
AFFIDAVIT OF DR. ADRIAN TREVES

STATE OF LOWER SAXONY)
)
DISTRICT OF HEIDEKREIS) ss
)
GERMANY)

Dr. Adrian Treves, being first duly sworn on oath, deposes and states as follows:

1. I am an adult resident of the State of Wisconsin. I offer this affidavit based on my personal knowledge in support of Petitioners' Motion for Temporary Injunction in the above-captioned case.

KEY CONCLUSIONS

2. This affidavit elaborates upon the basis for the following key conclusions, which are based on my scientific expertise and experience, my years of studying the ecology of wolves—with a particular focus on the Wisconsin wolf population—and my detailed analysis of the actions, policies, proposals, data, and methods of the Wisconsin Natural Resources Board (the “Board”) and the Wisconsin Department of Natural Resources (“DNR”) over the past 21 years.

- a. The Board had no scientific basis for its August 11, 2021, decision to set a quota of 300 wolves for the November 2021 wolf hunt (300 Quota).
- b. DNR lacks a scientific basis for its October 4, 2021 decision to set a quota of 130 wolves for the November 2021 hunt (130 Quota). The analysis described in DNR’s July 26, 2021, and October 4, 2021, memoranda is predicated on faulty reasoning, inaccurate information, and unwarranted assumptions, and it ignores the best science and most reliable data before the agency. The result is a quota that has the trappings of a scientific analysis, but lacks any real basis of scientific support.
- c. As DNR conceded, it is operating without fundamental information that is essential to evaluate the effects of any potential wolf hunt—including the current size of the state wolf population, and an estimate of the harm the February 2021 wolf hunt did to that

population's ability to reproduce. Without such basic information, DNR's quota is nothing more than a shot in the dark. Since DNR admits it does not understand the current state of the state's wolf population, it cannot credibly claim it can estimate the effects of the planned November 2021 hunt. It is reckless to authorize another hunt without more data about the full impact of the February 2021 hunt on the wolf population.

- d. The 130 Quota would not result in a "stable" population, as DNR claims, but instead would risk a crash in the Wisconsin wolf population. The lack of information about the impacts the February hunt had on wolf reproduction creates a wide degree of uncertainty. However, our models predict that if hunters were to kill more than 16 wolves¹ this November, it is more likely than not to cause the Wisconsin wolf population to fall below the state population goal of 350 wolves. If hunters were to kill only 74 wolves, which is the number of wolves that can be legally killed after the Ojibwe tribal reservation from the 130 Quota, our models predict a 65% probability that the state wolf population would fall below the state population goal by April 2022 and a 1% probability that the state wolf population would fall below the state listing threshold.
- e. In the more likely event that hunters were to once again exceed the number of wolves they can legally kill, and kill more than 115 wolves, it is more likely than not to bring the population under the state re-listing level of 250 wolves, triggering statutory relisting of wolves under the state endangered species act.
- f. Our models predict that the 300 Quota would have catastrophic results. The death toll resulting from the 300 Quota would certainly cause the state wolf population to fall

¹ The Ojibwe tribes have exercised their treaty rights to reserve up to half of the quota of wolves to be hunted in the ceded territories and choose to protect these wolves rather than hunt them. Once this tribal reservation is applied to the 130 Quota, hunters will be legally authorized to kill 74 wolves in November.

below the state re-listing level of 250 wolves, and would have a 9% probability of extirpation of wolves from the state. If the November hunt results in a death toll in excess of 357 wolves, our models predict that extirpation is more likely than not.

- g. There is enormous uncertainty regarding the current status of Wisconsin's wolf population, because the February 2021 hunt interrupted the annual breeding season and could have prevented a large percentage of remaining packs from successfully reproducing this spring. This lack of information could lead to a miscalculation that could easily cause grave damage to such a small population of animals. Given this significant risk, the precautionary approach to scientific uncertainty warns us to do no harm, which means the state should set a zero or near-zero quota for the proposed November 2021 wolf-hunt. In my view, that is the only course of action that would be in accordance with the public trust responsibilities of DNR and the Board.

BACKGROUND

3. I am a Professor with the Nelson Institute for Environmental Studies at the University of Wisconsin-Madison, where I founded and direct the Carnivore Coexistence Lab.

