Selected topics pertaining to the conservation and recovery of wolves in the United States

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About the witness: I am a professor in the School of Forest Resources and Environmental Science, Michigan Technological University. I have held a faculty position with Michigan Technological University since 1996. My scholarly expertise is population biology, most frequently examining wolves and their prey. I am also a scholar for certain topics pertaining to the human dimensions of conservation. I have authored or co-authored more than 80 peer-reviewed articles over the past two decades related to these and other subject areas, and have given more than 50 invited talks in the past 12 years.

I have been studying wolves for about 25 years. My predation ecology research includes but is not limited to how predator populations affect their prey and how prey affect predators. The majority of my wolf-related scholarship has been in Isle Royale National Park, located in Michigan and surrounded by Lake Superior. I have been working on the Isle Royale wolf-moose project since the early 1990s, and have been leading the project since 2001. It is also the longest running wolf study in the world and the longest study of any predator-prey system in the world.

Further details are offered in my CV, which was submitted with this testimony.

1. Overview

1.1. Prior to persecution by humans, wolves inhabited most of the coterminous United States. By the 1960s, after more than a century of persecution, wolves in their darkest hour were reduced to perhaps a few hundred, living only in the remote northern reaches of Minnesota. Over the past four decades, however, we have made incredible progress toward the recovery of wolves. Today, approximately 5500 wolves inhabit about 15% of their historic range within the coterminous United States. That effortful progress is one of the success stories in American conservation. At the very same time, the job is not done. Important work remains. Moreover, if we are to be successful, then some adjustment to our present course is required.

1.2. Essential background for many concerns about wolf conservation is conveyed through the series of annotated maps that are included as supporting material #1 appended to the end of this testimony. The maps pertain to gray wolves (*Canis lupus*), including a subspecies known as the Mexican wolf (*Canis lupus baileyi*). Red wolves are not treated in that series of maps, but are addressed in a separate section of this testimony.

1.3. The conservation and recovery of wolves entails a broad and disparate range of topics. In this testimony, I will highlight several of these topics:

The essential issues surrounding wolves – livestock losses, interests pertaining to deer and elk hunting, perceived threat to human safety, and legal/political issues – these issues are all quite manageable.

1.4. The health of many of our nation's ecosystems depends on the presence of healthy, functioning wolf populations (see Suppl. Material #2 for a pictorial summary). Wolves are also important for a second reason. That is, wolves are important for what they represent. When we Americans talk about wolves we are speaking simultaneously about *both* the four-legged creature *and* a creature that represents our understanding for how we ought to relate to nature. If the bald eagle is sacred as a symbol of our national spirit, then wolves are sacred as a symbol of our relationship with nature on the whole.

1.5. Consequently, our relationship with wolves is a bellweather for our relationship with nature and the nation's natural resources. For similar reasons, our treatment of wolves through the U.S. Endangered Species Act, 1973 (ESA) is also a bellweather for how we will treat the ESA in general and for the hundreds of species whose well-being depends on ESA protection.

For those two reasons, we must get it right by discovering a healthy relationship with wolves. We will be defined, in part, by the kind of relationship we forge with wolves ***and*** the fair treatment of our fellow citizens who are impacted by wolves in a genuinely negative manner. Those relationships, whatever they may be, will say much about the kind of people that we are.

Opportunities to work through some important challenges of conservation are impaired if and when Congress intervenes by making decisions about individual species in the context of the ESA. Such intervention can seem like an expedited solution, but its larger effect is to inhibit progress on the broader issues. Congress, the Fish and Wildlife Service, state wildlife agencies, and NGOs can all do better to provide stronger leadership on these issues. The American people are supportive of this work and we are more than able to handle this work.

2.0. WESTERN GREAT LAKES WOLVES

2.1. The Fish and Wildlife Service delisted gray wolves in the Western Great Lakes in December 2011. The decision was challenged in federal court. In December 2014, the court rejected the Fish and Wildlife Service's delisting decision and ordered the Fish and Wildlife Service to restore ESA protections for gray wolves in the Western Great Lakes. An important basis for the court's decision was that a DPS cannot be designated for the purpose of delisting. Details of the court's opinion in this case and other related cases indicate that the root concern is considerably broader.

2.2. The broader pattern of court decisions indicate that the ESA requires a species to be well-distributed throughout its historic range. That view is also well supported by conservation scholarship (e.g., Vucetich *et al*. 2006, Tadano 2007, Enzler & Bruskotter 2009, Geenwald 2009, Kamel 2010, Carroll *et al*. 2010, and Bruskotter et al. 2014, and references therein). On those grounds, Western Great Lakes wolves should not be delisted.

2.3. Failure to understand the legal definition of 'endangered species' also lies at the heart of concerns for the management and delisting of gray wolves in the Northern Rocky Mountain DPS.

2.4. Addressing these concerns would require the FWS to:

(i) Develop policy on "significant portion of range" that is consistent with the ESA. I believe the courts will eventually decide that the current Fish and Wildlife Service policy on this topic is inconsistent with the ESA. ("Significant portion of its range" is a key phrase in the legal definition of endangered species.)

(ii) Develop a robust national plan for wolf conservation and recovery.

