

February 22, 2023

**To: Colorado Parks & Wildlife**

6060 Broadway  
Denver, CO 80216  
Phone: 303-297-1192

Re: Comments on Colorado's Wolf Restoration and Management Plan

Via: <https://engagecpw.org/draft-wolf-plan-comments>

Esteemed Colorado Parks & Wildlife staff,

On behalf of the undersigned academics, we would like to submit for consideration the below comments and scientific literature on the Draft Colorado Wolf Restoration and Management Plan (hereafter, [the] 'Plan'). We appreciate and commend the efforts of all Colorado Parks & Wildlife (CPW) staff, the Technical Working Group (TWG) and Stakeholder Advisory Group (SAG) in providing input, scientific literature and developing the Plan.

However, during our review of the Plan, we identified several scientific and ethical shortcomings and errors that should be corrected if the Plan is truly striving for the successful restoration of gray wolves in their ecological role as apex predators while mitigating harm to humans, domesticated animals and wildlife, including wolves. In general, the systematic omission of scientific literature on various topics, the arbitrary prioritization of policy objectives, and the resulting biased perspectives on wolves, interventions and impacts result in a prejudiced and unscientific Plan. We expand on each point of concern in our detailed comments below and include a list of crucial academic literature we strongly suggest should be integrated into the Plan. We provide our comments in a constructive spirit with the hope of providing Colorado with a holistic and scientific approach to wolf policy.

**Best available science**

While the Plan claims that “the best available science is used in formulating this Plan” (CPW, 2023, p.1), the amount and caliber of missing academic literature clearly betrays such a statement. The Plan currently omits numerous, recent studies of strong scientific inference on various topics related to wolf physiology, ecology, evolution, and how policies and interventions impact them. What's more, such omissions of academic literature are even more concerning given they seem to be systematic as opposed to random regarding what the omitted literature evidences: a holistic understanding and consideration of wolves as sentient, conscious, self-aware, autonomous agents; the substantial weight of evidence in favor of the effectiveness of non-lethal interventions to prevent conflicts (and in particular relative to lethal interventions); and the harmful effects of killing on wolf physiology, ethology, social and population dynamics, ecology and evolution (see relevant sections below for citations). Such omissions inevitably raise grave concerns over inadequate scientific expertise guiding policy or, at worst, subpar scientific integrity given the systematic bias along with omissions of conflicting evidence. Regardless, the politics of citation in the Plan are strongly suggestive of an unscientific, value-based bias within

CPW and the Plan in favor of the use of lethal methods and the instrumentalization of wolves, as the resulting harms from the use of such methods are neither acknowledged nor highlighted as concerns for future research. We also note grave concerns over public misinformation if such omissions and biases are not corrected.

### **Wolf science, dynamics and wellbeing**

In general, the academic literature on wolves within the Plan is substantially lacking. CPW omits important ethological, physiological, social, population, ecological and evolutionary literature that is directly relevant to the Plan's objectives as well as the public's perception of wolves. A holistic, scientific understanding of wolves would describe them as highly sentient, self-aware, cognitively advanced and extremely social, family-oriented, autonomous agents, with their behavior mediated by such internal capabilities and values (see Birch et al. 2020, Edelblutte et al. 2022, Haber 1996, Kershenbaum et al. 2016, Low et al. 2012, Mazzini et al. 2013, Palacios et al. 2015). In omitting this body of literature on who wolves are and limiting itself to only a carefully selected literature on wolves' impacts on human activities and other species, CPW dismisses wolves themselves and ends up promoting a particularly biased, unscientific and instrumental perspective of wolves, rather than holistic understanding (Santiago-Ávila et al. 2018c).

