CANADIAN WILDLIFE BIOLOGY & MANAGEMENT

CWBM AN ALPHA WILDLIFE PUBLICATION

CWBM 2026: Volume 15, Numbers 1 & 2 *ISSN: 1929–3100*

Original Research

Adverse Effects of Hunting with Hounds on Participating Animals and Human Bystanders

Astghik MARKOSYAN[1], Laura MENEFEE[2], and Adrian TREVES[1]

[1]Nelson Institute for Environmental Studies, Science Hall, 550 North Park Street, University of Wisconsin, Madison, Wisconsin 53706, USA.

[2]Retired, Leeward College, University of Hawai'i, Pearl City, Hawai'i, and Sierra Club Wisconsin Chapter, USA.

Note: These authors have contributed equally and share first authorship.

Abstract

Hunting mammals with hounds (*Canis familiaris*) is little studied. We present 2 datasets consisting of quantitative and qualitative data from self-selected respondents. We frame 2 hypotheses and test predictions from each to explain why wolves and hounds engage in lethal competition. The first dataset came from hound handlers' reports of hound injuries with post hoc verifications by government agents. The second came from bystanders reporting eyewitness encounters with hounds or handlers with post hoc collection by a non-governmental organization (NGO). Self-selected samples cannot be used to extrapolate rates in space or time, but do provide some data on human-animal and human-human interactions. From the state of Wisconsin, USA, we describe government data on 176 hounds reported to have suffered injury during encounters with grey wolves (*Canis lupus*). The government did not collect data on wolves or other non-target animals that may have been injured during these encounters. We tested the predictions of 2 wolf-centred hypotheses (predation on dogs and territorial defense) for wolf-hound interactions (WHI). We found little support for either and propose new hound-centred hypotheses: (1) some hounds, far from their owners, will attack any wildlife they detect (non-selective hunting method), and (2) lack of law enforcement to discourage misconduct leads to unlawful behaviours from trespass to attacking non-target wildlife for which the handler has no permit (hunting misconduct). We propose a new hypothesis that government law enforcement has been captured by hound hunters. We discuss the limits to inference of official and NGO surveys whose methods are not fully documented.

Key Words: *Canis familiaris*; *Canis lupus*; Dog, Human-carnivore Conflict and Coexistence; Illegal Take; Poaching; Grey Wolf.

Correspondence: Adrian Treves (atreves@wisc.edu) and Astghik Markosyan (amarkosyan@wisc.edu), Nelson Institute for Environmental Studies, 30A Science Hall, 550 North Park Street, University of Wisconsin, Madison, Wisconsin, 53706, USA.

Introduction

In the face of biodiversity crises and concerns about animal ethics, partly caused by climate change and partly by human-induced mortality, some societies are re-examining many human uses of animals that were previously considered unobjectionable. For example, uses of poison, off-road vehicles, fire suppression, etc., have undergone scrutiny for their societal benefit-cost estimates and their effects on domestic animals, wildlife, and ecosystem health. Among the activities receiving attention is hunting of mammals with free-running hounds (*Canis familiaris*) loosed far from their owners.

Despite its long history, hunting with hounds seems under-studied in scientific literature (Harris 2017). In our search for work on hunting with dogs or hounds in Google Scholar, the search phrase 'hunt with (hound or dog)' yielded 38,300 results, declining by half when '-bird' was added to the search string to exclude bird-hunting with dogs. By contrast, the search phrase 'hunt-bird' yielded 3.16 million results. Such comparisons illustrate that mammal hunting with hounds has received less research attention. Additionally, the gap in information is also found in legal proceedings, judging from one court case in Wisconsin (Brown *et al.* v Kemp *et al.* 2021) where the practice of hound-hunting was protected from outside scrutiny, such as video-recording or observing hound handlers in public places. That statute protecting hound hunting was overturned in federal court in 2023 (Brown *et al.* v Kemp *et al.*, United States Court of Appeals for the Seventh Circuit, 21-1042).

The practice of hunting mammals with hounds has been recorded for at least 8,000 yrs (Guagnin *et al.* 2018), praised by President Theodore Roosevelt in 1902 (Roosevelt 1902), and is legal in numerous countries and several U.S. states (Heberlein 2000; Hristienko and McDonald 2007; Mayer *et al.* 2009). However, loosing mammal-hunting hounds to pursue prey, some as large as brown (grizzly) bears (*Ursus arctos*), may have harmful effects on people encountered along their path, on the hounds themselves, and on both target and non-target wildlife that they encounter or pursue (Grignolio *et al.* 2011; Gompper 2013). Here, we present data derived from reports submitted by self-selected hound-handlers alleging harm to their hounds, following interactions with grey wolves (*Canis lupus*). We also present self-reported perceptions of human bystanders who experienced the behaviour of hounds during training or hunting, and self-reported interactions with handlers or law enforcement agents, whom the bystanders summoned after an encounter. Although it is routine in research on carnivore predation on domestic animals to report only adverse encounters (e.g., Treves *et al.* 2002), such presentation is clearly incomplete. For an under-studied phenomenon such as hunting mammals with hounds, both adverse and beneficial effects might be studied. Because this study is based on the qualitative and quantitative data from complainants, our scope is limited to adverse effects only. Such incomplete datasets are common in studies of carnivore predation on domestic animals.

Non-target animals and their interactions with hounds

When pets kill wildlife, biodiversity may diminish or ecosystem health may deteriorate (Grignolio *et al.* 2011; Gompper 2013). Dogs are potential predators of both domestic animals and wildlife (Bowers 1953; Ciucci and Boitani 1998) and their presence can often induce behavioural changes in wildlife (Parsons *et al.* 2024; Beckmann and Lackey 2008; Harris 2017). For example, North American black bears (*Ursus americanus*) were reported to avoid encounters with hounds and, in so doing, approach people and major roads more frequently (Stillfried *et al.* 2015). In contrast, some animals will stand their ground when hounds encounter them (Treves *et al.* 2002; Wydeven *et al.* 2004; Backeryd 2007), and dogs alone may not displace large carnivores from kill sites (Suraci *et al.* 2019).

Hounds are often used for pursuit of mammals larger than themselves. Hounds may be injured when encountering animals that can defend themselves effectively. Larger size and greater competitive ability of the wild animals may alter the risk posed by hounds and vice versa. Researchers have examined aggressive encounters between grey wolves and dogs in many regions (Fritts and Paul 1989; Backeryd 2007; Kaartinen *et al.* 2009). The States of Wisconsin and Michigan, USA, have a relatively longer history of such research. Spatial patterns of grey wolf attacks on hounds are somewhat predictable (Treves *et al.* 2002; Wydeven *et al.* 2004; Bump *et al.* 2013; Olson *et al.* 2014). The risk of a complaint about a wolf-hound interaction (WHI) appeared to be higher in areas with more public land, larger wolf packs, proximity to a wolf pack, and length of baiting period. Building on these prior studies, we investigated 2 hypotheses about WHI. First, the predation hypothesis predicts WHI occur when grey wolves attack hounds for food, and second, the territoriality hypothesis predicts that WHI occur when wolves defend territory or pups (Treves *et al.* 2002; Wydeven *et al.* 2004).