3.0. RED WOLVES

3.1. BACKGROUND

3.1.1. There are important scientific uncertainties about the taxonomic status of red wolves. Nevertheless, there is widespread agreement among experts that the red wolf is a listable entity under the ESA under any plausible scenario describing its evolutionary history (see, e.g., USFWS 2016). Consequently, a recovery program is required by law.

3.1.2. The Fish and Wildlife Service had been managing red wolves through an "adaptive management" program that appears to have been effective in maintaining and growing the red wolf population. This adaptive management program included, among other strategies, sterilizing coyotes in order to reduce hybridization between wild red wolves and coyotes. Such hybridization adversely impacts the genetic constitution of the red wolf population and negatively impacts the ability of the red wolf population to grow and expand.

3.1.3. The red wolf population has declined from more than 100 wolves to 45 to 60 wolves in two years' time. The population is in extreme danger of extinction.

3.1.4. Recently, the Fish and Wildlife Service ended its adaptive management program and reintroductions of red wolves on the landscape, while allowing landowners to request the removal of wolves by lethal and nonlethal means. Those circumstances will exacerbate an already dire situation.

3.1.5. Concerns about the removal of wolves from private land need to be resolved because it is not possible to have a recovered red wolf population without red wolves living on private lands.

3.1.6. Even though this red wolf population is designated as non-essential experimental, its loss would be a grave setback to red wolf recovery.

3.1.7. Red wolves are adversely affected by poaching. Anti-poaching laws exist but are not enforced. Anti-poaching laws are not enforced through an informal policy known as the McKittrick policy. Under the McKittrick policy, prosecutors do not pursue cases of red wolf poaching if the defendant claims the killed animal was a coyote. Some additional background is provided in Cart (2013). The policy lends tacit support for poaching red wolves and is antithetical to red wolf recovery. In no other part of our American hunting heritage is mistaken identity a defense for poaching. The McKittrick policy should be discontinued.

3.2. RECOVERY GOALS

3.2.1. An explicit goal of the Fish and Wildlife Service's Red Wolf Recovery Plan is to grow the wild population of red wolves to 220 individuals. With the population recently having declined significantly from approximately 100 animals to perhaps less than 50, management clearly is not moving toward, and may even be undermining, that established goal.

3.2.2. Recent actions of the Fish and Wildlife Service (described in 3.1.4) are not moving toward that goal. These recent actions are more consistent with abandoning the conservation and recovery of the red wolf than with its advancement.

3.2.3. In addition, these recovery goals were set 30 years ago and do not reflect the best available science about the size of a recovered population. Any formal scientific review of the recovery plan would undoubtedly recommend increasing the number of red wolves needed in the wild to qualify as recovered under the ESA. Until the recovery plan and the targets are updated, however, the Fish and Wildlife Service should work towards its established recovery goals.

3.2.4. Last week the FWS announced significant adjustments in its approach to managing the red wolf recovery program. The announcement is explained in a memorandum (12 Sept 2016) to the Regional Director (of the FWS's Southeastern Region) from the Assistant Regional Director (USFWS 2016). The changes include a significant shift of effort away from the experimental population. The underlying rationale for the adjustment is "maximizing efficient use of Services resources." In scholarly parlance, the rationale is "conservation triage"

The concern is that conservation triage, when conducted according to the principles of best-available science, require a formal, explicit, and appropriately quantified analysis of the cost and benefits of various allocations of resources (e.g., Botrill et al. 2008, McDonald-Madden et al. 2008). To my knowledge, no such analysis has been shared with the public.

General concerns about the FWS's treatment of conservation triage were aptly summarized by Evans et al. (2016). They wrote that the Fish and Wildlife Service (FWS) has

> *a prioritization system for analyzing tradeoffs… [that] includes 36 ranked categories grouped according to 4 factors: degree of threat, potential for recovery, taxonomic uniqueness, and conflict with human activities... However, it is well established that FWS does not frequently use its system. Instead, FWS's allocations are <u>more often driven by political and social factors</u> [emphasis added], including congressional representation, the number of employees in field offices, staff workload, and opportunities to form partnerships and secure matching funds. In addition, different regions and field offices often use different allocation formulas.*
>
> *Without following a uniform and explicit system for prioritizing recovery actions, FWS cannot efficiently allocate its funding to meet recovery needs. That is partly why most recovery funding has benefited only a small fraction of listed species. Moreover, FWS cannot clearly articulate to Congress and other stakeholders what recovery actions it will implement with available funding and what additional achievements are possible with more funding. As a result, the agency is poorly positioned to request additional funding.*

The authorship of Evans et al. (2016) included eighteen scholars, including federally-employed scientists that collectively represent considerable ESA expertise.

I am also concerned that the memorandum associated with announcement (i.e., USFWS 2016) seems to arrive at its conclusion, in part, through a misunderstanding or misrepresentation of some of the science that is cited (and should have been cited) in the memo, especially Gese et al. (2015), Murray et al. (2014), and Bohling et al. (2016; *Evolutionary Applications*).

Because last week's announcement was (i) preceded by FWS actions that represent a significant shift in effort away from the experimental population (see 3.1.4) and (ii) not

accompanied by a formal and appropriately quantified analysis of the costs and benefits associated with various allocations of resources – for those two reasons, there is a concern that the announcement is an *ad hoc* explanation for the shift in focus and that the appropriateness of the announced shift was prejudged.

