MEMO

DATE: 26 March 2014
TO: Senator Hawj and colleagues in the Minnesota legislature
RE: Bill SF2256 and specifically pertaining to "modifying wolf management provisions"

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Combined, the scientists signing this memo hold more than 10 decades of experience studying wolf-human interactions and participating in wolf management. Together we have published >250 scientific articles on predators and their interactions with people. Together we have served on >22 advisory boards or management committees for state, tribal, federal, or private organizations.

Purpose
For the following provisions of SF2256 we cite the scientific literature to explain why we support each provision:

Provision 1.14 Annual wolf census

Estimating the location and size of wolf packs across the population annually in late winter should allow the commissioner of natural resources to make better decisions about regulated sources of mortality, such as depredation control and harvest quotas. These human causes of mortality can be modulated or controlled to avoid precipitating rapid and unexpected declines (Vucetich 2012). Natural fluctuations in reproduction within wolf populations are a normal background consequence of severe winters, diseases, and other random environmental effects. Therefore careful monitoring in late winter can reveal the presence of breeding pairs, the approximate size of the pack, and estimates of territory size or range (Fuller 1989). We recommend a carefully selected sample of packs be subject to radio-telemetry after the placement of radio-collars on wolves. If the packs targeted for radio-collaring are of sufficient number and represent a random sample of the packs in the population, one may be able to draw strong inferences by extrapolating from the sample. We recommend avoiding the sampling

scheme used in Wisconsin (Wydeven et al. 2009), which did NOT involve random sampling but rather repeated sampling of a biased subset of packs that were in wilder areas.

Provision 1.15 Educational strategies and development of materials for reducing conflicts between wolves and humans

Conflicts between wolves and humans include wolf threats to people or property (real or perceived) and people's retaliation against wolves (Treves et al. 2006). It would be prudent to address both directions of the conflict. We recommend developing simple, easy-to-use recommendations for preventing property losses to wolves, combined with information on the benefits of all sorts derived from wolves. An experiment with information on preventing nuisances by American black bears showed that acceptance of the bears declined unless the informational materials also described the many, diverse benefits of black bears (Slagle et al. 2013). Given the potential for humans to retaliate against wolves, we recommend informational materials also clarify the law and the conditions under which it is legal or illegal to act privately.

Provision 1.19-2.3 The task force must include representatives of environmental organizations, agricultural organizations, hunting and trapping organizations, wolf advocate organizations, government agencies, at least one biologist who is not employed by and does not receive funding from the Department of Natural Resources, and private citizens with a specific interest in wolf management issues.

We support this recommendation because it would demonstrate adherence to the public trust doctrine (PTD). Over a century of U.S. jurisprudence has upheld the common law tenet that the state holds wildlife in trust for current future generations' uses, where use is broadly interpreted by the U.S. Supreme Court to include aesthetic as well as limited harvest rights (Blumm & Paulsen 2013). Decades of research show majorities of U.S. citizens within and without wolf range, especially in urban and suburban areas, care about wolf management and endorse their restoration outside of current wolf range (Treves et al. 2009; Williams et al. 2002). Adding to the potential geographic diversity of concerned constituencies are the variety of uses and interests people express in wolves. People watch, feed, track, photograph, revere, and listen to them. Petitioners may ask courts to scrutinize the state's representation of these and other diffuse uses. A 2013 Minnesota Appeals Court recognized that plaintiffs' aesthetic uses of wolves presented a "cognizable injury", one of three requirements for standing to petition a court (CBD Inc. & Howling for Wolves v MinDNR, Minnesota Court of Appeals, A12-1680 (2013), p. 5–6). Recognizing non-lethal interests in wolves in natural resource governance would send a signal that Minnesota follows accepted principles of the PTD.

Provision 2.7 if requested by tribal leadership, the commissioner will close federally recognized tribal lands to hunting and trapping wolves.

The Ojibwe people of the Western Great Lakes revere the gray wolf (David 2009). That reverence is expressed in public attitude surveys as majorities opposing any cap on wolf populations, and strict conditions on regulated harvest (Shelley et al. 2011). It is also expressed in public opposition to the state of Wisconsin's wolf hunt (Sanders 2013). Tribes have recourse to federal courts when issues of sovereignty are raised. We recommend careful consultation with all federally recognized tribes.

Provision 2.11 Baiting wolves is prohibited within ten miles of tribal lands where taking wolves Is prohibited.

In addition to our recommendation above, we support this recommendation because bait has been hypothesized to attract carnivores from many miles around. Thus bait outside tribal areas might draw out wolves the tribes consider residents. Strong scientific evidence shows that trophy hunting operations that take lions from an area adjacent to a national park are reducing the viability of the lion population WITHIN that park (Loveridge et al. 2007a; Loveridge et al. 2007b). Moreover baiting in general may habituate carnivores to seeking anthropogenic food sources, which may elevate the risk of negative interactions with people.