To evaluate predictions of these hypotheses, we describe the self-reports by owners on the characteristics of both canids involved, and self-reported correlates of the outcomes of WHI. At the time of our study, it was illegal for hounds to attack wild animals. Nevertheless, such attacks might have occurred. We do not have evidence of which animal in a WHI initiated aggression or escalated it to the point of injury or death. We only present data on the outcomes for hounds

because outcomes for grey wolves were not documented. Therefore, we cannot rule out the possibility that wolves responded defensively to hound attacks. The evidence for wolf attacks on hounds came from handlers seeking compensation or other forms of redress (Treves *et al.* 2002, 2009; Ruid *et al.* 2009). In a prior study, a number of wolf deaths caused by other canids were attributed to other wolves (Treves *et al.* 2017a). Yet, veterinary pathologists might not be able to reliably distinguish large dogs, such as hunting hounds, from wolves by simple scrutiny of bite marks without DNA analysis (Plumer *et al.* 2018). Therefore, our sample is necessarily biased toward handler concerns and outcomes for hounds.

Hounds and humans

There are no published data on hound-handler encounters between bystanders and either handlers or their free-running hounds, although there are prior studies of hound handlers' attitudes toward wildlife (Appendix 1). In brief, as a group, hound-handlers have the lowest tolerance for wild wolves in any group measured thus far in Wisconsin. Yet interactions between hounds and bystanders or bystanders and hound handlers are not yet documented, to our knowledge.

In response, the Sierra Club Wisconsin Chapter (SCWC) initiated a study to collect data on bystander experiences after a request for information from government agencies and law enforcement was returned without data. The Sierra Club Wisconsin Chapter (SCWC) members led an effort to gather information more broadly and systematically. As part of a National Sierra Club initiative, the SCWC subcommittee solicited first-hand reports that members had received of bystander experiences with free-running hounds, hound handlers, or both. Because such first-hand reports are likely to be remarkable, most reports were adverse. As with the self-selected reports provided by hound handlers, the SCWC survey respondents were self-selected, which prompts the following cautions about scientific inference.

Self-selection bias tends to focus on extreme events, not average ones. Therefore, spatiotemporal patterns or estimates of frequency in absolute terms would be misleading and we avoid such inferences. However, self-selected reports can describe the nature of interactions and nuances that third parties may not be able to document, and also events during interactions that may be invisible to third parties post hoc.

We consider the limits to inference of our 2 data sources carefully and transparently. We recommend avoiding a double standard of believing government surveys but disbelieving NGO surveys. We also recommend avoiding a double standard in assuming government agents' records are necessarily accurate or precise, given the methods have not been subjected to experimental test or rigorous scientific standardization. The methods make them accurate or reproducible, not the source. Yet we do not have detailed evidence for the methods or infer observer reliability for either dataset. Therefore, we offer the reports as observations and as a starting point for understanding and managing interactions between hounds, wildlife, bystanders, and handlers.

Materials and methods

Study site

Wisconsin's wolf range is characterized by forest, wetland, lakeside habitats including uplands with a mix of hardwood, softwood, evergreen and deciduous trees. Many wetlands derive from the glacier melt about 11,000 yrs ago, and consist of tamarack (*Larix laricina*), sumac (*Rhus* spp.), alder (*Alnus glutinosa*), native cranberry (*Vaccinium* spp.), sundew (*Drosera* spp.), sphagnum moss (*Sphagnum capillifolium*), cottongrass (*Eriophorum vaginatum*), and bog bean (*Menyanthes trifoliata*). Public lands are generally surrounded by an agricultural matrix of smallholder private lands or large corporate timber plantations. Breeding wolf packs are present since the late 1970s alongside coyote (*Canis latrans*), beavers (*Castor canadensis*), red foxes (*Vulpes vulpes*), American mink (*Neogale vison*), American black bears, bobcats (*Lynx rufus*), and many other small vertebrates. White-tailed deer (*Odocoileus virginianus*) are common and the primary food of wolves. Seasonal temperature ranges (°C) ranged as follows: Winter −11 to 7, Spring −7 to 30, Summer 2 to 34, and Fall 0 to 23. According to US Climate Data, mean seasonal precipitation in central Wisconsin was 12.6 cm in winter, 34.5 cm in spring, 30.7 cm in summer, and 17.3 cm in fall.

Wolf-hound interactions (WHI) behaviour, grouping, and phenotype

During our study period, hounds were legally used to hunt many mammals, including smaller carnivores and black bears. Bear hunting in Wisconsin occurred legally from the last week of August into October, and hound training was legal in July and August during the study period (Treves *et al.* 2009; 2010). Hound hunters accounted for approximately 40% of the annual take by bear hunters (Treves *et al.* 2010; Olson *et al.* 2014). Typically, hounds were loosed from vehicles and allowed to run far from their owners, without direct control (Wydeven *et al.* 2004). Hounds were often fitted with global positioning systems (GPS) or VHF radio-collars, allowing the owner to follow remotely the movements of hounds and determine when and where an animal was encountered. Hunters used groups of up to 6 hounds to track and trail prey during training or hunting (Wydeven *et al.* 2004).

We examined WHI from 7 August 1999 through 19 January 2012. Case files documented 145 killed and 31

injured hounds deemed by state or federal verifiers as "confirmed" (85%) or "probable" (15%) WHI (see methods in Treves *et al.* 2002). Wolf-hound interactions case files included written reports and sometimes detailed forms documenting field investigations, including necropsy data, photos, veterinary reports, and anecdotal reports from handlers. During the early years of record-keeping, documentation and reporting of fatal WHI lacked uniformity; thus, some portions of the data were missing, resulting in lower sample sizes for various analyses. Although methods of field verification have not been described scientifically, it appears that 1 or more government agents would receive a complaint and attempt to visit the site of WHI to examine physical evidence. It appears in some unquantified proportion of cases that there was no evidence left but for injuries on hounds. In some of these cases, the injuries on hounds were attributed by private veterinarians paid by the owners (Treves *et al.* 2002). Wisconsin Department of Natural Resources (WDNR) provided compensation for domestic animals injured or killed by grey wolves, including hounds (Treves *et al.* 2002, 2009; Ruid *et al.* 2009). United States Department of Agriculture agents assumed responsibility for verifying WHI in 1990, and conducted most of the investigations used in our analysis of WHI (Willging and Wydeven 1997).

Owners with confirmed losses in Wisconsin were eligible to receive up to $2,500 per hound based on the estimated value of the hound. It has been a well-publicized programme. Since the compensation programme began in 1985, nearly $350,000 were paid to hunters to compensate for hounds injured or killed by wolves. Between 1985 and 2006, payments for hunting hounds comprised 37% of all compensation (Treves *et al.* 2002, 2009; Naughton-Treves *et al.* 2003; Ruid *et al.* 2009). The current working hypothesis is that most WHI incidents were reported because of a compensation programme characterized as more generous than those in other jurisdictions (Naughton-Treves *et al.* 2003; Treves *et al.* 2009). Corroborating, Bump *et al.* (2013) suggest fewer WHI are reported in Michigan's wolf range because hound owners receive no compensation.

In total, we report on 176 WHI files. From files, 91% of WHI occurred while hounds pursued bears, bobcats, or coyotes, which involves different breeds and use of hounds than for other quarry, such as waterfowl, upland birds, or rabbits. Hounds that hunt large prey such as bears or coyotes are typically breeds of large size and build, frequently Plott (18–27 kg), or larger hound breeds (Bluetick, Redbone, or Walker coon-hounds (18–36 kg). Occasionally, WHI files did not specify the type of prey being pursued. In these cases, if the breed of hound was 1 of the 5 listed above, we assumed the WHI occurred while pursuing the above 3 wildlife species. We quantified the frequency of WHI among breeds of hounds. If the hound was reported as a mix of multiple breeds, we used the first breed listed. We pooled breeds in an "other" category when a single breed had too few WHI to meet the assumptions of the chi-squared test. No data are available on breed frequencies or preference by hunters in Wisconsin, with which we could estimate relative risk by breed.