4.0. MEXICAN WOLVES

Mexican wolf recovery has faced a variety of challenges. I believe the three most important concerns at present are:

4.1. The FWS has failed to fulfill its statutory obligation to develop a scientifically-defensible recovery plan. In response to a legal challenge to FWS's failure to complete a recovery plan, the FWS committed in a settlement agreement to complete a recovery plan by November 30, 2017.

More precisely, the Fish and Wildlife Service has been actively attempting to develop a science-based recovery plan for the past 15 years. On two occasions in the past 15 years, the Fish and Wildlife Service suspended the activities of the Mexican wolf recovery team just as the team was on the cusp of presenting its findings. The FWS is now working through a third effort.

No stakeholder group thinks it is desirable for the recovery planning process to have taken so long. The delays have resulted in stakeholder mistrust and created opportunities to interfere with the scientific process, both of which ultimately impair Mexican wolf recovery. The delay in producing a recovery plan is clearly a problem in its own right, but it is also symptomatic of a deeper, chronic problem.

4.2. The second challenge pertains to the reliable identification of best-available science as it pertains to the ESA. The challenge is illuminated, in part, by recent sociological research pertaining to grizzly bear recovery. The scholarship indicates that the problem is identifying best available science. Recent work shows that scientists "working for state or federal wildlife agencies were 2-3 times more likely to recommend delisting grizzlies than those employed by academic institutions" (Bruskotter et al. 2016). That paper goes on to say that these recommendations:

> *were influenced not so much by an expert's knowledge or assessment of risk but more so by their social environment; in particular, the peers with whom an expert regularly interacts and respects… our concern is that supposed scientific judgments may well be heavily influenced by socially segregated groups and their associated beliefs.*
>
> *Of course, it is not inherently problematic that an expert's judgment is affected, in part, by how he or she expects respected peers would judge a given circumstance. Nor is it necessarily problematic that judgments about conservation routinely depend on factors beyond science, like one's values and emotions. Indeed, the dichotomy between facts and values may well be a false dichotomy, as argued by the great American philosopher Hillary Putnam...*
>
> *What's concerning here is that, as opposed to academic scientists who are somewhat shielded from politics by tenure, scientists in state and federal agencies can face strong, top-down pressure to reach a particular decision.*

A full discussion of how to reliably identify the best-available science is beyond the scope of this written testimony. The relevance of this concern to Mexican wolf recovery planning is explained in subsection 4.3.

4.3. Recent deliberations in the development of a recovery plan may be of concern. In particular, state governments have been advancing the notion that recovery actions should be focused in Mexico. Other scientists on the recovery team believe that while Mexico is an important partner in wolf restoration, prudent recovery planning should remain focused on efforts in the United States. **The concern is that the political expediency may end up being mistaken for a genuine spirit of state-federal collaboration** and the Fish and Wildlife Service will focus recovery efforts in Mexico when doing so is otherwise not justified. Details of this concern appear in section 4.4.

4.4. Focusing recovery efforts for *Canis lupus baileyi* in Mexico is unlikely to be successful because the lands in Mexico where recovery efforts might be focused are dominated by private land, higher densities of livestock, and the abundance of wild prey is not reliably known. Because the Fish and Wildlife Service wouldn't focus wolf recovery efforts on such lands if they existed in the United States, the Service should not find it wise to do so in Mexico.

By contrast, recovery efforts would be successful if they focused on selected regions in Arizona, New Mexico, southern Colorado and possibly southern Utah. Details for this claim are presented in draft documents prepared about two years ago by the scientific sub-team of the Mexican wolf recovery team.

Mexico is a valuable partner in efforts to restore Mexican wolves. However, the largest share of the task in recovering Mexican wolves will almost certainly fall within the borders of the United States.

Two concerns that are sometimes expressed about efforts to recover *C. lupus baileyi* in the United States are:

(i) The historic range of *C. lupus baileyi* did not extend as far north as northern Arizona and northern New Mexico, and

(ii) *C. lupus baileyi* is physically smaller than other subspecies of gray wolf; as such they are not well adapted to survive on elk. Rather they are better suited to surviving on smaller prey like deer and javelina.

The concerns are addressed by noting:

(i) The best-available science indicates that the historical distribution of gray wolf subspecies involved wide zones of overlap such that the traditional notion of historical range, with sharp boundaries, does not apply well.

(ii) C. lupus baileyi living for many years on the Blue Range (in AZ and NM) demonstrate that they are more than capable of surviving very well on elk.

5.0. NORTHERN ROCKY MOUNTAIN WOLVES

5.1. Many of the issues surrounding recovery and management of wolves in the Northern Rocky Mountain DPS are identified and discussed in other sections of this testimony.

5.2. In 2011, wolves in Montana and Idaho were delisted by an act of Congress, i.e., a Congressional rider to the "Department of Defense and Full-Year Continuing Appropriations Act." That action compromised important opportunities for critical concerns and challenges to be worked out and addressed by key stakeholders (e.g., Fish and Wildlife Service, state-governments, NGOs, etc). Congressional delisting did not ameliorate those concerns and challenges.

6.0. HUMAN ATTITUDES PERTAINING TO WOLVES

6.1. Attitudes pertaining to wolves are important for at least two reasons:

6.1.1. If attitudes of Americans were, on the whole, negative; then the values and expressed values of Americans may be at odds with the ESA's mandate to conserve and recover wolves.
6.1.2. If attitudes of Americans are, on the whole, supportive of wolf recovery; then negative attitudes by smaller segments of American society represent an important concern deserving attention.