Provision 2.13 The open seasons for taking wolves…are suspended in order to study outcomes of the wolf hunt on the wolf population…

Again we recommend scientific evaluation before augmenting human-caused mortality (Chapron et al. 2008; Liberg et al. 2011; Vucetich 2012). Building upon those scientific analyses, we recommend careful analysis of BOTH observed and undetected mortality in light of estimated population growth (pack reproduction), combined with appropriate statistical techniques to estimate probabilities of driving Minnesota's wolf population down further (Vucetich 2012). Once the probabilities are estimated, the commissioner of natural resources may wish to convene an advisory group to determine the **acceptable level of risk** of driving the wolf population below a predetermined level, such as the current wolf population size. Any additional, regulated mortality should not exceed the acceptable level of risk.

Provision 2.20 The commissioner of natural resources must provide comprehensive, publicly accessible data of all known wolf deaths and illnesses in the state, including deaths from the destruction of wolves authorized under Minnesota Statutes...

We support recommendations for transparency. The scientific community is beginning to embrace such transparency in its work (Vucetich 2012) because it allows replication of findings, comparisons between studies finding contrasting results, and discovery of novel patterns that could not have been imagined at the time of data collection. All of these benefits of transparency will improve decision-making about wolves. Likewise no data should be reserved for particular investigators or concealed from the public. Petitions to conceal information (e.g., wolf pack ranges) because of assumed costs (e.g., facilitating poaching) should be weighed explicitly and transparently against the public good of sharing information.

Provision 2.24 The commissioner of natural resources must conduct a study of public sentiment towards wolves, including issues related to intolerance.

We recommend regular, scientific measures of attitudes toward wolves including standard measures of tolerance (Bruskotter & Wilson 2014; Williams et al. 2002), and public approval for policies and management interventions (Karlsson & Sjostrom 2011; Naughton-Treves et al. 2003). With such measures, policy-makers can anticipate problems of political opposition or illicit action against wolves (e.g., poaching) (Treves 2009; Treves & Martin 2011; Treves et al. 2013a). Furthermore, new policies can be

treated as experiments and their effects on public attitudes measured. For example, it has been widely predicted that implementing a regulated wolf-hunt would improve tolerance for wolves (Ericsson & Heberlein 2003; Treves 2009). Our 2013 study of this prediction revealed instead a continued decline in tolerance for wolves among men residing in Wisconsin's wolf range (Hogberg et al. 2013).

Provision 2.26 The commissioner of natural resources in consultation with the commissioner of agriculture, must develop comprehensive best management practices (BMPs) that may be used by livestock producers to reduce and prevent wolf depredation. The BMPs should include both lethal and nonlethal control methods.

Generalizations such as "non-lethal methods don't work", "a bullet is cheap and effective", "the only way to stop wolves from attacking farm animals is to kill them", and "lethal control does not work" do not withstand scientific scrutiny. Research done in the Western Great Lakes and pioneered in Minnesota in many cases, scientifically evaluated various lethal and non-lethal interventions to protect property from wolves. The various studies present the evidence for the limited range of situations in which each type of control will work (Andelt 2001; Davidson-Nelson & Gehring 2010; Harper et al. 2008; Harper et al. 2005; Mech et al. 2000; Schultz et al. 2005; Shivik 2006; Shivik et al. 2003; Treves et al. 2010; Treves & Naughton-Treves 2005; Treves et al. 2013b). The take-home lesson is that several alternatives exist for every livestock operation and each operation deserves tools tailored to the local conditions. Although questions remain about Harper et al. (2008), it was a comprehensive study of effectiveness of lethal control of wolves. Their findings remain relevant, "No analysis indicated that trapping wolves substantially reduced the following year's depredations at state or local levels." (Abstract, Harper et al. 2008). Although some specific situations might have prevented future depredations (Harper et al. 2008), re-analysis may be needed because the authors made numerous assumptions without justification. Please note this study was conducted in Minnesota by Dr. Liz Harper, who currently works for the MnDNR.

A recent analysis of the Michigan wolf-hunt suggests it would not achieve its goal of reducing depredations (Vucetich et al. 2013). There are reasons to doubt most public hunts would reduce wolf depredations (Treves 2009).

Provision 2.31 The commissioner of natural resources must produce a map of wolf and human conflicts, including wolf predation on livestock.