4. I hold B.A. degrees in Biology and Anthropology from Rice University and a Ph.D. in Human Evolutionary Biology from Harvard University. I have been conducting ecological research since 1991.

5. I am a Professor with the Nelson Institute for Environmental Studies at the University of Wisconsin-Madison, where I have been teaching and conducting applied research since 2007, and where I founded and direct the Carnivore Coexistence Lab. I have taught courses including Preserving Nature; Introductory Ecology; Wolves, Dogs and People; Conserving Biodiversity; Large Carnivore Conservation; Conservation Biology; and Environmental Planning and Adaptive Management.

6. I have received numerous awards and honors for my work. As of writing, I am collaborating with the German Ministry of Environment in lower Saxony on wolf management

through a German federal grant. I have twice been a Fulbright Senior Specialist for conservation of carnivores (Ecuador and Chile), and I was awarded a Fulbright for teaching and research on wildlife biology in Sweden in 2014-15. I formerly served on the DNR Wolf Science Committee until it was disbanded. Between 2004 and 2018, I was a keynote speaker at 12 scientific meetings or conferences. I also was nominated for the Indianapolis Prize for Conservation in 2018 and won the Clements Prize for Outstanding Research & Education in 2017. From 2015 to 2019, I was selected five times by students as an Honored Instructor. In 2010, I won the Award for Best Monitoring and Evaluation methods from the Rainforest Alliance Eco-Index. I am currently a Vilas Associate at University of Wisconsin-Madison, receiving funding for my research on wolves in Germany.

7. I have published more than 134 peer-reviewed scientific articles on ecology, management, and conservation, including 99 articles published by scientific journals. I have been investigating human-wolf coexistence in Wisconsin since 2000, with my most recent peer-reviewed scientific article on Wisconsin wolves published on June 18, 2021. My full curriculum vitae is attached to this declaration as Exhibit (“Ex.”) A.

8. This declaration is based upon my knowledge and experiences of researching wolf ecology and related fields over the course of almost three decades, my review of relevant scientific literature, and my close study over the past 21 years of the Wisconsin wolf population and the actions, policies, proposals, data, and methods of DNR and the Board, including those made public during 2020 and 2021.

PARTICIPATION IN DEVELOPMENT OF QUOTA

9. Over the past year, I have actively attempted to advise DNR and the Board, and to share with them the recent data and research relevant to their decisions about managing the state wolf population. I have attached the written comments that I provided to DNR and the Board to this declaration, and will summarize many of them below.

- On May 15, 2021, I submitted comments to DNR and the Board related to setting a quota for the November 2021 wolf hunting season and the revision of the Wolf Management Plan. These comments, including several appendices detailing research on key issues under DNR's consideration, can be found at Ex. B.
- On June 4, 2021, I submitted comments to DNR related to its statement of scope for a potential new emergency rule to regulate wolf hunting. Ex. C.
- On June 16, 2021, I submitted comments to the Board related to the statement of scope for a potential new emergency rule to regulate wolf hunting. Ex. D.
- On June 18, 2021, I submitted comments to the Wolf Harvest Advisory Committee and the Wolf Management Planning Committee regarding the topics they were scheduled to discuss in their upcoming agendas, including the development of a new Wolf Management Plan and the setting of a quota for the November 2021 wolf hunt. Ex. E.
- On July 19, 2021, I submitted comments to DNR related to its development of a recommendation for the quota for the November 2021 wolf hunt. Ex. F.
- On August 3, 2021, I submitted comments to the Board regarding DNR's recommendation of a quota of 130 wolves for the November 2021 wolf hunt. Ex. G.
- On August 10, I submitted supplemental comments to the Board regarding the quota for the November 2021 hunt, which include further analysis of DNR's recommendation. Ex. H.
- I observed and testified during the August 11 hearing at which the Board attempted to set the 300 Quota.

FUNDAMENTAL FLAWS IN DNR ANALYSIS

10. In attempting to set a quota of 300 wolves, the Board did not even pretend that it had any scientific basis, but merely pushed aside the concerns that such a high quota could have a devastating impact on the wolf population. Instead, the Board started its debate with a proposal to set the quota at 504 wolves, and seemed to bargain down from there, until it found a number to

which a majority of its members would approve. In so doing, those Board members who spoke in favor of these higher quotas brushed aside the science of wolf ecology in favor of simple math—subtracting the number of wolves that it planned to allow hunters to kill from inaccurate population estimates, to arrive at the population number that they deemed acceptable. Such a process has no place in science-based management or responsible wildlife management².