6.2. Americans' attitudes toward large carnivores, including wolves, are largely positive. Those attitudes have also become increasingly positive over the past four decades (George et al. 2016; See also Suppl. Material #3). And, only 10% of Americans have significantly negative attitudes about wolves (George et al. 2016; See also Suppl. Material #3).

6.3. What accounts for the false impression of low tolerance for wolves?

6.3.1. Some sociological studies suggest that attitudes towards wolves have become more negative over time; these studies tend to focus on hunters and rural residents living within wolves' range (e.g. Treves et al. 2013, Ericsson & Heberlein 2003). While it is important to address these attitudes (see below), they are not representative of the interests of most Americans.

6.3.2. Other research indicates that biased media coverage gives the impression of low and deteriorating tolerance for wolves. For example, Houston et al. (2010) examined North American news coverage about wolves over a 10-year time period (1999-2008). Of the 6,000 stories they analyzed, 72% of the news media represented negative attitudes about wolves. They also found that these negative expressions had increased significantly over time. The concern is that media coverage does not accurately represent Americans' attitudes (see George et al. 2016).

6.3.3. In 2003 the Utah Division of Wildlife Resources hosted a series of scoping meetings concerning wolf management. About 80% of the 900 people who attended those meeting identified 'do not allow wolves in Utah' as a management priority. At the same time (i.e., in 2003), a systematic study of attitudes toward wolves found that 74% of Utahans exhibited positive attitudes toward wolves.

This case illustrates that state agencies can get the false impression of low support for wolves on the basis of their contact with the public. The concern is that agencies' contact with the public is not always representative of the public's attitude on the whole, or even of those who care about wildlife conservation issues. This circumstance is regrettable, but understandable, given that scoping meetings, for example, are often attended disproportionately by stakeholders who are especially upset about an issue. This case and these circumstances are detailed in Bruskotter et al. (2007).

6.4. Psychological research indicates that intolerance for wolves (and other large carnivores) may originate from negative emotional reactions toward these species (Slagle et al. 2012) that are at gross odds with scientific knowledge about these species (Johannson et al. 2012). Other sociological research makes the case that negative attitudes about wolves are associated, less so with the negative impact of wolves, and more so with "deep-rooted social identity" (Naughton-Treves et al. 2003; see also Heberlein 2012).

While it is important to ameliorate the adverse impacts of wolves for those few individuals who are actually impacted, doing so is not likely to cause those individuals to have more positive attitudes, as was demonstrated by Naughton-Treves et al. (2003).

6.5. Existing data indicate that public support for the ESA is widespread and strong. A sociological study concludes that most Americans (84%) are supportive of the ESA (Czech & Krausman 1997). That study also indicated that 49% of respondents believed that ESA should be strengthened. And, only 16% believed it should be revoked or weakened.

Recent polling data give the same positive impression. One poll, conducted in 2015, indicates that approximately 80 to 90% of Americans are supportive of the ESA (Harris Interactive 2011). Another poll, conducted in 2011, indicates that support for the ESA transcends political ideology. That is, support for the ESA by self-identified liberals, moderates, and conservatives is 96%, 94%, and 82%, respectively (Tulchin Research 2015).

6.6. CONCLUSION. – The values and will-power of the American people, on the whole, support the ESA and wolf conservation. We are also a sufficiently resourceful and generous people to fairly redress the concerns and negative attitudes held by a small segment of Americans.

7.0. WOLF HUNTING

7.1. Wolf hunting in several states is intensive enough to raise the following concerns:

7.1.1. The Findings section of the ESA (Sec 2.(a)(3)) indicates that species are valuable to the Nation and its people, in part, for their "ecological" value. The primary ecological value of wolves is largely associated with their influence on deer and elk populations, including preventing deer and elk from becoming overabundant. The ecological value of wolves is impaired if they are hunted too intensively. There is considerable evidence that deer and elk are overabundant in numerous places where wolves are intensively harvested or where wolves once lived but no longer live (e.g., McShea et al. 1997, Bradford and Todd 2008; Dickson 2015). Overabundant deer and elk are detrimental to human safety, agriculture, and forestry.

7.1.2. An important prospect for wolves achieving recovery is through dispersal and range expansion from areas where wolf populations are already established. The concern is that range expansion is, at least, significantly curtailed by intensive hunting of wolves.

7.1.3. Intensive hunting of wolves will likely impair the adequate genetic connectedness of subpopulations in the Northern Rocky Mountain gray wolf population. The importance of adequate genetic connectedness is memorialized through recovery criteria. (This concern is not ameliorated by the feasibility of human-assisted dispersal. For details, see the FWS's scientific peer-review of Wyoming's state management plan conducted in December 2011.)

7.2. Four important motivations for wolf hunting:

7.2.1. Hatred of wolves is an important motivation to hunt wolves. In the past, hatred has motivated programs designed to eliminate certain populations of wildlife. But, never before in the history of America's hunting heritage has hatred been an acceptable or ethical basis for hunting.