Our analysis of the body site bitten was limited because a number of hound carcasses were partially or wholly consumed before retrieval by an owner arriving late at the scene. We pooled head, neck, and throat into one category and all other sites into another category to test if outcomes of WHI differed by bite site. We compared hound group size, number of hounds involved in the WHI, and grey wolf pack size using (1) number of wolves seen and reported by hunters (observed), and (2) WDNR-reported wolf pack sizes from the winter preceding the WHI (censused).

Because wolf packs exhibit fission-fusion sociality and packs disaggregate often in the summer (Mech 1970), when many WHI occurred, wolf packs in Wisconsin average 4 adults in late winter (range 2-12), usually composed of offspring of the 2 (usually) unrelated breeders. By summer, pups are exiting the dens but range near them or near other pack rendezvous sites until the pack regularly fuses and travels long distances in mid- to late fall. During this time, most wolf pack members return periodically to rendezvous or den sites to assist with pup-rearing, and consequently have higher food demands, perhaps requiring wolves to forage more frequently (Ruprecht *et al.* 2012). From birth until the end of August, wolf pups experience the highest growth rates, with September representing a critical month for weight gain (Kreeger 2003). In some cases, wolf pups have been observed gaining as much as 1.6 kg per wk (Van Ballenberghe and Mech 1975). Pup growth, critical to survival, is limited by food quality and availability. By late August, growth begins to taper (Pulliainen 1965), as does rendezvous site use (Van Ballenberghe and Mech 1975; Kreeger 2003; Ruprecht *et al.* 2012). The seasonality of wolf life-history on an annual cycle may elevate the risk of WHI in late summer and autumn because of all pack members', and especially pups,' caloric needs. Finally, we analysed the temporal occurrence of WHI as it relates to public hunting seasons, and we compared the frequency of WHI during the hound-training period (July–August) to that during the bear-hunting season (approximately September–October; Treves *et al.* 2010).

Handler behaviour and husbandry

The state wildlife agency implemented several methods for mitigating or preventing WHI, including compensation for handlers' self-reported losses, encouraging the use of

warning devices on collars to deter grey wolves, statewide communication to hunters on recent hound injuries and their locations, and designation of Wolf Caution Areas (WCAs). The state communicated the location of higher-risk WCAs online, posted in the field, and in other ways to handlers (Wydeven *et al.* 2004; Olson *et al.* 2014). Within WCAs, the WDNR recommended that bear hunters release hounds >3.2 km from known rendezvous sites. Prior work documented handlers' willingness to risk hounds in posted WCAs, even within the same season and even within hrs of previous WHI or WCA posting (Wydeven *et al.* 2004; Olson *et al.* 2014). Compensation records also document multiple payments to the same owner or handler within a single season (Treves *et al.* 2009). These data suggest that not all hunters heeded the state's warnings.

Handlers may be able to prevent WHI by using protective vests or stronger collars (Shivik 2004; Backeryd 2007; Khorozyan *et al.* 2020), keeping hounds leashed until the targeted game species is located, or bringing first aid kits on the hunt. Method of hound training might be important. Before a court case in 2012, hound training was restricted to a few mo in the summer after that court case training was allowed year-round (WI Federal Humane Societies 2014). We are not aware of an independent, scientific study of training methods, so it is unclear if training could influence the frequency or severity of WHI, although hounds have been evaluated as deterrents for nuisance black bears, and response has varied among individual bears and effects were temporary (Beckmann *et al.* 2004). The possible effect of these interventions has not been studied in Wisconsin.

Survey of bystanders

The Sierra Club Wisconsin Chapter (SCWC) subcommittee on Protecting Native Forests and Wildlife collected information from self-selected bystanders' experiences with hounds loosed during hunting or training. They posted the survey on the Sierra Club Wisconsin Chapter website from 2015-2021, and administered the survey. The survey appeared at https://docs.google.com/forms/d/e/_1FAIpQLSd6LcXrzUh-P061eyQ1hJQTS_8QKulY0IQxCz2WhWVCrNQDw/viewform?c=0&w=1 (accessed May 2026). The Sierra Club sub-committee members also printed hard copies of the instrument and distributed these at wolf and wildlife related meetings and conferences in Wisconsin in 2015 and 2016. They also invited any members of the public who described adverse hounding encounters to fill out the online report. Therefore, respondents were self-selected with attendant biases discussed below.

About 80% of respondents used the online form to report anonymously, and 20% sent their responses directly to SCWC via mail, phone, email, or in person while being assured of anonymity. The Sierra Club (SCWC) administrators stripped identifying information from the data and shared the data with LM for publication. We analysed anonymized data stripped of identifying information. University of Wisconsin-Madison Human Subjects Protection Institutional Review Board states that anonymized third-party data is exempt from review.

The 25-question survey (Appendix 2) is organized in 4 sections: Observations; Trespass; Property Damage, and Personal Injury or Threats. Interactions with Law Enforcement included a total of 22 yes/no questions and 4 items that allowed unstructured responses in order to elaborate on answers. Respondents could identify the county in which the interaction occurred. Respondents could report how many hounds they saw during each interaction. We used the average of the latter data to compare to average hound party size from WHI records. When 2 respondents mentioned the same interaction by date and county, but different numbers of hounds, LM averaged and rounded up for the number of hounds. LM screened the sample to eliminate responses that did not report an interaction but only expressed an opinion about the practice of hunting with hounds (Appendix 2). After the screening, the sample presented here appears to come from independent incidents.

Hypothesis and predictions

We evaluated 2 prior hypotheses for WHI: territoriality and predation. In brief, territoriality might lead wolves or hounds to interact aggressively, which might be expected to affect seasonal rates of WHI because either canid could have more to protect in certain seasons. For example, wolf packs protect pups while young in summer or early fall (June–September). Hounds have regular ranging areas and only have access to those areas for part of the year. Regarding the predation hypothesis, periods of higher caloric need and lower food availability for wolves might lead to higher rates of WHI in late summer or early fall (caloric needs) or winter (low food availability or high energy costs of thermoregulation). The state of the carcass might reveal if predation or scavenging were primary or secondary motivations for WHI.

Statistical analyses

We performed statistical analyses (SAS Institute 2013) using Student's paired *t* tests to compare the differences in average estimated ages of hounds and numbers of wolves during the attack, in relation to the outcome (i.e., killed or injured) after evaluating if variances were equivalent (F test). We used Spearman's rank correlation to detect associations between multiple continuous variables. All statements of statistical significance are based on $P \leq 0.05$.

We handled the problem of self-selection bias by discussing it in every section of this paper. Also, we avoid extrapolating from the data but restrict analyses of percentages and frequencies to within the dataset and note

when upward or downward bias might arise from self-selection for extreme cases. When used appropriately, as we attempted, surveys can reveal what allegations are being made. Such data are similar to claims made by hunters complaining of grey wolf attacks on dogs, where replicating the events is impossible, and confirming who the aggressor is likewise impossible because human eye-witnesses were almost never present during a WHI. In these conditions, the only observers are handlers (self-selected) and government agents called to the field for complaint verification. The methods for such verifications have not been described scientifically, tested for interobserver reliability, or trained in standardized fashion as 21st century science requires; and different agents may differ in skill, bias, uncertainty, confidence in their own assessments, and the accuracy of the hound owner's report. Nevertheless, imperfect observations are a starting point for further research.

Ethical note

We conducted no research on hounds or grey wolves. The data presented are exempt from approvals for research on human subjects because the data were collected and anonymized by another organization (WDNR and SCWC). Institutional review boards and Animal Care and Use Committees are convened to protect human and animal subjects of research, not to protect anonymized data. No funding was required for this study and no author received compensation for the work from any outside organization.