11. DNR’s analysis that led it to set the 130 Quota has a veneer of scientific process, but it lacks the hallmarks of scientific integrity: transparency, independent review of methods and results, and reproducibility of the findings and inferences drawn from accurate and precise facts. *See Ex. G at 2 (containing full discussion).*

12. DNR’s analysis is based on false assertions of fact and assumptions that have no factual support, and it omits crucial information that should have been considered in recommending a fall 2021 wolf hunting quota. In its July 26, 2021, memoranda, DNR purports to use a model to estimate the impact of the 130 Quota on the wolf population, but that modeling omits consideration of crucial factors, and ultimately has no predictive value because of the inaccuracy and uncertainty of the data DNR uses as the basis for its modeling.

13. DNR’s modeling: (1) inaccurately assesses the size of the Wisconsin wolf population, while admitting that it cannot accurately assess that population; (2) makes unsupported assumptions based on inadequate data about wolf reproductive success following the February 2021 hunt; (3) employs a fictional estimate of background wolf mortality derived from the consensus of a non-expert committee, which is a lower annual rate than any peer-reviewed estimate and less than half of the 2020 mortality estimated through the scientific process described in the manuscript attached as Ex. J (*see Table 1*)² (4) misuses a limited model for estimating the impact of the quota; (5) fails to address the near certainty that more wolves will be killed than the number

² Treves, A., Louchouarn, N., 2021. Uncertainty and precaution in hunting wolves twice in a year. Unpublished and pending peer review.

set in the quota; and (6) ignores some of the most fundamental questions about the impact the quota will have on the health and stability of the state's wolf packs. Id.

14. Instead of relying on the best available science to estimate the state wolf population in November 2021, DNR used a crude estimate of the population which it knew to be incorrect and used this inaccurate information to inform the rest of its modeling. On June 18, 2021, I shared with DNR a peer-reviewed study that my colleagues and I had published, which estimated that as of April 15, 2021, there were between 695-751 wolves in Wisconsin, including those with territories overlapping tribal reservations. *See Treves, A., Santiago-Avila, FJ, Putrevu, K. 2021. Quantifying the effects of delisting wolves after the first state began lethal management. PeerJ DOI 10.7717/peerj.11666* (attached as Ex. J).

15. Our estimate indicated a 27-33% drop in the population since April 15, 2020, when there were an estimated 1,034 wolves in the state. Our numbers accounted for the 218 wolves that hunters reported killing during the February 2021 wolf hunt, as well as the 98-105 additional wolves that we estimate poachers illegally killed after the U.S. Fish and Wildlife Service announced in November 2020 that it was removing gray wolves from the federal endangered species list. DNR ignored that study entirely, even though it was then (and remains now) the only peer-reviewed estimate available of the state wolf population, was provided to DNR in plenty of time to develop its quota, and would have provided the agency with a much stronger foundation for its population modeling.

16. In addition to ignoring the best available science estimating the wolf population following the February 2021 hunt, DNR's estimate of the wolf population (1) is based on DNR's untested and unsupported occupancy model, which has a systematic bias toward overestimating the wolf population when compared to the time-tested traditional way of estimating wolf

populations;³ (2) truncates the occupancy model just before the February 2021 hunt, in an unconventional, untested, and clearly unwarranted way, to exclude one of the highest periods of background wolf mortality; and (3) arbitrarily arrives at what DNR purports to be a current population number, apparently by merely subtracting the reported numbers of wolves legally killed during the February hunt, without accounting for additional poaching deaths that would almost certainly precede, accompany, and follow that wolf-hunt. Taken together, these errors provide a fundamentally flawed foundation that means that DNR’s additional modeling lacks any reasonable basis, leading to a quota that is too high, and which involves risks to the wolf population that DNR fails to quantify or recognize. Ex. G at 5.