Risk maps for predicting wolf depredation on livestock have been constructed for four states, including Minnesota (Bradley & Pletscher 2005; Edge et al. 2011; Treves et al. 2011; Treves et al. 2004). The most advanced was produced for Wisconsin and successfully predicted risky locations for 91% of depredations that occurred after the risk map was constructed (Treves et al. 2011). Also half of all the depredations in Wisconsin occurred in 5% of the state area designed as highest-risk by the map; the other half of the depredations affected 33% of the state, significantly reducing the area considered risky. We constructed the risk map for Minnesota ten years earlier (Treves et al. 2004) at a lower resolution (townships of 26 square miles) and it achieved lower predictive power (7%% approximately, Figure 1). Considering the state-of-the-art has advanced considerably since then, we recommend constructing a finer-scale Minnesota wolf depredation risk map (9.3 square miles should be feasible now).

Risk maps can be shared on mobile apps with little investment of effort by programmers or recipients or they can be shared online and via hard copies to local stakeholders. The benefits of risk maps include empowering the local livestock producer to know their own relative risk and understand the factors that raise their risk. Managers can benefit by targeting preventive actions at the high-risk sites or conducting outreach in those areas. Policy-makers can benefit by delineating management zones based on risk.

In addition we support the general provisions of annual review and scientific evaluation of the data that are collected using above methods. That evaluation should inform subsequent management actions with direct cause-and-effect logic.

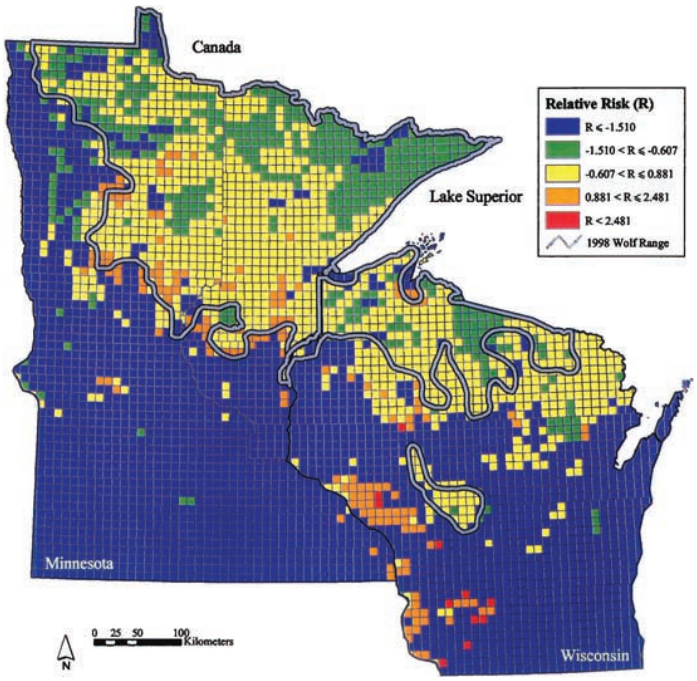

Figure 3. Relative risk of wolf predation on livestock, assuming wolves only occupy territories with a road density of <0.88 km/km^2 Any township with a road density of >0.88 was assigned the lowest risk class (blue), whereas all other townships retained the same colors as in Fig. 2.

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Thank you for the opportunity to share our recommendations,

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Addendum approved by all signatories on March 26th, 2014

Justifying the provision to suspend the hunt

In our view, the strongest scientific argument for suspending the MN wolf hunt is that it might push the wolf population below the minimum level the state designated as safe from federal relisting. The probability of reaching that low a population must be estimated before anyone can argue 'the hunt is safe' or 'the hunt is unsafe'. The precautionary principle and the public trust doctrine both instruct state trustees against ventures into the unknown and jeopardizing a pubic trust resource.

The other scientific reason to suspend the hunt until more data are collected is to quantify other sources of mortality and reproductive failure. That would help ensure a safe, sustainable quota will be set for the future. There are three most likely scenarios (and a few less likely ones) why the MN wolf population dropped so low so quickly after the wolf-hunts. The first is that the original MN wolf census was wrong (too high) or the recent census was wrong (too low) - i.e., measurement error. That would seem to justify proper measurement. Second, other demographic changes or sources of mortality changed at the same time as the wolf-hunts (e.g., severe winter mortality or poaching). Third, hunters in the first wolf-hunt killed many breeders so reproduction diminished significantly. All of these explanations might be detected by an energetic, systematic, and thorough data collection effort.

Continuing the hunt and also collecting the data has been suggested. Usually data on wolves without telemetry collars would be collected during the winter months because snow allows tracking and counting tracks, detection of alpha pairs (a pair of raised-leg urinations in the snow) and possibly ovulation by the alpha female (blood in the urine). Given MN's fall harvest, the hunt would start and end before the data collection. That seems to go against the idea of the bill and the precautionary principle (i.e., hunt one more time before collecting data).

Furthermore the principle of adaptive management favors a suspension of the wolf-hunt. Specifically a science-based, adaptive management approach stipulates that you monitor (collect information) every time you intervene (hunt) to make sure your intervention is doing what it was intended to achieve. And that monitoring should not be limited to performance (did hunters take wolves?) but should include outcomes (did wolves respond as expected?).