CPW also omits important and recent academic work on the biological, ecological and evolutionary implications of killing wolves. In particular, the Plan lacks literature on how killing negatively impacts surviving wolves' physiology and behavior (Almberg et al. 2015, Bryan et al. 2015, Pereira et al. 2022) which build up to negative impacts on wolf dynamics (Adams et al. 2008, Ausband et al. 2015, Ausband et al. 2017, Brainerd et al. 2008, Borg et al. 2015, Cassidy et al. 2023, Creel & Rotella 2010, Creel et al. 2015, Fuller et al. 2003, Haber 1996, Milleret et al. 2017, Mitchell et al. 2008, Murray et al. 2010, Rich et al. 2012, Rutledge et al. 2010, Sparkman et al. 2011, Vucetich 2012) including wellbeing, fitness, ecological relationships (e.g., "human actions will often attenuate the ecological effects of large carnivores", Kuijper et al. 2016; see also Ordiz et al. 2013), and even evolution (Wallach et al. 2015).

Given the above omissions of literature, the Plan also promotes a cursory and reductionist understanding of wolf 'health' as only concerning disease prevalence and transmission. This understanding of 'health' runs contrary to most scientific interpretations that include other physical, mental and social aspects relevant to sentient, conscious and social beings such as humans and wolves (Lynn et al. 2023). For example, the World Health Organization defines 'health' as "a state of *complete physical, mental and social wellbeing* and not merely the absence of disease or infirmity". We see no scientific justification for limiting concerns over wolves' 'health' to disease, nor any reason why such a comprehensive definition of 'health' would not apply to wolves given their similar mental and social capabilities (see evidence presented above and reference list). In fact, such an understanding of 'health' would be grounded in better and stronger inference, and would allow the consideration of wolves' wellbeing when assessing policies, interventions and management phases.

In fact, except for abundance, no other factors inherent to wolves' wellbeing, physiology (barring disease) or social dynamics seem to be adequately considered by CPW anywhere in the Plan, and especially when addressing management phases and the possibility of wolf hunting, despite the ample literature documenting negative ecological and evolutionary implications of such

exploitation. For example, Rutledge et al. (2010) point to the importance of maintaining stable wolf social structures for long-term fitness, and lists evidence of its importance for various ecological processes such as resource use (Sand et al. 2006; Stahler et al. 2006) and pup survival (Brainerd et al., 2008; Schmidt et al., 2008). Other studies have noted (e.g., Wallach et al. 2015 and Ordiz et al. 2013) that killing large carnivores, especially sustained killing, should be considered an evolutionary pressure that reduces the quality of traits and effects that allow wolves to fulfill their role as apex predators, along with other unexplored evolutionary implications. The cooperative behaviors that underlie wolves' ecology and dynamics are hindered through the social break-up of the family group, and such social instability highly constrains their ecological effects because "the pack is the apex predator, not the single individuals" (Wallach et al. 2009; see also Haber 1996). The strong scientific evidence for the negative impacts of killing on surviving wolves' physiology and dynamics, such as effects on hormone regulation (e.g. Bryan et al. 2015, Pereira et al 2022) or pair/pack persistence (e.g., Brainerd et al. 2008, Cassidy et al. 2023) suggests a strong presumption against the implementation of lethal methods, as well as greater emphasis on wolves' wellbeing for an effective recovery. The omitted literature on interventions to mitigate wolf-human conflicts bolsters this case.

### **Conflicts with domestic animals**

We appreciate CPW's encouragement of the use of non-lethal methods as a 'first line of defense'. However, given the body of scientific literature, the most effective approach to mitigation of wolf-human conflicts should prioritize wolf protections and concentrate on non-lethal management of wolves in response to conflict with domesticated animals. Despite CPW's claim that lethal interventions in response to conflicts are 'necessary' and 'effective', the Plan cites few studies to substantiate that claim while ignoring contrary evidence that is more recent, numerous and of stronger inference. As for the cited studies suggesting effectiveness of lethal methods: Bangs et al. (2006) presents no empirical evidence for the claimed effectiveness of lethal methods; Musiani et al. (2005) also provides evidence of immediate recurrence of predation after lethal methods are implemented; and recent studies have raised concerns over the reliability of Bradley et al.'s (2015) analyses (see Santiago-Ávila et al. 2018a). Moreover, none of these studies claim lethal methods are 'necessary' nor 'effective' (given the rapid recurrence of events), as stated by CPW in the Plan. The statement that "lethal control is a necessary tool for reducing wolf depredation on livestock" (p. 57) is demonstrably false according to the body of scientific evidence on the effectiveness of interventions.