17. The analysis behind DNR’s quota is also inherently unreliable because, as DNR concedes, it lacks key data on wolf reproduction during the summer of 2021. DNR’s analysis contains no information about the reproductive success of the wolf population following the February 2021 hunt. Because DNR decided not to collect and examine carcasses from the February hunt, we do not know the number of pregnant females that were killed, or even whether hunters might have selectively targeted breeding pairs of wolves. Given the massive disruption potentially caused by the February 2021 wolf hunt on breeding wolves, any independent and reputable scientific analysis of the status of the population would need to include estimates of successful breeding with pups surviving to the age of independence this fall. Without such an estimate, no responsible scientist would purport to set a “sustainable” quota for the upcoming hunting season, because it is impossible to know the health and size of the wolf population before that hunting season begins, or its ability to withstand additional losses. Currently, DNR is only speculating that

³ It is curious that DNR uses the same wolf population number for 2021 as it had estimated for 2020. While it is conceivable that DNR recorded zero change in the population between 2020 and 2021, it is significantly more likely that DNR made a fundamental error at the beginning and started with the wrong baseline population. If so, DNR’s already fictional wolf population estimate started out with the wrong number, and it performed its own crude calculation incorrectly.

wolves in Wisconsin successfully bred this year, and that the population could thus sustain another hunt this fall. Sheer speculation is not science. *Id.* at 5-7.

18. In justifying its quota, DNR also uses unreliable information on background mortality. To reasonably model the potential impact of any quota, DNR must have a reliable estimate of background wolf mortality, since such an estimate is critical to the use of the “Adams model” on which DNR largely relies to determine the likely effect of its quota. Rather than using a careful scientific estimate of background mortality, DNR uses an unscientific “consensus” opinion that reflects the mortality rate *preference* of a narrow collection of non-scientific interest groups. There is no scientific merit to such a process: the opinions of the interest groups convened are not reproducible, transparent, objective, or informed by independent review or peer-reviewed science. Several peer-reviewed studies have estimated the annual mortality rate in Wisconsin’s wolves,⁴ so there is no justification for DNR to ignore this established science in favor of polling interest groups for their uninformed opinions of such a critical fact. Therefore, DNR’s quota is severely compromised by a systematic under-estimate of background mortality, leading to an overestimate of the sustainable hunting deaths, with risky consequences for the wolf population. *Id.* at 7-13.

19. DNR’s use of the Adams 2008 Model to determine the impact of its quota is thus scientifically indefensible because it inputs knowingly inaccurate data on wolf population numbers and background mortality. There are other reasons to be skeptical about the use of this model to predict a sustainable quota, since DNR has chosen not to incorporate three other models that are

⁴ See Treves, A., J.A. Langenberg, J.V. López-Bao, and M.F. Rabenhorst, *Gray wolf mortality patterns from 1979 to 2012*. Journal of Mammalogy, 2017. **98**(1): p. 17-32. 10.1093/jmammal/gyw145; and

Santiago-Ávila, F.J., R.J. Chappell, and A. Treves, *Liberalizing the killing of endangered wolves was associated with more disappearances of collared individuals in Wisconsin, USA*. Scientific Reports, 2020. **10**: p. 13881. 10.1038/s41598-020-70837-x; and

Stenglein, J.L., A.P. Wydeven, and T.R. Van Deelen, *Compensatory mortality in a recovering top carnivore: wolves in Wisconsin, USA (1979–2013)*. Oecologia, 2018. **187**(1): p. 99–111. 10.1007/s00442-018-4132-4. <https://doi.org/10.1007/s00442-018-4132-4>.

more conservative into its analysis. DNR justifies this choice as “it works” rather than “it is better,” even though the Adams Model failed to accurately predict the impact in 20% of the years Wisconsin had a wolf-hunt—as DNR concedes. The Adams Model was not designed for the purpose for which DNR uses it (planning wolf-hunting), nor is it the only model, the most recent, or the most conservative. A conservative approach to science and management and a precautionary approach to killing wildlife is to err on the side of not killing wildlife if you are unable to determine the likely effect of doing so. *Id.* at 13-15.