Results

Wolf-hound interactions (WHI) behaviour, grouping, and phenotype described

In 176 case files, we found 140 independent WHI cases during our study period, where we pooled a case reported on the same day and location by different owners into one WHI. Records included 145 killed (83%) and 31 injured (17%) hounds, similar to 71% and 82% reported in Nordic countries (Backeryd 2007; also see Kojola and Kuittinen 2002). The high percentage of fatalities in both cases might reflect that handlers sometimes took hours to find distant hounds. Therefore, sub-lethal injuries might not be attributed to a WHI if handlers and hounds reunited long after it ended; this effect would bias WHI records upward to more fatalities (see discussion of self-selection bias).

Wolf injuries and deaths in WHI were not documented nor reported in case files. Another possible source of missing data might come from misidentifying wolves as the wild interactant, given the availability of compensation for such WHI and not for casualties from other wildlife.

In total, 89% of WHI occurred while hunters reported pursuing black bears; bobcats, 6%; coyotes, 4%; and raccoons (*Procyon lotor*), 1%. However, we lack independent data on the animal being pursued by those hounds at the time of WHI. We also lack the relative frequencies of targeting each species with hounds statewide

Table 1. The number of hounds (*Canis familiaris*) reported in wolf-hound interactions by breed and month.

Breed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bluetick	0	1	0	0	0	0	3	6	8	0	0	1
Plott	0	0	0	0	0	0	11	20	9	3	0	0
Redbone	0	1	0	0	0	0	4	4	1	0	0	1
Walker	0	0	0	1	0	0	16	19	16	3	1	5
Other	1	2	0	0	0	0	12	15	8	0	0	4
Totals	**1**	**4**	**0**	**1**	**0**	**0**	**46**	**64**	**42**	**6**	**1**	**11**

and over time. There was no association between the outcome of WHI categorized as either injury or death and the prey being pursued by hunters (χ^2 = 1.9, P = 0.75, df = 4, n = 140). The bear-hound-training period accounted for 62% of WHI, whereas the bear-hunting season accounted for 28%, despite being the same length approximately. Outcomes were not associated with month annually (χ^2 = 8.5, P = 0.38, df = 8, n = 176, Table 1).

Predictions of territoriality and predation hypotheses

The above 2 results suggest that seasonality and wolf reproductive timing did not predict injury or death of hounds, which undermines both the predation and territoriality hypotheses (see further below). We lack information on the frequency with which WHI was initiated by hounds, which could result in different causal hypotheses focused on the motivations of hounds and handlers.

Neither sex nor age of the hounds was associated with the outcome of WHI (sex χ^2 = 1.32, P = 0.25, df = 1, n = 151; age t = -0.71, P = 0.49; variances were equivalent F = 0.49). The Treeing Walker Coonhound was the most common breed in WHI (33.3%, n = 51), followed by the Plott (27.5%, n = 42). There was a suggestive association between breed and outcome (χ^2 = 10.7, P = 0.03, df = 4, n = 176). Notably, the Plott fatality frequency of 95.4% was higher than the average 81.2% (Table 1). Plott hounds are the smallest and most vocal hound breed commonly used in Wisconsin for mammals. Small body size has been implicated in the risks and fatalities associated with WHI (Fritts and Paul 1989; Peterson 1995; Backeryd 2007; Kaartinen *et al.* 2009). The Plott breed is also known for its baying vocalizations, which might alert wolves from a long distance, as in Backeryd (2007) and Kaartinen *et al.* (2009). Small size may make a hound more vulnerable to head and neck bites. Bites to the neck were associated with higher fatality rates in a Scandinavian study (Backeryd 2007). Again, self-selection bias may inflate the involvement of Plott hounds if fatalities were more common for this breed.

Our analysis on hound body site bitten was limited to 109 WHI. We cannot be certain that wolves inflicted every bite because of the delays in discovering hounds mentioned above and the potential bias created by compensation that apply only for attacks by wolves. Of the 109 carcasses with bite information, 50 provided 1 bite location (46%), 37 provided 2 locations (34%), and 22 provided 3 or more locations (20%). Considering all bite locations (n = 193), the single most frequent bite site was the neck (33%), followed by back (17%), upper thigh (12%), and chest (10%). We considered bites to the head, shoulders, neck (as opposed to throat), back, and upper thighs as indicative that the hound had been lower than its attacker. Those upper body parts were represented in 72% of the 193 bites, whereas under-parts (throat, groin, sternum, ribs, lower legs, abdomen) were represented in 28% of bite locations. We found no relationship between body site bitten and outcome, when we separated neck and head bites from others (χ^2 = 1.5, P = 0.22, df = 1, n = 66).

Another factor affecting the vulnerability of canids to attack by other canids is numerical superiority. Aggression between grey wolves and coyotes in Yellowstone National Park had fatal consequences when wolves outnumbered the smaller coyotes, but not when coyotes outnumbered wolves, suggesting that group size exerted less influence than individual body size differences in determining outcomes between canids (Ballard *et al.* 2003; Merkle *et al.* 2009).

An average of 1.3 hounds were injured or killed per WHI (maximum 5 in a single WHI). The average size of the hound group was 3.8, (SD 1.4, n = 57), and only 3 (5%) of those WHI involved a single hound in the handler's control. The number of hounds involved in the WHI averaged 2.6 (SD 1.3, n = 47) with 9 (19%) cases of those WHI involving only 1 hound. These values both resembled the number of wolves observed by hound handlers (2.9, SD 1.2, n = 15) and to the census pack size for the pack blamed by the state or federal agent tasked with verifying the report (2.4, SD 1.0, n = 19; 4 WHI included information for both observed and censused estimates). The outcomes were not associated with the number of hounds, number of wolves, or difference between the two in a given WHI by any of the measures of group size or pack size above (Welch test assumes unequal variance, F < 0.72, P > 0.41 in every test). Wolves injured or killed hounds in groups with superior numbers in 44% of WHI, with such data (n = 16). The lack of relationship between pack or group size and outcomes does not clearly support either the predation or territoriality hypotheses.

Of 80 deaths with data on consumption of a hound carcass, 49% were partially consumed. Of those 80 hounds consumed, 71% occurred in July–August and 27% in September–October. The timing of WHI presents equivocal evidence for both hypotheses. Higher frequencies of WHI occurred during the hound training period in July and August than during the autumn black bear hunt in September and October (Table 1). Elevated risk in July and August might have been associated with the practice of baiting, as grey wolves visit black bear bait sites in search of food (Bump *et al.* 2013). In Wisconsin, bear bait sites could be legally established as early as April and could last the entire wolf pup-rearing season. Bump *et al.* (2013) documented that the risk of WHI was 3–7 times greater in Wisconsin than in adjacent Michigan, citing the extended bear-baiting period as a probable cause for the much higher rate. That might support the predation hypothesis if bait was more available (or predictable) than wild foods. However, bear baiting was

confounded with wolf pup defence predicted by the territoriality hypothesis. The hound training period coincided with wolf use of rendezvous sites or den sites during the study. The consumption of hound carcasses might corroborate the predation hypothesis, but that is not persuasive because consumption was recorded in only approximately half of the WHI and we do not know if the wolves that attacked were the consumers. Nor can we rule out that consumption followed after the primary motivation for aggression in either the hounds or the wolves. The hound carcasses and bite locations provided limited insight. Bites to head, neck, and throat represented 41% of bite locations on hound carcasses. The predation hypothesis might find support from this result because cranio-cervical killing bites are associated with predation by many mammals (Steklis and King 1978; Van Valkenburgh and Ruff 1987). But the greater height of wolves off the ground than most hounds would predict such bite locations in any case.