Furthermore, although it may be true that "...lethal control options (e.g., damage tags) may empower local residents and provide a sense of security" (p. 27), the large body of scientific evidence suggests that is a false empowerment and sense of security given the ineffectiveness and counterproductive effects of lethal interventions for conflict mitigation (e.g., Bruns et al. 2020, Eklund et al. 2017, Khorozyan and Waltert 2019, Lennox et al. 2018, Miller al. 2016, Treves et al. 2016, van Eeden et al. 2018a,b). According to this literature, such a false empowerment and sense of security comes with the cost of not only not preventing, but also exacerbating conflicts; i.e., the cost of this sense of empowerment is the *actual* security of domesticated animals and their guardians (e.g., Haber 1996, Santiago-Ávila et al. 2018a,b, Treves et al. 2016, van Eeden et al. 2018b). Moreover, recent studies in the Northern Rocky Mountains and the Great Lakes have also documented the effectiveness of non-lethal methods in

conflict prevention and mitigation (Davidson-Nelson & Gehring 2010, Gehring et al. 2010, Stone et al. 2017, Wilson et al. 2018). The literature referenced above also indicates that non-lethal approaches, both proactive and reactive, lead to better conflict mitigation (e.g., van Eeden 2018b). There is stronger evidence suggesting lethal management often fails to provide a long-term solution to wolf predation and has the least consistent success rates when compared to non-lethal practices (see Bruns et al. 2020, Santiago-Ávila et al. 2018a,b). This scientific evidence has not been included in the Plan, hence the tradeoffs are not acknowledged, the public is misinformed and policy is not only ineffective, but risks increased harm to wolves, domesticated animals and their guardians.

Given such a substantial body of evidence, the plan should *require* the implementation of non-lethal conflict mitigating interventions by domestic animal owners, especially for the latter to receive compensation for confirmed predation(s). Additionally, alteration of animal husbandry practices (if more adequate ones exist for specific operations, such as human presence or removal or carcasses) should be required prior to implementation of any other non-lethal methods given the former's potential to mitigate conflicts effectively, feasibly and economically, and in particular because non-lethal methods may require particular changes in husbandry to be effective (contingent on the non-lethal methods to be implemented). Given the risk of exacerbating conflicts through the use of lethal methods, both for ranchers and companion animal guardians, non-lethal methods should also be exhausted prior to the consideration of lethal methods to mitigate the risk of subsequent conflicts. Finally, training domesticated animal owners (ranchers and companion animal guardians) in the implementation of non-lethal interventions seems essential if CPW and owners are striving for optimizing their functional effectiveness, and if the result of them not being effective is killing wolves (which may exacerbate conflicts).

### **Wolf policy and 'tolerance'**

A similarly biased presentation of the scientific literature is deployed when discussing the effects of policies and interventions on human tolerance of wolves. CPW begins by citing a study that 'believes' removing wolves improves tolerance and reduces illegal take (Bangs et al. 2006), yet that study presents no evidence for that belief. Hence, CPW relies on two studies for this claim (Hill et al. 2022, Olson et al. 2014). However, various studies documenting wolf population dynamics, human-caused mortality in North American wolves and human attitudes towards wolves have found that policies liberalizing the killing of wolves resulted in considerable decreases in wolf population growth rates (Chapron & Treves, 2016a,b, 2017), linked to considerable increases in the hazard over time of reported conflicts, legal and illegal killing (Louchouart et al. 2021, Santiago-Ávila et al. 2020a, 2022a), while tolerance did not improve and even decreased for various stakeholder groups (Agan et al. 2021, Hogberg et al. 2015, Naughton-Treves et al. 2003, Treves et al. 2013). Such results from Wisconsin undermine Olson et al.'s (2014) simple correlation, and taken as a whole, the studies present contrary evidence to Hill et al. (2022). It does not inspire trust in the department's scientific expertise or 'objectivity' that such contrary evidence, promoting stronger protections for wolves and discouraging the use of lethal methods, is omitted, while selected studies are foregrounded and presented as comprehensive evidence on which to base policy.