7.2.2 Wolf hunting is motivated, in part, by state game and fish agencies' interest to satisfy elk and deer hunters. This motivation may be sensible when all of the following conditions hold: (i) wolves cause elk and deer abundance to decline, (ii) wolf hunting (as implemented) results in a significant increase in elk or deer abundance without

impairing the health and functioning of the wolf population, (iii) increased elk or deer abundance will translate to hunters' satisfaction with their hunting experience, and (iv) interests to increase ungulate abundance outweigh interest to decrease ungulate abundance.

In many cases, it is far from reasonably certain that all of these conditions hold.

7.2.3. Some argue that wolf hunting is important for building tolerance for wolves. However, sociological evidence suggests that tolerance is not built by legal killing of wolves (e.g., Treves et al. 2013, Browne-Nunez et al. 2015, Hogberg et al. 2015).

7.2.4. Wolf hunting is also, in some cases and at least to some extent, a kind of trophy hunt.

7.3. Concerns raised by the above-mentioned motivations:

Our treatment of wolf hunting is importantly connected to hunting in general. American participation in hunting has been declining for several decades. The demographic forces behind that decline are expected to continue into the foreseeable future. Those trends are of great concern to state wildlife agencies, and they are searching for ways to reverse those trends.

While participation in hunting is low and declining, support for hunting by non-hunters is high. However, that support depends on the reason that is offered for why hunting takes place. For example, 85% of Americans support hunting when motivated by the acquisition of meat. But only about 26% of Americans support hunting motivated by the acquisition of a trophy. For details, see Duda and Jones (2008).

Because motivation for hunting affects support for hunting by non-hunters and because the motivations for wolf hunting are weak, wolf hunting is liable to harm the honor of America's hunting tradition. We should not be surprised to see that wolf hunting works against interests to promote hunting in a society with waning participation in hunting.

I believe that Congress, the Fish and Wildlife Service, and state wildlife agencies could be effective agents for better promoting our American hunting heritage.

8.0. LIVESTOCK, LETHAL CONTROL & CONFLICT AVOIDANCE

8.1. According to a 2011 USDA report on cattle death loss, wolf depredation represents less than half of one percent of all losses (USDA 2011). For context, about half of all losses are health-related (e.g., digestive problems, respiratory problems, metabolic problems). Losses due to dogs are almost three times as common as wolf-related losses. Losses due to poisoning and theft are six times as common as wolf-related losses. These statistics are similar within each of the states inhabited by wolves, i.e., MI, MN, WI, MT, ID, WY, WA, AZ and NM. Wolves are not a threat to the livestock industry.

8.2. In certain instances, wolves compete with the interests of *individual livestock owners*. Those instances are important. The American people share a burden to assist in these instances. To this end, the states, the Fish and Wildlife Service, the Department of Agriculture and non-profit organizations all have programs to assist ranchers financially or with tools and management techniques to reduce conflicts with wolves. Several varieties of these programs exist, focusing variously on: compensation for livestock losses; cost-share and technical assistance for the use of nonlethal tools that reduce conflict; and incentive payments such as payment for presence. Where there is a need to improve these programs, they should be so improved.

8.3. Lethal and non-lethal control

8.3.1. Scientific evidence indicates that lethal control may be less effective than is commonly supposed (reviewed in Treves et al. 2016).

8.3.2. Lethal control is also a source of public controversy, as it is shunned by some stakeholders. A critical component of meeting the challenges represented by lethal control (both the establishment of lethal control policy and the aftermath that can follow some instances of lethal control) is a robust multi-stakeholder committee, such as the Wolf Advisory Group in the state of Washington. The establishment and maintenance of such bodies is effortful, but also very important.

8.3.3. Non-lethal methods are often effective for preventing depredation and avoid conflict before considering lethal control. There is a suite of nonlethal methods and strategies that have been effectively used in the Northern Rockies and the Southwest to do just this. These include: nonlethal predator deterrents such as livestock guarding dogs, fencing and fladry; increasing human presence on the landscape through range riders; use of scare tactics and alarms; best management practices for livestock and land such as changing grazing strategies and removing carcasses.

Those tools have been used effectively, for example, in a community-based project in the Wood River Valley of Idaho – an area with between 10,000 to 22,000 sheep grazing per year. During the first 7 years of the project (which began in 2007) fewer than five sheep were killed per year.

9. HUMAN SAFETY

9.1. Except in the very rarest of circumstances, wolves are not a threat to human safety. Incidents of wolves harming people are incredibly rare. Wolves generally avoid people and in almost all cases people have nothing to fear from wolves in the wild.

In the 21st century, only two known deaths have been attributed to wild wolves in all of North America. There have been no deaths from wolves in the conterminous United States. Far more Americans are killed by bees or dogs than by wolves. Far more Americans are killed in deer-car collisions. Our overall response to any threat to human safety should be, in part, commensurate with the risk of that threat.

On the extraordinarily rare occasions when a wolf has appeared to be even potentially problematic, the appropriate agency (state or federal) has moved swiftly to address any possible threat. For example, in May 2015, the Mexican Wolf Interagency Field Team lethally removed a wolf that was exhibiting unusual activity near residents and populations in Catron County, New Mexico.