In sum, we find equivocal support for both hypotheses. This could imply both are correct or we are missing information, such as whether the hounds were pursuing wolves. We also do not have information on the body condition of any of the participants, which seems essential data to test the predation hypothesis. Therefore, we find no strong evidence that WHI occurred because of wolf predatory motivations or wolf territorial motivations.

Handler behaviour and husbandry

Husbandry, such as avoidance of rendezvous sites and use of bells on collars are difficult to evaluate because of a lack of data on prevalence and use. Overall, 55 (31%) records reported whether hounds in WHI wore bells on their collars, with 20 (36%) wearing them and 35 did not (64%). But we have no data on the use of bells among hounds that did not enter the WHI database and the majority of records did not contain any information on devices. Outcomes were not associated with hunter self-reports of affixing bells to collars. Another step handlers might take to protect hounds and wolves would be to release hounds only in low-risk areas. The state did not systematically collect data on whether their

Table 2. Bystander reports (n=105) of 117 adverse interactions with hounds or their handlers across counties of Wisconsin, USA. Because a respondent might report more than 1 interaction, we present the counties from most reports (6) to fewest (1), the names of the 50 counties mentioned in reports, the sum of interactions per row, and the maximum number of hounds (*Canis familiaris*) reported in a single interaction. When multiple reports were filed about the same interaction and the number of hounds differed, we counted only 1 interaction and averaged the number of hounds, rounding to the higher integer.

Reports per county	Sum of interactions	Maximum number of hounds in a single interaction	Counties with interactions reported
6	15	8	Bayfield, Iron, Sawyer
5	5	5	Forest
4	4	6	Langlade
3	13	6	Chippewa, Dane, Marathon, Polk, Washburn
2	18	6	Dodge, Douglas, Dunn, Florence, Lincoln, Oconto, Price, Shawano
1	62	8	Ashland, Barron, Brown, Burnett, Calumet, Cheboygan MI, Columbia, Cuyahoga OH, Door, Eau Claire, Fond du Lac, Gogebic, MI, Green, Houghton, MI, Jackson, Kenosha, Kewaunee, Macon, GA, Manitowoc, Marin, CA, Marinette, Milwaukee, Nash, NC, Oneida, Ontonagon, MI, Outagamie, Ozaukee, Rock, Rusk, St. Croix, Sheboygan, Taylor, Trempealeau, Vernon, Vilas, Walworth, Washington, Waukesha, Winnebago, Wood

warnings about high-risk WCAs were heeded. The WHI records did not contain such information.

Survey of bystanders

In all, 105 respondents reported adverse incidents with hunting hounds from 51 WI counties, 4 Michigan counties, and 4 other. The average number of incidents per county was 2. Seven respondents declined to specify location, but timing distinguished the reports from others' reports. The 105 respondents reported 117 separate incidents (Table 2). Of the 105, 42% reported the hounds observed were not accompanied by a handler; similarly, 41% reported finding abandoned or lost hounds on their property. In both cases, some respondents reported contacting local animal shelters, law enforcement, or handlers via phone numbers on collars.

Overall, 63% (n=105) described incidents of trespass including hounds running on their property without permission, handlers found on property without permission, or handlers running hounds on property after being denied permission. Of the 105, 18% of respondents described damage to property caused by hounds, including downed fencing, damaged landscaping and gardens, injury to self and livestock, dead wildlife left on property, vandalism, or litter. Of the 105, 11% reported injury to pets or livestock by hounds; 24% reported knowledge of hounds attacking others' pets or livestock. Of the 105, 8% describe direct encounters with hounds resulting in personal injury or being chased.

Regarding bystander-handler interactions, 31% reported threatening altercations with handlers, including being unwillingly detained by handlers' trucks on public roads, or their own private driveways. Of the 105, 51% of respondents reported they "feel intimidated by hound handlers," and 44% feared retaliation from handlers for reporting confrontations to law enforcement (Appendix 3).

Finally, approximately a third of respondents described distrust of the information provided by law enforcement officers and also reported filing official complaints upon which no discernible action was taken. Of the 105, 36% believed a conflict of interest existed for law enforcement officers, including game wardens, because of relationships between officers and handlers, or because the officers were believed to hunt with hounds themselves.

Comparing numbers of hounds from WHI and survey data

Survey respondents reported 2–8 hounds per interaction (average 3.7, mode 2). That average is identical to the average number of hounds that handlers reported in their pack in WHI above, despite the different study periods and presumably locations. This seems to be corroborating evidence of accuracy in reports of hound pack sizes in both datasets, as neither set of complainants was aware of the other. Given the rarity of single hounds (5%) in WHI, the bystander reports of >1 hound seem unsurprising. Similarly, bystanders reported >6 hounds in 3 events (8% of reports that include these data) but handlers never reported >6 in their pack after a WHI. The legal limit per handler was ≤6 hounds per handler released from direct control.

Discussion

The behaviour of hunters and hounds exploiting mammals has rarely been investigated. Here, we fill the gap partly with self-reported data on the behaviour of hounds and wolves associated with aggressive wolf-hound interactions (WHI). We report a shortage of data on wolf injuries reflecting human-centric (anthropocentric) record-keeping by the government wildlife agents. Also, we present self-reported data on the experiences of bystanders exposed to hound behaviour, handler husbandry, and bystander-handler interactions. We report bystanders perceptions or allegations of unlawful actions by handlers or their hounds. Although hound-handlers' attitudes have been repeatedly and extensively measured, this is the first data on bystanders. We note an absence of systematic observations of behaviour of all participants. Outcomes of WHI (injury or death of hounds) were not associated with the number of wolves observed or censused near the site, or the numerical differences between wolves and hounds, hound age, hound sex, the species of prey targeted by hunters, or the month in which WHI occurred.

This study is subject to shortcomings and limitations that are common to WHI, as under-studied and difficult to observe research. Both official and NGO surveys rely on self-selected reports and imperfect observations. Neither of them could be replicated nor confirmed on which actor-initiated WHI or bystander-hound-handler interactions. In most cases, assessment of incidents depends on post hoc evaluations. As a result, these data cannot resolve hypotheses about WHI or bystander-hound-handler adverse interactions. Nonetheless, such records offer important information about the kinds of events that prompt complaints and finding features of reported WHI similar to complaints of hunters about wolf attacks on dogs. Such study can inform hypothesis development and identify priorities for future, more systematic research. The survey data and WHI self-reports by handlers are self-selected samples, which cannot be verified directly or used to extrapolate rates, frequencies, or representativeness in space, time, or demography. Nevertheless, the data are the first of their kind to our knowledge and deserve consideration.

Our inability to find strong support for either the predation hypothesis or the territoriality hypothesis for WHI, which focuses on wolf motivation for WHI, suggests either a multi-causal phenomenon or we lack hypotheses for the motivation of hounds or handlers to initiate WHI. One of the values of

observational data even if self-selected complainants report their perceptions only, is to identify potential new explanatory hypotheses and test pre-existing predictions of long held hypotheses. Next, we focus on hounds and their behavior to set the stage for a new hypothesis about WHI and bystander-hound-handler interactions.

