct impact on livestock and the high level of societal opposition (Marucco and McIntire 2010). To achieve this goal, they have developed a model based on previously successful projection models and pack presence forecasts to estimate spatially explicit wolf depredation risk on livestock, allowing for tailored local and regional management actions (Marucco and McIntire 2010). This approach enables prioritization of management efforts, including minimizing livestock depredations, identifying important corridors and barriers, and locating future source populations for successful wolf recolonization of the Alps (Marucco and McIntire 2010).

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