9.2. The false impression that wolves are a threat to human safety is fostered by the interaction between (i) a public that is easily and overly impressed by certain kinds of fear and (ii) those who fabricate or exaggerate the threat that wolves represent. The seriousness of these exaggerations is illustrated with two examples from Michigan:

9.2.1. A state Senator conveyed a “horrifying and fictional” account of wolves threatening humans. That account was included in a 2011 resolution urging the U.S. Congress to remove ESA protections for gray wolves in Michigan. Later the Senator conceded that the account was not true. See Oosting (2013) for details.

9.2.2. Adam Bump, an official from the Michigan Department of Natural Resources, “misspoke” when he was interviewed by Michigan Radio (a National Public Radio affiliate) in May 2013. Bump apparently said to the interviewer: “You have wolves showing up in backyards, wolves showing up on porches, wolves staring at people

through their sliding glass door while they're pounding on it exhibiting no fear." Later, Bump conceded that this did not happen. See Barnes (2013) for details.

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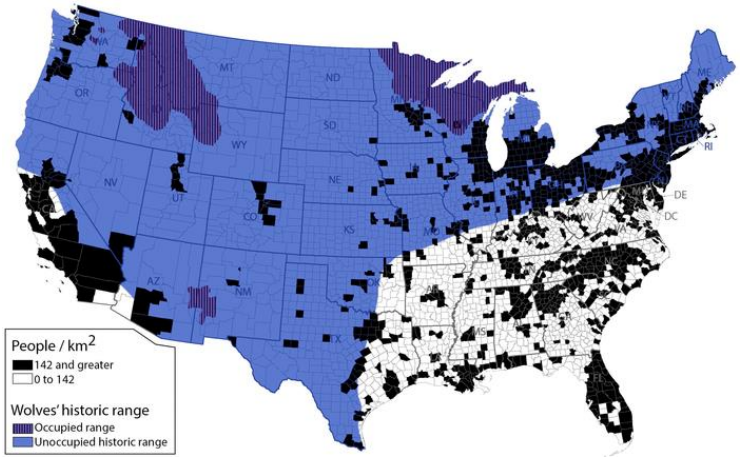
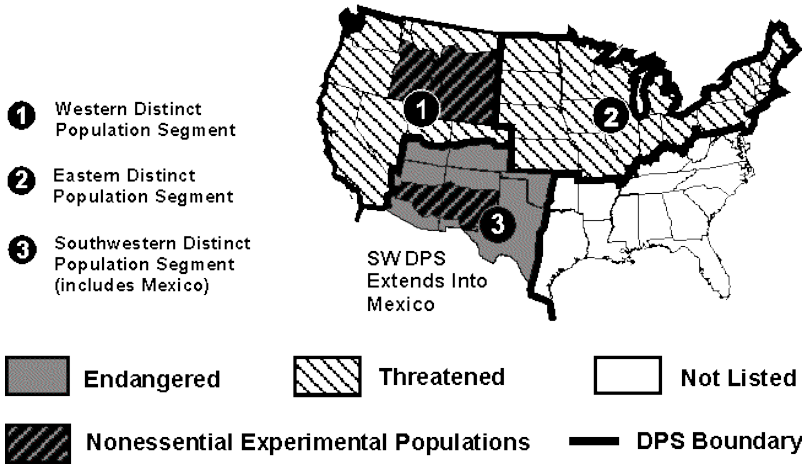
SUPPLEMENTARY MATERIAL #1. A SERIES OF THREE ANNOTATED MAPS.

Map 1. Approximate Range (Historic & Current) Of Gray Wolves In The Conterminous United States.



Before human persecution, gray wolves occupied most of the conterminous United States (blue regions on the map). Currently, gray wolves occupy about 15% of their former range (purple regions on the map). The map is taken from Bruskotter et al. (2014) which explains how it would be feasible for wolves to inhabit more geographic range than they currently do. The blackened counties represent areas where wolves and humans would likely not coexist well, owing to higher human population density. (Note: This map overestimates the size of areas where human population density exceeds 142 people/km^2.)

Map 2. Distinct Population Segments Of Gray Wolves Established By The United States Fish And Wildlife Service On April 1, 2003.



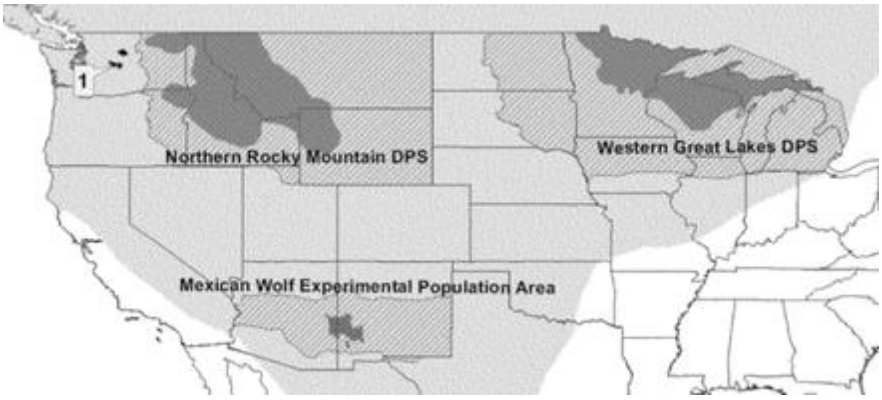
A "distinct population segment" is a listable entity under The Endangered Species Act (ESA). According to FWS policy (61 Fed. Reg. 4722, Feb. 7, 1996) determinations regarding the management of DPSs are to be based on the population's discreteness, its significant to the species to which it belongs, and whether the population would be deemed endangered or threatened if treated as a species.