Treeing Walker coonhound was the breed most commonly involved in WHI. Most WHI were fatal for hounds. Plott hounds were disproportionally represented among fatalities. We could not confirm or reject a protective role of special collars with bells or defensive features. We could not evaluate the role of training in WHI avoidance or escalation. Nevertheless, we recommend the state obligate veterinary clinics that treat hounds for wildlife injuries to report each such incident so the welfare of all animals can be monitored. Such data could reveal whether preventive actions taken by handlers might be improved after evaluation by professional veterinarians and wildlife scientists. In light of recent findings that studded leather collars protect cattle (*Bos taurus*) against leopards (*Panthera pardus*) (Khorozyan *et al.* 2020), recommending more precautions by handlers seems prudent.

Given the equivocal tests of the wolf-centred hypotheses of predation and territoriality as motivators of WHI, we propose 2 hound-centred hypotheses for WHI. First, some hounds far from their owners might attack any wildlife they detect. Free-running hounds are loosed beyond direct control of handlers, and we lack data on whether hounds-initiated encounters with wolves or other wildlife. A majority of WHI involved hounds pursuing black bears compared to other prey, but none could confirm what animal the hounds were pursuing when WHI began. The absence of data on injuries to wolves or other non-target wildlife prevents evaluation of this hypothesis with existing records.

Secondly, perhaps a lack of law enforcement available in the field to discourage handler misconduct leads to unlawful behaviours. Such misconduct alleged by bystanders ranged from trespass to chasing bystanders to attacking non-target wildlife for which the handler has no permit. Our survey of bystanders documented repeated allegations of trespass, intimidation, property damage, and inaction or conflicts of interest among law enforcement officers (Appendix 3). These conditions may reduce deterrence and increase the likelihood that handlers release hounds in ways that elevate risks to wild and domestic animals, hounds, and people. It might be impossible to verify that the handlers or hounds were acting lawfully at the time of the WHI.

If even 1 allegation of unlawful behaviour by handlers was accurate, we recommend attention by law enforcement and hunt managers, as follows from our second hound-centred hypothesis concerning the role of enforcement in handler behaviour. We found little financial or non-financial incentive for the self-reports, other than bystander dissatisfaction with law enforcement response or value-based disapproval of hounding. By contrast, our other self-selected data set (handler complaints of hound losses in WHI) were motivated by a compensation programme that paid for injured or dead hounds. That programme also seems to need reform, given that no information on harm to wolves was collected despite legal protections for wolves. Furthermore, the size of packs of hounds (up to 6) and the possibility that multiple handlers can run multiple packs in the same area simultaneously creates a clear danger for wolves and other non-target animals. These results highlight a need for improved regulation, greater oversight and more energetic enforcement of activities involving the use of hounds during hunting.

Our results are also consistent with earlier findings of wildlife crimes (Appendix 1). Wolf-poaching is the major cause of mortality in US wolf populations (Treves *et al.* 2017b). Most recently, data reveal that cryptic poaching of Wisconsin wolves rose during hound training, bear-hunting seasons, and deer-hunting seasons (Santiago-Ávila and Treves 2022). The 2021 Wisconsin wolf-hunt saw the most rapid season closure and over-kill of the legal quota in Wisconsin wolf management history, with 218 wolves killed in <72 hrs. Of these, >80% were killed by hunters using hounds; these incidents included at least some hound-inflicted injuries to wolves (Treves *et al.* 2021).

Self-report and perception data in wildlife management studies

The topic of comparing self-reports by handlers and self-reports by bystanders raises an issue of expertise, power asymmetries, and research bias. While we have attempted to describe the biases inherent to self-selected respondents in both of our datasets, dismissing these data because they are self-reports cannot be justified scientifically either.

The larger literature is not so transparent about biases in reporting human-animal interactions. For one, it is routine to publish papers describing adverse effects of wildlife on people, but not the benefits. We follow this pattern here. Moreover, work describing the adverse effects of hunters on wildlife or people is often restricted to so-called bushmeat or distant trade in wildlife parts. Less often, the North American model of hunter behaviour is applauded by various commentators without acknowledging its darker side, revealed by data such as ours.

Moreover, the human-human conflicts we described from self-selected eye-witnesses exposes another problem in research bias. A common assumption in peer-reviewed commentary on hunting is that hunters have lay knowledge gained through local experience and expertise in their practices (Sandstrom *et al.* 2009; von Essen *et al.* 2015).

This may favour the views and preferences of hunters over others, but that assumption is unjustified when two local, lay types of expertise are pitted against each other as in some of our study, undoubtedly, when hound handlers and the bystanders complaining about them were equally local and both held lay expertise. The power asymmetry reflected in complaints by bystanders described here suggests we need more attention to all participants affected by hunting. Attention to law enforcement staff may also be warranted given the allegations by bystanders we reported here.

In USA wildlife law, the Endangered Species Act (ESA) and federal court cases surrounding these make clear that some hound handlers are vulnerable to prosecution. First, any "take" of wolves (including harassment, pursuit, injury, killing, etc.) is prohibited under the ESA regardless of whether the perpetrator knew the wild animal harmed was listed (Newcomer *et al.* 2011; WildEarth Guardians 2017). The absence of data revealed by this study indicates that hounding is not adequately regulated. Because wolves were often a federal- or state-listed species during our study, WHI regardless of motivation or instigator would represent unlawful "take" by the ESA definition which includes pursuit, harassment, injury or worse. Therefore, the practice of hound-hunting in wolf pack territories should be prohibited when wolves are a listed species unless it can be strictly regulated and monitored to reduce WHI to near zero. Prohibitions on non-selective killing methods in the range of endangered species and prohibitions on hunting non-listed species of similar appearance such as coyotes (Newsome *et al.* 2015), might prevent some WHI.

Disclosures of potentially competing interests

We perceive no potentially competing interests. All funding awarded to AT as of 8 February 2026 are listed here http://faculty.nelson.wisc.edu/treves/archive_BAS/funding.pdf, which we provide along with our full CVs for reader stop judge for themselves: AT http://faculty.nelson.wisc.edu/treves/archive_BAS/Treves_vita_latest.pdf and AS https://faculty.nelson.wisc.edu/treves/archive_BAS/Markosyan_Astghik_CV_2026.pdf. LM is a retired Associate Professor from the Department of Humanities, Leeward College, University of Hawai'i and currently a member of the Endangered Species Coalition, Society for the Preservation of Poultry Antiquities, National Wolfwatchers Coalition, Wisconsin Wolf Trackers, Wolf Patrol, and the Executive Committee, Fox Valley Group, Sierra Club Wisconsin Chapter.

Acknowledgements

LM wishes to acknowledge the support of Elizabeth Roberts, Sierra Club Wisconsin Chapter in compiling the Adverse Hound Hunting Related Incidents Survey; Sierra Club Wisconsin Chapter for hosting the website for online reports; also, Heathcliff Wright, graphics editor. No funding was sought or required for this work.

Literature cited

Backeryd, J. 2007. Wolf attacks on dogs in Scandinavia 1995–2005. Ecology Institute, Swedish University of Agricultural Sciences: Grimso, Sweden.

Ballard, W. B., L. N. Carbyn, and D. W. Smith. 2003. Wolf interactions with non-prey. Pages 259–271 *in* L. D. Mech and L. Boitani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press: Chicago, Illinois, USA.

Beckmann, J. P., and C. W. Lackey. 2008. Carnivores, urban landscapes, and longitudinal studies: a case history of black bears. Human-Wildlife Conflicts 2: 168–174.

Beckmann, J. P., C. W. Lackey, and J. Berger. 2004. Evaluation of deterrent techniques and dogs to alter behavior of "nuisance" black bears. Wildlife Society Bulletin 32: 1141–1146.

Bowers, R. R. 1953. The free-running dog menace. Virginia Wildlife 14: 5–7.

Brown, J., *et al.* 2021. Brown *et al.* v. Kemp *et al.* U.S. Court of Appeals, 7th Circuit, USA.