20. DNR’s analysis fails to discuss other crucial information. Most importantly, DNR fails to grapple with what went wrong with the February 2021 hunt, and how it is going to prevent those same problems from recurring. For example, DNR should have described how it would increase enforcement and close zones earlier to avoid an over-kill. DNR’s July 26, 2021 analysis does not address issues of hunter compliance, poacher activity (a major cause of wolf death), or the slow or lax closure of zones. Although DNR had suggested plans to develop a new emergency wolf hunting rule to help it police these issues, it has run out of time for that endeavor, and has instead chosen to go forward with the same provisions from the 2012 “emergency” rule. The only concession that DNR makes in its October 4, 2021, analysis toward preventing another overkill is to limit licenses to a 5-to-1 ratio, as opposed to the 13-to-1 ratio used during the February 2021 hunt. This is inadequate because reducing the number of permits to five times the number of quota wolves does not by itself eliminate the risk of over-kill—even if each hunter only legally kills one wolf, they could still kill significantly more wolves than the quota allows in a short period of time under the current rules. Again, the DNR is making decisions without the benefit of scientific measurements. To stop over-kill under the current rules, DNR must close a zone before the zonal quota is reached and anticipate the fulfillment of the statewide quota before it is reached. If DNR is not going to take aggressive steps to prevent another significant over-kill of wolves this fall, then it needs to account for the fact that this is likely to recur, and compensate for it in its modeling and set a lower quota. *Id.* at 15-16.

21. When an agency recommends that wolves be killed during a public hunting season, it should answer several scientific questions about the effects of killing those wolves. DNR's analysis does not address most of these questions, which I believe are questions that any responsible wildlife manager, and public wildlife trustee, must grapple with before authorizing a hunt of a species with such complex social relationships and such a profound impact on the ability to maintain healthy ecosystems. The questions are the following:

- What effect does killing (or not killing) one wolf have on surviving wolves, the ecosystem, and society?
- What effect does killing (or not killing) the entire quota have on surviving wolves, the ecosystem, and society?
- Is the health of the wolf population only a question of numbers or are other ecological factors worth considering?
- What constitutes significant under-kill or over-kill?
- Will the numbers of permits result in the quota being met, under- or over-shot?
- Will the methods for hunting, trapping, hounding and related modes of pursuit or luring wolves result in the quota being met, under- or over-shot? *Id.* at 16-17.

MODELING OF POTENTIAL IMPACT OF FALL HUNT

22. Before the Board' hearing on August 11, 2021, I submitted a preliminary evaluation of the likely impact on the wolf population of the 130 Quota. My first, and primary, conclusion was that the February 2021 hunt caused such great uncertainty about reproduction and pup survival that it would be reckless to authorize a November 2021 hunt without gathering more data about the full impact the February 2021 hunt had on the population. This lack of information about the status of the wolf population following the spring/summer 2021 breeding season led me to develop a model that accounts for the uncertainty.

23. In the initial model presented to DNR before the August hearing, my colleagues and I showed that even a quota of zero has a measurable risk of 13% that the state wolf population

would fall below 350 by April 2022 when the next wolf census is due to be published. Our model does not take into account any increases in unreported killing, only the normal background mortality rate seen in 2020 and the typical vagaries of wolf reproduction. Through this model, my colleagues and I showed that even a quota of zero has a measurable risk of 13% that the state wolf population would fall below 350 by April 2022 when the next wolf census is due to be published. Our model did not take into account any increases in unreported killing, only the normal background mortality rate seen in 2020 and the typical vagaries of wolf reproduction. Ex. H at 1. Our modeling suggests a danger that the wolf population could crash even further if there is poor reproductive success in 2022, which may be likely, depending on which wolves are killed in fall 2021. *Id.* at 1-2.

24. I expanded upon this initial model in a paper that a colleague and I have recently submitted for peer review and publication, attached here as Exhibit J. In that paper, we use the only peer-reviewed published estimate of the state wolf population in April 2021, and construct scenarios for deaths, births, and pup survival to November 2021, and then for the population by April 14, 2022, given a wide range of potential death tolls that may result from the proposed November 2021 hunt season. Our paper develops the first scientific estimate of background mortality to put into perspective DNR's decision to set the background mortality level at 13% based on a consensus-based compromise. Our estimate is a background mortality level of 38-56% between April 2020 and April 2021, *not including* the 218 wolves legally killed in the February 2021 wolf-hunt. This background mortality is so high that the DNR should expect minimal to no growth of the wolf population even without *any* November wolf hunt. Ex. J.