## Management phases and population estimation

We are also concerned about the unexplained and normative thresholds chosen for CPW's 'Phased Management of Wolves' (Chapter 4, p. 36). In that chapter, the Plan is explicit on who played a role in developing such thresholds: "The thresholds were developed through expert deliberation of the Technical Working Group (TWG) members and are presented in a phased framework." (p. 36). CPW presents no explanation to substantiate such decisions on thresholds by the TWG aside from reference to the opinion of said experts. This raises grave concerns over normative decisions being disguised as scientific and the exclusive province of 'objective' experts.

Decisions about what constitutes (risk of) 'endangerment', 'recovery' and the associated conditions leading to different categorizations are inherently normative (Vucetich et al. 2006) rather than scientific. As stated in Vucetich et al. (2006, 1389) scientists do not "...have exclusive right to determine the normative dimensions of specifying the conditions of extinction."; instead, science is used "...to determine whether specified conditions for endangerment are met by particular species." Moreover, the scientific literature has also evidenced how agency scientists: are generally beholden to an anthropocentric worldview and so "are neither neutral nor objective about nonhuman animals and human-wildlife conflict" (Treves & Santiago-Ávila 2020; see also Santiago-Ávila & Treves 2021); hold more utilitarian, dominating views towards wildlife than the broad public (Manfredo et al. 2018); and their policy recommendations are biased by this professional affiliation, generally towards lower protections and liberalized killing (Karns et al. 2018). For comparison, a recent statewide poll found most Colorado voters believe that neither trophy hunting or trapping of wolves should be allowed.<sup>1</sup> Moreover, scientists are not trained to engage in deliberative, normative decision-making, such as those relevant to endangerment, recovery or decisions to kill wolves.

The selected thresholds are also problematic because most analyses concerned with population viability do not account adequately for genetic health of wildlife. The '50' wolves threshold to move to 'Phase 2' decided on in the Plan seems to follow from decades old research suggesting an effective population size ( $N_e$ ) of 50 as sufficient to prevent inbreeding depression in the short term. However, recent research has critiqued the use of such thresholds as far too low to prevent genetic issues (Frankham et al. 2014). Instead, Frankham et al. (2014) suggest a short-term goal of  $N_e \geq 100$  seems a requisite to limit loss of genetic fitness to  $\leq 10\%$ . Moreover, the cooperative behaviors that underlie wolves' ecology and dynamics provide strong evidence that "the pack is the apex predator, not the single individuals" (Wallach et al. 2009). Due to their cooperative breeding, the effective population size for gray wolves is typically the number of packs, not the total number of wolves. Hence,  $N_e = 100$  means 100 packs for a value-based number of generations. Therefore, all the selected thresholds for phase shifting (50-200 wolves) would fall short of what is scientifically recommended for a genetically healthy, self-sustaining wolf population. The selection of thresholds without regard to the above considerations nearly ensures that the delisted wolf population will be precarious and the state will depend on its neighbors for