The DPS provision offers flexibility in recovering species that occupy large geographic ranges. For example, if gray wolves living in the Eastern DPS had reached recovery, but wolves in the southwest DPS had not reached recovery, then wolves in the Eastern DPS could be removed from the list of endangered species and wolves from the southwest DPS could continue receiving the ESA protection necessary for recovery. The DPS policy can also enhance FWS's ability "to address local issues (without the need to list, recover, and consult rangewide) [and] result in a more effective program." *Id.*

The DPSs represented on the map above depict the gray wolves' historic range. The dark hatched areas within the Western DPS and the Southwestern DPS on the map represent

areas in which FWS manages gray wolves as non-essential, experimental populations under section 10(j) of the ESA. That provision authorizes the release of an endangered or threatened species or subspecies outside their current range "if the Secretary determines that such release will further the conservation of such species." Section 10(j)(B). Moreover, species managed under Section 10(j) do not receive the full protection otherwise provided by the ESA. For example, an experimental population deemed "not essential to the continued existence of the species," and which is not located within the National Refuge or National Park systems, is treated as a species proposed for listing and the FWS may not designated critical habitat for that population. Section 10(j)(C)(i)-(ii).

Map 3. Revised Distinct Population Segments Of Wolves Established By The United States Fish And Wildlife Service.



The Northern Rocky Mountain DPS was created in April 2009 (74 FR 15123). Except for the state of Wyoming, gray wolves are delisted in this DPS.

The Western Great Lakes DPS was created in December 2011 (76 FR 81665). The Fish and Wildlife Service also delisted wolves in this DPS in December 2011. Three years later, in December 2014, a federal court ordered the Fish and Wildlife Service to reinstate full ESA protection for wolves living in this DPS.

The most recent census of the wild Mexican wolf population living in Arizona and New Mexico, conducted in December of 2015, found only 97 individuals. Mexican wolves are listed as a subspecies. The Fish and Wildlife Service has been actively working on a recovery plan for Mexican wolves for the past 15 years.

Red wolves are not represented on this map, but are discussed in section 3 of this testimony.

SUPPLEMENTARY MATERIAL #2.

The figure below, referenced in section 1.4 of this document, is taken from Ripple et al. 2014, which was published in *Science*. The figure represents a conceptual summary of 12 scientific publications, and is a conceptual representation of what is known about how wolves influence the health of ecosystems.