25. The analysis in our paper evaluates the probabilities that any given quota will lead to the Wisconsin wolf population dipping below certain thresholds—the population goal of 350 wolves set by the 1999 Wisconsin Wolf Management Plan; the threshold of 250 wolves, which would trigger wolves to go back on the state endangered species list; and potential extirpation of wolves from the state.

26. Only the scenario with a zero (no wolf-hunt) quota can truthfully be described as precautionary, because it has only a 13% probability of dipping below any of these thresholds. As soon as the quota reaches double digits, there is a measurable risk that the hunt will cause the population to dip below 350 wolves—meaning that within the space of a single year, Wisconsin will have decimated two-thirds of its wolf population. If any wolf hunt is held, even with a quota in single digits, there is a risk of unreported killing and wounding that could drive the population below 350 by April 2022. Therefore, canceling the wolf hunt is the only precautionary approach that would ensure no further harm is done to the wolf population. If the death toll were as low as 16, the odds of reducing the wolf population below 350 begin to fall below 50:50 odds.

27. Our paper provides predictive lines that allow us to evaluate the risk of crossing these legal thresholds for any given quota. This model shows that DNR’s so-called conservative quota of 130 wolves has a 64% probability of driving the population below the state endangered listing level of 250. This is not conservative in either a scientific sense or from the viewpoint of wildlife conservation. *Id.* at 25. This same is true even after subtracting the Ojibwe tribal reservation, which would mean DNR would authorize hunters to legally kill 74 wolves in November. Our models predict this hunting level would mean a 65% probability that the wolf population dips below the state population goal of 350—a far cry from DNR’s proclaimed goal of keeping the wolf population stable at about 1,195 wolves.. The above averages and probabilities assume no over-kill or illegal kills beyond that estimated by our background mortality rate.

28. Examining the Board’s 300 Quota, any hunt leading to a death toll at or above 300 wolves would drive the wolf population below the statutory state relisting level of 250 wolves, and risks extirpation of the state population. If hunters and poachers kill more than 358 wolves in the November hunt, it is more likely than not to result in extirpation of the state wolf population outside reservation lands and could even kill wolves that largely use tribal reservations, thus extirpating the species within the Wisconsin state borders. *Id.* at 27.

29. Some may contend that our forecasts are too pessimistic. The contrary may in fact be true because our forecasts do not account for unreported kills that occur in three main ways. First, poaching is the major source of wolf mortality in all wolf populations in the United States and typically that poaching goes undetected by authorities. The Carnivore Coexistence Lab has estimated rates of such “cryptic” poaching in which perpetrators conceal evidence, including destroying radio- and GPS-transmitters, as amounting to 25-66% of poaching incidents. Second, hunters may inflict sub-lethal injuries that cause wolves to die afterwards in another location, where they cannot be retrieved by hunters or found by law enforcement. Such unrecorded fatalities seem more likely when you have a large number of hunters in the field at one time, as during the February hunt. We have published prior peer-review studies that estimated such mortality rates at >40% of the wolf population annually.⁵ Indeed, we estimate the annual mortality rate in 2020 at 38-56%, so 2021 could see even higher mortality rates. *Id.* However, our research data came from periods with less political controversy and less overt anti-wolf sentiment, so that figure is likely to underestimate the additional death toll from the February 2021 hunt and the upcoming November 2021 hunt.

30. The only way for a proponent of a higher quota to reasonably predict less dire outcomes is if we imagine that the state’s wolves had a better than average reproduction in summer 2021 or to imagine that adult survival in 2021 was higher than in 2020. However, there is no scientific basis for such optimism. To the contrary, scientists have found evidence of depensatory effects from wolf hunts, meaning that for every one wolf intentionally killed, 1.2 wolves actually die. This could occur because wolf packs are family units that act as teams to defend territories, raise pups, and hunt cooperatively. The wolf hunt of February 2021 obliterated many of those wolf “families,” so they will not be able to hunt, breed, or patrol territories as effectively as a result.

⁵ Santiago-Ávila, F.J., R.J. Chappell, and A. Treves, *Liberalizing the killing of endangered wolves was associated with more disappearances of collared individuals in Wisconsin, USA*. Scientific Reports, 2020. **10**: p. 13881. /10.1038. | <https://doi.org/10.1038/s41598-020-70837-x>.