Browne-Nuñez, C., A. Treves, D. Macfarland, Z. Voyles, and C. Turng. 2015. Tolerance of wolves in Wisconsin: a mixed-methods examination of policy effects on attitudes and behavioral inclinations. Biological Conservation 189: 59–71.

Bump, J. K., C. M. Murawski, L. M. Kartano, D. E. Beyer, and B. J. Roell. 2013. Bear-baiting may exacerbate wolf-hunting dog conflict. PLoS ONE 8: e61708.

Chapron, G., and A. Treves. 2016a. Blood does not buy goodwill: allowing culling increases poaching of a large carnivore. Proceedings of the Royal Society B 283: 20152939.

Chapron, G., and A. Treves. 2016b. Correction to 'Blood does not buy goodwill: allowing culling increases poaching of a large carnivore'. Proceedings of the Royal Society B Volume 283: 20162577.

Ciucci, P., and L. Boitani. 1998. Wolf and dog depredation on livestock in central Italy. Wildlife Society Bulletin 26: 504–514.

Fritts, S. H., and W. J. Paul. 1989. Interactions of wolves and dogs in Minnesota. Wildlife Society Bulletin 17: 121–123.

Gompper, M. E. 2013. Free-ranging dogs and wildlife conservation. Oxford University Press: Oxford, UK.

Grignolio, S., E. Merli, P. Bongi, S. Ciuti, and M. Apollonio. 2011. Effects of hunting with hounds on a non-

target species living on the edge of a protected area. Biological Conservation 144: 641–649.

Guagnin, M., A. R. Perri, and M. D. Petraglia. 2018. Pre-Neolithic evidence for dog-assisted hunting strategies in Arabia. Journal of Anthropological Archaeology 49: 225–236.

Harris, S. 2017. The impact of hunting with dogs on wildlife and conservation: a review with particular reference to the National Trust. Available online: https://www.league.org.uk/media/filer_public/af/0a/af0ae437-6b89-4ee7-9e13-880294ea5515/the_impact_of_hunting_with_dogs_on_wildlife_and_conservation.pdf Accessed May 2026.

Heberlein, T. A. 2000. The gun, the dog and the thermos: culture and hunting in Sweden and the United States. Sweden & America Fall 2000: 24–29.

Hogberg, J., A. Treves, B. Shaw, and L. Naughton-Treves. 2015. Changes in attitudes toward wolves before and after an inaugural public hunting and trapping season: early evidence from Wisconsin's wolf range. Environmental Conservation 43: 45–55.

Hristienko, H., and J. E. J. McDonald. 2007. Going into the 21st century: a perspective on trends and controversies in the management of the American black bear Ursus 18: 72–88.

Kaartinen, S., M. Luoto, and I. Kojola. 2009. Carnivore-livestock conflicts: determinants of wolf (*Canis lupus*) depredation on sheep farms in Finland. Biodiversity and Conservation 18: 3503–3517.

Khorozyan, I., G. Siavash, S. Mobin, M. Soofi, and M. Waltert. 2020. Studded leather collars are very effective in protecting cattle from leopard (*Panthera pardus*) attacks. Ecological Solutions and Evidence 1: e12013.

Kojola, I., and J. Kuittinen. 2002. Wolf Attacks on dogs in Finland. Wildlife Society Bulletin 30: 498–501.

Kreeger, T. 2003. The internal wolf: physiology, pathology, and pharmacology. Pages 192–217 *in* L. D. Mech and L. Boitani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press: Chicago, Illinois, USA.

Louchouarn, N. X., F. J.Santiago-Ávila, D. R. Parsons, and A. Treves, 2021. Evaluating how lethal management affects poaching of Mexican wolves (registered report). Royal Society Open Science 8: 200330.

Mayer, J. J., R. E. Hamilton, and I. L. Brisbin. 2009. Use of trained hunting dogs to harvest or control wild pigs. Pages 275–288 *in* Wild pigs: biology, damage, control techniques and management. Savannah River Site, Aiken.

Mech, L. D. 1970. The Wolf: the ecology and behavior of an endangered species. University of Minnesota Press, Minneapolis, Minnesota, USA.

Merkle, J., D. Stahler, and D. W. Smith. 2009. Interference competition between gray wolves and coyotes in Yellowstone National Park. Canadian Journal of Zoology 87: 56–63.

Naughton-Treves, L., R. Grossberg, and A. Treves. 2003. Paying for tolerance: the impact of livestock depredation and compensation payments on rural citizens' attitudes toward wolves. Conservation Biology 17: 1500–1511.

Newcomer, E., M. Palladini, and L. Jones. 2011. The Endangered Species Act v. the United States Department of Justice: how the Department of Justice derailed criminal prosecutions under the Endangered Species Act. Animal Law 17: 241–271.

Newsome, T., J. T. Bruskotter, and W. J. Ripple. 2015. When shooting a coyote kills a wolf: mistaken identity or misguided management? Biodiversity and Conservation 24: 3145–3149.

Olson, E. R., A. Treves, A. P. Wydeven, and S. Ventura. 2014. Landscape predictors of wolf attacks on bear-hunting dogs in Wisconsin, USA. Wildlife Research 41: 584–597.

Parsons, M. A., B. E. George, and J. K. Young. 2024. Evaluating the efficacy of aversive conditioning of mountain lions with hounds. Canadian Wildlife Biology and Management 13: 125–137.

Peterson, R. 1995. Wolves as interspecific competitors in canid ecology. Pages 315–323 *in* L. Carbyn, S. Fritts, and D. Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute: Edmonton, Alberta, Canada.

Plumer, L., T. Talvi, P. Männil, and U. Saarma. 2018. Assessing the roles of wolves and dogs in livestock predation and suggestions for mitigating human-wildlife conflict and conservation of wolves. Conservation Genetics 19: 665–672.

Pulliainen, E. 1965. Studies on the wolf (*Canis lupus*) in Finland. Annales Zoologici Fennici 2: 215–259.

Roosevelt, T. D. 1902. Hunting the grisly and other sketches. G. P. Putnam's Sons: New York, USA.

Ruid, D. B., W. J. Paul, B. J. Roell, A. P. Wydeven, R. C. Willging, R. L. Jurewicz, and D. H. Lonsway. 2009. Wolf–human conflicts and management in Minnesota, Wisconsin, and Michigan, Pages 279–295 *in* A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. Recovery of gray wolves in the Great Lakes Region of the United States: an endangered species success story. Springer: New York, New York, USA.

Ruprecht, J., D. Ausband, M. Mitchell, M. Garton, and P. Zager. 2012. Homesite attendance based on sex, breeding status, and number of helpers in gray wolf packs. Journal of Mammalogy 93: 1001–1005.

Sandstrom, C., J. Pellikka, O. Ratamaki, and A. Sande. 2009. Management of large carnivores in Fennoscandia: new patterns of regional participation. Human Dimensions of Wildlife 14: 37–50.

Santiago-Ávila, F. J., R. J.Chappell, and A. Treves. 2020. Liberalizing the killing of endangered wolves was associated with more disappearances of collared individuals in Wisconsin, USA. Scientific Reports 10: 13881.

Santiago-Ávila, F. J., and A. Treves. 2022. Poaching of protected wolves fluctuated seasonally and with non-wolf hunting. Scientific Reports 12: 1738.

SAS Institute, Inc. 2013. JMP 11.0. Cary, North Carolina, USA.

Shivik, J. A. 2004. Non-lethal alternatives for predation management. Sheep and Goat Research Journal 14.