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<sup>1</sup> Remington Research Group. August 2022. Colorado Public Opinion. [https://blog.humanesociety.org/wp-content/uploads/2022/08/CO-Statewide-Public-Opinion-Survey-083022.pdf?\\_gl=1\\*flwhca\\*ga\\*MTE0MzO4NjMzNi4xNjc1ODkwOTcy\\*\\_ga\\_DGPX92WLR5\\*MTY3NjQ5MDc0Mi4zLjEuMTY3NjQ5MDgxMC41Mi4wLjA.\\*fpIc\\*ZVpzVXhBcUZDV2VidFN2SHJ6NTJtMDRoaiUyRiFZaU3WUxLO05ySVN0OEU2Yk5kdGtzSWVETTVZVVhK T0NwdWklMkZqMDZaRW02QjRHeXFXU0xlaWxmYkdTNXRhcWclMkJFZFRSUEY4VVKlMkZxbGxRMk42N0tScHhEVkt yV0VpbWFsNncIM0QIM0Q](https://blog.humanesociety.org/wp-content/uploads/2022/08/CO-Statewide-Public-Opinion-Survey-083022.pdf?_gl=1*flwhca*ga*MTE0MzO4NjMzNi4xNjc1ODkwOTcy*_ga_DGPX92WLR5*MTY3NjQ5MDc0Mi4zLjEuMTY3NjQ5MDgxMC41Mi4wLjA.*fpIc*ZVpzVXhBcUZDV2VidFN2SHJ6NTJtMDRoaiUyRiFZaU3WUxLO05ySVN0OEU2Yk5kdGtzSWVETTVZVVhK T0NwdWklMkZqMDZaRW02QjRHeXFXU0xlaWxmYkdTNXRhcWclMkJFZFRSUEY4VVKlMkZxbGxRMk42N0tScHhEVkt yV0VpbWFsNncIM0QIM0Q).

genetic or demographic rescue. In short, any claim of viability or adequate genetic health cannot be sustained scientifically because it depends on assumptions and value judgments.

Given the above, CPW should engage the broad public and follow a deliberative approach to address such normative aspects central to the Plan and wolf policy, and restrict scientists' (i.e., TWG) input to providing the most accurate information (which given our comments, needs much improvement) on when such normative goals are met.

Lastly, on the topic of population monitoring and estimation, we want to note two critiques of recently developed wolf estimation methodologies mentioned in the Plan as potential alternatives for future estimation (e.g., Stauffer et al. 2021). Two recent, independent scientific critiques highlight grave concerns over such methods' adequacy and reliability, including inadequate data, model assumption violations, no consideration of anthropogenic mortality on wolf dynamics, and other technical decisions at odds with empirical studies, leading to systematic overestimation of populations (Creel 2022, Treves & Santiago-Ávila 2023).

### **Ecological impacts and related concerns**

Although we do not disagree with the statement that wolf predation can limit wild ungulate abundance, such discussion notably omits the substantial and recent scientific literature suggesting that killing wolves may not be favorable to hunting of wild ungulates, which is exactly the intervention recommended by CPW (p.44): “**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.” First, given wolves' substantially documented direct and indirect impacts on wild ungulates, they may always be 'suspected' of such impacts, which would allow lethal intervention to occur at will given the lack of explicit criteria to be considered. We also note 'suspicion' is not an objective, scientific criterion.

Second, on precisely that management topic, a recent meta-analysis of predator-prey studies exploring the overall effect of predator removal on wild ungulate populations found predator removal had low and variable effectiveness for increasing such populations (Clark and Hebblewhite 2021). A recent study in Alberta, CA also shows that “increasing large-predator populations do not necessarily reduce hunter harvest of elk” and that sustainable hunting of elk has continued, and populations have increased with increasing large predator populations (Trump et al. 2022). Another recent study analyzing 4 decades of efforts in Alaska, US to reduce abundance of large predators, including gray wolves, brown and black bears, found: (1) no positive correlations between killing of bears and subsequent moose hunting, (2) moose hunting was negatively correlated with the prior year's wolf killing (weak relationship) and (3) no differences in mean moose hunting during periods of recent liberalized killing of predators relative to prior periods (Miller et al. 2022). Such evidence at the population level is consistent with prior and recent research documenting how wolves have primarily compensatory and weak additive effects on population dynamics of wild ungulates (Vucetich et al. 2005, Christianson & Creel 2014, Griffin et al. 2011, Brodie et al. 2013), given their focus on calves and older females with low reproductive value (Eberhardt et al. 2007; see also Wilmers et al. 2020). The above studies provide direct scientific evidence that contradicts the effectiveness of CPW's proposed management action in the Plan, and most of them are not included.