31. Moreover, human-caused killing was much higher in summer 2021 than it was in summer 2020, when wolves were still protected by the U.S. Endangered Species Act. Indeed, DNR recently reported that 68 wolves have been killed to date in 2021 through legal permits issued as a result of suspected wolf-livestock conflicts. This means that landowners and agents from USDA Wildlife Services have killed roughly an additional 10% of the adult wolf population that survived the February 2021 hunt. The number of wolves reportedly killed in summer 2021 may be the highest rate of lethal control for livestock conflicts that has ever been reported in Wisconsin, which would be expected to harm reproductive performance even further. This alarming rate of additional wolf killings suggests once again that, if anything, our modeling may be too *optimistic*, and that the actual state of the wolf population may be even more dire.⁶

32. Given the high level of uncertainty caused by DNR's lack of information about the wolf population, and the dire consequences of a miscalculation when dealing with such a small number of animals, I contend that proponents of setting any significant quota for the November 2021 hunt must bear the burden of proof. They must show that estimates are accurate, precise, and reproducible as judged by scientific peer review, which is the only appropriate standard for science-based resource management. DNR has fallen far short of this standard.

33. The precautionary approach to scientific uncertainty warns scientists to take a conservative approach in the face of uncertainty, to ensure that their actions will not harm a population. In this case, that conservative approach leads to the inevitable conclusion that the only

⁶ Although it is not the focus of this opinion, I call attention to the extensive discussion in my comments submitted to DNR and the Board regarding the lack of scientific evidence that lethal wolf control diminishes wolf-livestock conflicts. Exhibit B, Appendix 4. To the contrary, there is evidence that killing wolves may lead to more conflicts. In particular, it is likely that the indiscriminate killing during February 2021 destabilized wolf packs, causing remaining wolves to be less able to hunt more challenging game, rendering them more likely to prey on livestock in more predictable locations (small, fenced pastures). A recent paper by Clark and Hebblewhite (Predator control may not increase ungulate populations in the future: A formal meta-analysis) also undermines the claim that predator control is needed to protect ungulate populations. Ex. K. The three claims that are commonly invoked for the benefits of hunting wolves are to protect livestock, protect game, and protect people. The first two have been contradicted by recent, sophisticated analyses, and there has never been any evidence for the third justification.

responsible course of action is to set a zero or near-zero quota for the November 2021 wolf-hunt. *Id.* at 1, 25.

FAILURE TO FULFILL PUBLIC TRUST RESPONSIBILITIES

34. In my May 15, 2021, comment on setting the quota for the wolf hunting season and revision of the Wolf Management Plan, I discussed the role and responsibilities of DNR as a trustee which must manage and conserve wildlife populations, including wolves, on behalf of current and future generations. Ex. B. I based these comments on my extensive research about the duties in caring for a public asset such as wolves, and they are especially applicable to the issues currently before the Court.

35. I start with the basic principle that a trustee cannot preserve a trust asset responsibly without full information. Speculation, discarding the peer-reviewed literature, substituting its own opinions and those of interest groups for expert evaluations all seem to me unreasonable for a trustee. In my comment, I described the information and data that DNR must have before it makes management decisions about the Wisconsin wolf population, to avoid substantial impairment of that public asset. I discuss the lessons we have learned from the history of Wisconsin wolf management and policy, drawing on my research on ecology, human dimensions of wildlife management and trusteeship for wildlife. I concluded with a caution about what science tell us that public wolf-hunting cannot achieve. Exhibit B at 1-2.

36. I have extensively studied and published about the duties of a wildlife trustee and believe that three primary principles should guide management decisions by DNR and the Board, including their management of the November 2021 hunt.

37. First, the highest-priority duty for a wildlife trustee is to ensure that the health of wildlife is not substantially impaired. In the context of the Wisconsin wolf population, this means: (a) avoiding actions that will risk lowering the population to state listing level of 250; (b) protecting the renewal capacity of the public asset, by preventing harm to the reproductive capabilities of the state wolf packs; (c) preventing any harm to the wolf population that would result in the federal

government removing the state from its trustee position by placing wolves back on the federal Endangered Species list—thus putting the U.S. Fish and Wildlife Service in the role of primary trustee; and (d) if any actions have already been taken that risk the harms detailed above, putting a plan in place to ensure that this damage is repaired. *Id.*

38. The second priority for a wildlife trustee is to preserve wildlife for future generations. This requires: (a) prioritizing future generations' interests in preservation over current users' interests in exploitation; (b) regulating use by current generations with precautions taken to protect against errors; and (c) preventing illegal, unregulated, or undetected uses that drain the public asset. *Id.* at 2.