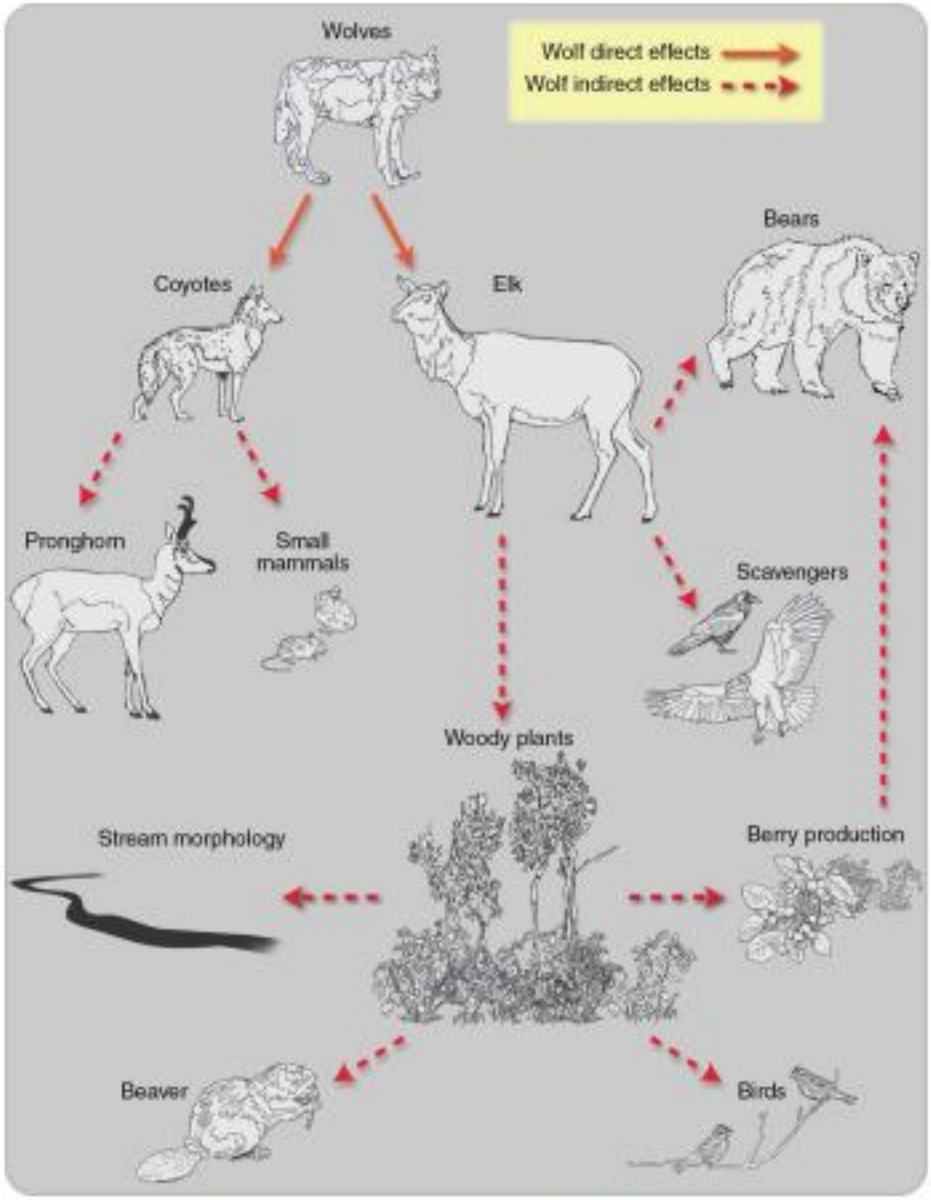


Fig. 4. Conceptual diagram showing direct (solid lines) and indirect (dashed lines) effects of gray wolf reintroduction into the Greater Yellowstone ecosystem. Wolf direct effects have been documented for elk (*96*) and coyotes (*97*), whereas indirect effects have been shown for pronghorn (*98*), small mammals (*99*), woody plants (*100*), stream morphology (*54*), beaver (*55*), birds (*101*), berry production (*63*), scavengers (*53*), and bears (*56*, *63*). This is a simplified diagram, and not all species and trophic interactions are shown. For example, the diagram does not address any potential top-down effects of pumas, bears, and golden eagles (*Aquila chrysaetos*), which are all part of the Yellowstone predator guild where juvenile or adult elk are prey.

SUPPLEMENTARY MATERIAL #3.

The figure below, referenced in section 6.2 of this document, is taken from George et al. (2016).

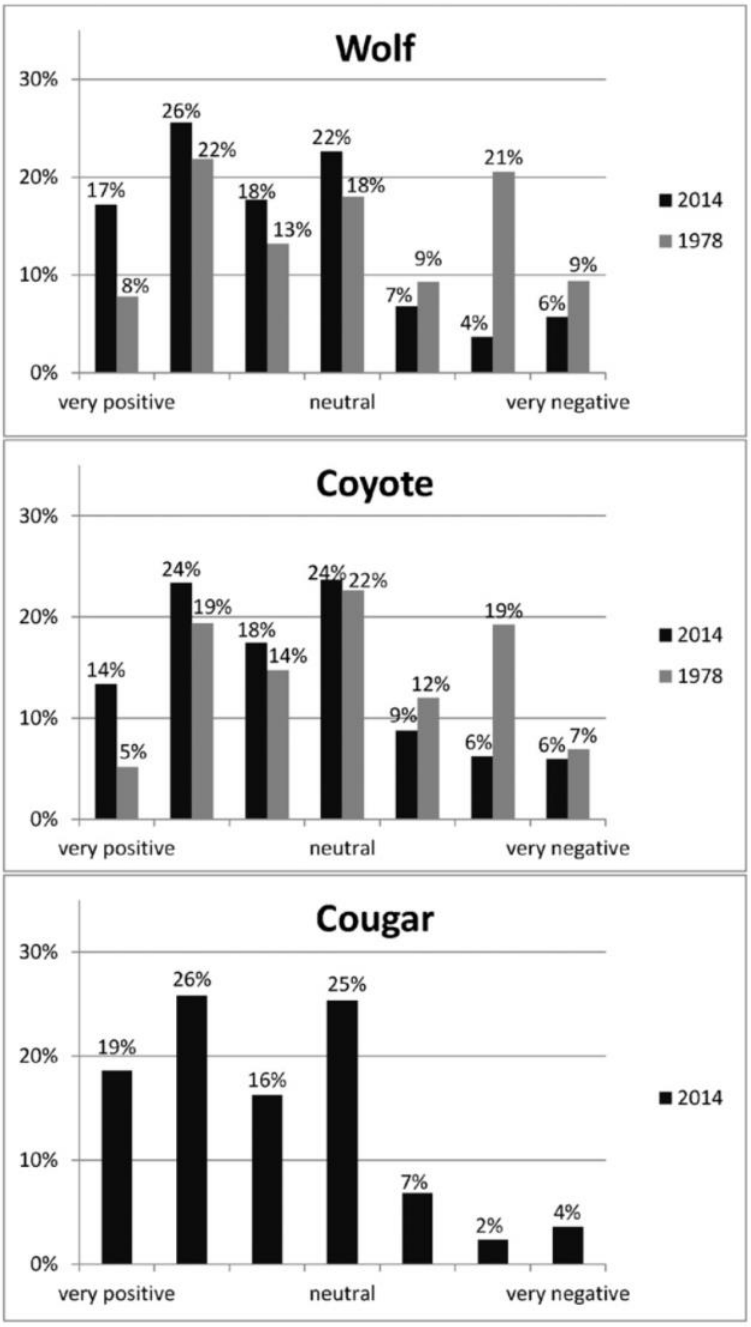


Fig. 1. U.S. Resident's attitudes toward mammalian carnivores: 1978 ($n = 3107$) & 2014 ($n = 1270$). No data for cougar preference were collected in 1978. *Least liked species includes neutral or midpoint (4) on a 1 (strongly like) to 7 (strongly dislike) scale.