It is also concerning that the Plan will consider wolf impacts on wild ungulates relative to Herd Management Plans (HMPs) notably influenced by minority preferences for increased hunting opportunity, instead of allowing top-down regulation of wild ungulates indispensable for self-regulating ecological relationships and ecosystems, and updating HMPs accordingly. Using such hunter benchmarks for a particular increased abundance and easily accessible distribution of wild ungulates will undoubtedly raise the likelihood that any natural impacts of wolves on wild ungulates will be interpreted as substantial and negative, to the detriment of naturally regulating systems. We also note the blatant conflict of interest inherent in CPW awarding such priority to hunting of wild ungulates given 55% of CPW's hunting and fishing license revenue is derived from elk and deer licenses (46% and 9%, respectively).

The exposition of science relevant to wolves' impacts on wild ungulates is also missing important literature relevant to positive effects of wolves in mitigating disease transmission in prey species. While Brandell et al. (2022) is included in the Plan, its implications of findings relevant to wolf impacts on Chronic Wasting Disease (CWD) are absent. Using data from the Greater Yellowstone Ecosystem, that modeling study found wolves' selective predation pressure of late-stage CWD infections (those most responsible for transmission and prevalence) "may decrease CWD outbreak size substantially and delay the accumulation of symptomatic deer and elk" and that "increasing predator kill rates can result in opposing forces on prey abundance and CWD prevalence". A prior modeling study also found selective wolf predation on deer to suppress CWD prevalence and potentially eliminate the disease from a closed population (Wild et al. 2011). Other studies also provide evidence for wolves contributing to reduced levels of indirect transmission of diseases (e.g., tuberculosis in wild boar, Tanner et al. 2019) and as a selective pressure (through predation) against genes associated with developing diseases (e.g., severe osteoarthritis in Hoy et al. 2022). Importantly, all this literature points to increased benefits of allowing predators to naturally regulate their prey populations, with beneficial effects on such prey populations. As stated by Hoy et al (2022), given their results were obtained from a system unaffected by anthropogenic wolf mortality (Isle Royale National Park, Michigan, US): "The evidence we present for predation's influence on the health of prey populations is also relevant for policy-related arguments about refraining from intensively hunting wolf populations."

Moreover, in the exposition of the science behind the role of wolves in shaping trophic cascades, CPW neglects to include various relevant studies documenting such impacts outside protected areas, while claiming that such effects have been observed mostly in protected areas. Many studies from WI outside protected areas have documented trophic cascade effects, including: wolf pack presence affecting elk habitat selection and home ranges (Anderson et al. 2005); increased forb and shrub species richness and reduced fern richness in high wolf areas (Callan et al. 2013); reduced deer density, visitation and time foraging in areas of high wolf use, leading to substantial reductions in browsing of saplings, and increased sapling height and forb species richness relative to low wolf use areas (Flagel et al. 2015).

Such studies also suggest widespread and indiscriminate killing of wolves would negate or mitigate such ecological impacts and related ecosystem benefits. Other studies note that wolf hunting and trapping would reduce the enjoyment of wolves by far more numerous non-consumptive users (e.g., Borg et al. 2016) and may even mitigate other broad benefits such

as reductions in vehicle collisions with wild ungulates (Raynor et al. 2021). CPW does not include such literature in the Plan. Hence, such conflicts are not acknowledged, and it is assumed throughout the plan that an exploited yet ‘sustainable’ wolf population provides the same ecological benefits and the same levels of non-consumptive experiences (for a broader public) without any supporting scientific evidence, and contrary to some omitted evidence (e.g., Borg et al. 2016, Kuijper et al. 2016, Ordiz et al. 2013, Wallach et al. 2009).