39. The third priority for a wildlife trustee is to act transparently, so that the public on whose behalf it is managing the asset can see that it is doing so responsibly, effectively, and cost-efficiently. That requires: (a) demonstrating the use of the best available science and information to protect wildlife and regulate human uses; (b) providing accountability to all trust beneficiaries; (c) correcting errors forthrightly and honestly; (d) acting in a manner that is incorruptible and is not unduly influenced to favor one class of beneficiaries over another. *Id.* at 2.

40. In my research on scientific integrity and my reading of the National Academies of Sciences, Engineering, and Medicine (NAS) 2017 Guidance on Fostering Scientific Integrity, I have found three principles of scientific integrity are paramount. First, transparency about methods, assumptions, evidence, analyses, data, and inferences is the fundamental tenet of scientific integrity, which makes every other step possible. DNR should be obliged to make data public in a format that peer scientists can evaluate, by following current practices in the peer-reviewed scientific journals of the highest caliber. Second, independent review is essential to avoiding the potential competing interests that make data and inferences dubious because their proponents may have had a financial or non-financial motive for promoting or demoting the evidence. DNR should seek independent peer review and avoid justifying its claims about facts with internal, non-peer-reviewed analysis and unpublished data. Third, reproducibility is the

scientific principle that a trained peer scientist should be able to replicate submitted findings. When two or more studies exist with contradictory findings, the study with the most rigorous methods—not the results the agency prefers—should win out, because those methods that are more reproducible are better methods.

41. DNR and the Board do not have sufficient information to assess the status of the wolf population, to determine if there has already been such a substantial impairment, especially following the February 2021 wolf hunt, or to allow them to measure the effects of future actions to prevent them from causing substantial impairment to pack reproduction, ecological function, or a self-sustaining healthy population. Until DNR and the Board have gathered sufficient baseline data, and set up processes to monitor changes, they should not make any additional decisions that may endanger the state wolf population and violate their primary duties as trustees. *Id.* at 3-4.

42. DNR and the Board currently have very little of the information they need to make responsible decisions about wolf management. This baseline information should include knowledge of the following factors.

- Number of wolf packs in the state and how many successfully breed each year;
- Number of wolves in each pack;
- Survival of juveniles and causes of death by November each year;
- Locations of illegal kills and methods and motivations of poachers (those who kill wolves illegally);
- Effectiveness of non-lethal and lethal methods of protecting domestic animals from wolf predation;
- Detailed records of marked wolves (collared or otherwise tagged) from marking until death or disappearance, including locational data and cause of death or disappearance;
- Ecological effects of human-caused wolf mortality, including evaluation of the effects of intentional killing, whether by the public or by government agents;

- Reliable social science data on attitudes to wolves and tolerance for various scenarios involving coexistence with wolves, inclination to poach wolves, and support for DNR policies, measured in a uniform random sample of state residents and a random, representative sample of out-of-state hunters;
- Veterinary and pathological information on diseases and causes of death for a relatively large random sample of recovered wolf carcasses;
- Other information on changing rates of nonhuman causes of death or reproductive impairment each year;
- The effect on the wolf population after the February 2021 hunt that exceeded the quota by 82%; and
- An estimate of the additional number of wolves poachers have killed since April 2020.

43. DNR's explicit desire to set a "conservative" quota for the November 2021 wolf hunt suggests that it may be trying to take a different approach from the February 2021 hunt. But DNR's recommendation was far from conservative, and the Board took the extreme action of more than doubling that recommendation, to reach a quota that is devoid of any scientific support or analysis.

44. As public trustees, DNR and the Board should prioritize preserving Wisconsin's wolves for future generations; take steps to prevent unregulated, illegal, or undetected killings; and account transparently to the public regarding how it is managing this public resource in accordance with the best available science. At present, DNR and the Board are fulfilling none of these trustee responsibilities, and the effect of their reckless actions could be the destruction of the public asset that they are duty-bound as trustees to preserve.

Adrian Treves

Subscribed to and sworn before me

this _____ day of October 2021.

Notary Public

My commission expires _____