### **Education**

We are in full agreement with CPW in that “[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.” (p. 62). However, both the selective information included in the plan and its biased exposition betray CPW’s alleged commitment to those statements.

Given the substantial scientific deficiencies identified in the Plan, currently CPW presents a view of wolf ecology limited to information relevant to mitigating any impacts perceived as negative on certain privileged human activities and promoting wolf killing, while dismissing relevant science germane to viewing wolves holistically. Therefore, any education efforts that derive from such a biased perspective on wolves, wolf ecology and related conservation interventions will inevitably misinform the public.

Appropriate public education should begin by correcting such biases within the Plan and relevant wolf policy. Such a goal should incorporate all the included scientific literature on wolf ethology (emotional, cognitive and social capabilities) and agency (Edelblutte et al. 2022), as well as how such capabilities and wellbeing is greatly harmed by killing them, with conservation implications. Unfortunately, almost all such scientific literature is missing from the plan, which thoroughly betrays this objective. These omissions of scientific evidence suggest a biased plan favoring a particular, instrumental view of wolves that masquerades as a comprehensive scientifically-based plan. (Treves & Santiago-Ávila 2020; Santiago-Ávila et al. 2018c, Santiago-Ávila & Treves, 2021). We urge the department to correct the omission of science relevant to wolves in the plan prior to doing any type of educational outreach.

### **Research**

To the omitted scientific literature on various topics exposed above, we must add that CPW does not seem concerned with conducting any research on the impact of lethal methods on wolf physiology, ecology, population dynamics, conflicts and the effects of killing wolves on such matters. We are deeply concerned about such omissions and recommend CPW focus its research on the science we have identified as omitted from the Plan, such as researching holistic wolf health and wellbeing (beyond disease), how management and interventions affect such health at the individual (e.g., cortisol levels and reproductive hormones) and population scales (e.g., pack persistence, survival, distribution, size), and how to improve humans’ views of wolves as individuals from a holistic, rather than instrumental, perspective.

## **Ethical concerns**

In the above sections, we have highlighted the unscientific and value-based bias inherent in the Plan along with concerns over violations of scientific integrity that fail to uphold ethical values internal to the scientific process, such as transparency, honesty, truth and conflicts of interest (Lynn et al. 2006). We have noted the bias inherent throughout the Plan, given the lack of care or concerns for the wellbeing of wolves as individuals and as a population as long as the population remains ‘sustainable’, along with the prioritization of consumptive uses of wildlife and lethal methods preferred by certain interest groups (Santiago-Ávila et al. 2018c). Such violations militate against the promotion of another ethical value essential for the scientific endeavor as well as public policy: trust.

Moreover, the Plan contains other yet equally important ethical errors. There is a cursory misunderstanding of and dismissal in practice of the ‘intrinsic value’ of wolves as a ‘positive impact’. Intrinsic value is not an impact, or ‘for’ humans (Batavia & Nelson, 2017; Treves et al. 2018). It is a recognition of the value of those beings as autonomous agents, and demands strict ethical and scientific scrutiny when intervening in their lives. What is evidenced instead is an inappropriate understanding and consideration of holistic worldviews about wolves and ethical wolf-human relationships. To correct for this error, the recommended revisions to the plan are essential, beginning with who wolves are, their internal capabilities (sentience, self-awareness), behavior and sociality. Otherwise, what is being promoted is a biased, unscientific and purely instrumental/objectifying view of wolves that panders to narrow interests and is not shared by the broad public. Throughout our comments, we have strived to recommend how to address those concerns and we would be happy to support CPW in that task.

Sincerely,

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PAN Works

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