Steklis, H. D., and G. E. King. 1978. The craniocervical killing bite: toward an ethology of primate predatory behavior. Journal of Human Evolution 7: 567–581.

Stillfried, M., J. Belant, N. Svoboda, D. Beyer, and S. Kramer-Schadt. 2015. When top predators become prey: Black bears alter movement behaviour in response to hunting pressure. Behavioural Processes 120: 30–39.

Suraci, J. P., J. A. Smith, M. Clinchy, L. Y. Zanette, and C. C. Wilmers. 2019. Humans, but not their dogs, displace pumas from their kills: an experimental approach. Scientific Reports 9: 12214.

Treves, A., K. A. Artelle, C. T. Darimont, and D. R. Parsons. 2017b. Mismeasured mortality: correcting estimates of wolf poaching in the United States. Journal of Mammalogy 98: 1256–1264.

Treves, A., R. L. Jurewicz, L. Naughton-Treves, R. A. Rose, R. C. Willging, and A. P. Wydeven. 2002. Wolf depredation on domestic animals: control and compensation in Wisconsin, 1976-2000. Wildlife Society Bulletin 30: 231–241.

Treves, A., R. L. Jurewicz, L. Naughton-Treves, and D. Wilcove. 2009. The price of tolerance: wolf damage payments after recovery. Biodiversity and Conservation 18: 4003–4021.

Treves, A., and K. A. Martin. 2011. Hunters as stewards of wolves in Wisconsin and the Northern Rocky Mountains, USA. Society and Natural resources 24: 984–994.

Treves, A., L. Naughton-Treves, and V.S. Shelley. 2013. Longitudinal analysis of attitudes toward wolves. Conservation Biology 27: 315–323.

Treves, A., K. J. Kapp, and D. M. Macfarland. 2010. American black bear nuisance complaints and hunter take. Ursus 21: 30–42.

Treves, A., J. A. Langenberg, J. V. López-Bao, and M. F. Rabenhorst. 2017a. Gray wolf mortality patterns in Wisconsin from 1979 to 2012. Journal of Mammalogy 98: 17–32.

Treves, A., F. J. Santiago-Ávila, and K. Putrevu. 2021. Quantifying the effects of delisting wolves after the first state began lethal management. PeerJ 9: e11666.

Van Ballenberghe, V., and L. Mech. 1975. Weights, growth, and survival of timber wolf pups in Minnesota. Journal of Mammalogy 56: 44–63.

Van Valkenburgh, B., and C. B. Ruff. 1987. Canine tooth strength and killing behaviour in large carnivores. Journal of Zoology 212: 379–397.

von Essen, E., H. P. Hansen, H. N. Kallstrom, M. N. Peterson, and T. R. Peterson. 2015. The radicalisation of rural resistance: how hunting counterpublics in the Nordic countries contribute to illegal hunting. Journal of Rural Studies 39: 199–209.

WildEarth Guardians 2017. WildEarth Guardians v. U.S. Department of Justice. U.S. District Court, Arizona, USA.

Wisconsin Federated Humane Societies, Inc. 2014. Wis. Federated Humane Societies, Inc. v. Stepp, 356 Wis. 2d 326, 855 N.W.2d 491. Wisconsin Court of Appeals, Wisconsin, USA.

Willging, R., and A. P. Wydeven. 1997. Cooperative wolf depredation management in Wisconsin. Pages 46–51 *in* C. D. Lee and S. E. Hygnstrom, editors. Thirteenth Great Plains Wildlife Damage Control Workshop Proceedings. Kansas State University Agricultural Experiment Station and Cooperative Extension Service: Lincoln, Nebraska, USA.

Wydeven, A. P., A. Treves, B. Brost, and J. E. Wiedenhoeft. 2004. Characteristics of wolf packs in Wisconsin: identification of traits influencing depredation. Pages 28–50 *in* N. Fascione, A. Delach, and M. E. Smith, editors. People and Predators: From Conflict to Coexistence. Island Press: Washington, D.C., USA.

About the authors

Astghik Markosyan is a PhD student at the University of Wisconsin-Madison, and worked as the Head of the Human-Wildlife Conflict Study Program at the German Nature Protection Union (NABU) in Armenia. She received her bachelor's and first master's degrees from Yerevan State University, where she studied human-wildlife conflict in Armenia, and completed a second master's degree as a Fulbright Scholar at Colorado State University, where she worked on wolverine

reintroduction in Colorado. Her current research focuses on ecology and human dimensions of gray wolf coexistence and aims to identify conflict hotspots, assess the effectiveness of current mitigation measures, and develop situation-specific coexistence strategies.

Laura Menefee, Assistant Professor of Literature, University of Hawai'i Leeward College (retired) and National Endowment for the Humanities grant recipient, holds BA (1985) and MA (1988) degrees in Humanities from University of Santa Cruz, Cowell College and University of Hawai'i, respectively. She volunteered with USFWS and NMFS in the Hawaiian Islands monitoring sensitive species, and worked as docent for the University of Minnesota's exhibit, "Wolves and Humans" at Bishop Museum, Honolulu. In Wisconsin, she is a certified state carnivore tracker and represented Sierra Club on the state's Wolf Advisory Committee during the wolf recovery period from 2008 to 2012, when the Natural Resources Board disbanded the committee at the time of the state's inaugural, recreational wolf hunt. In addition to presenting research at Midwest Wolf Stewards conferences, Menefee has written congressional testimony on wolf issues for Sierra Club and continues to advocate wildlife coexistence in Wisconsin.

Adrian Treves focuses on ecology, scientific integrity, public trust principles, and agro-ecosystems where crops and domestic animals overlap carnivore habitat. He and his lab have authored >160 scientific articles, best known for their gold standard experiments on non-lethal prevention of predation on domestic animals, estimates of illegal wolf-killing and cryptic poaching, and work on risk maps to predict human carnivore conflict sites. Founder and Director of the Carnivore Coexistence Lab, and Professor of Environmental Studies at the University of Wisconsin–Madison, Adrian earned his PhD at Harvard University in 1997.

Received 13 February 2026 – Accepted 12 June 2026

Appendix 1

Biodiversity may suffer after domestic animals are injured or killed, because their owners may react in several ways detrimental to nature protection efforts. Owners may escalate and kill one or more wild animals, following the incident or for years afterwards. Furthermore, resentments engendered by dangerous wildlife encounters can spread to associates of the involved humans and become broad-based attitudes of intolerance or even preemptive lethal actions against the wildlife. For instance, consider the history of social scientific work done by various authors measuring attitudes to wolves in Wisconsin (Naughton-Treves *et al.* 2003; Treves *et al.* 2009; Treves and Martin 2011; Treves *et al.* 2013; Browne-Nuñez *et al.* 2015; Hogberg *et al.* 2015). The first survey in 2001 included complainants who believed they had experienced a wolf attack on their domestic animals, whereas the second survey in 2004 included many more individuals who had not experienced such losses, yet both groups showed decreases in tolerance for wolves when they were resampled in 2009. The interest group least tolerant of wolves was bear hunters who used hounds and the group whose tolerance for wolves declined most over time were men in wolf range who had hunting experience, not those with personal experience of wolf attack on domestic animals (Naughton-Treves *et al.* 2003; Treves *et al.* 2009; Treves and Martin 2011; Treves *et al.* 2013; Hogberg *et al.* 2015). The prior results on tolerance were paralleled by inclinations to kill wolves illegally (Browne-Nuñez *et al.* 2015; Naughton-Treves *et al.* 2003; Treves *et al.* 2013). Also, attitudes to wolves and inclination to kill wolves illegally were unrelated to the hound handler's own experience with wolves or their experience with policy interventions relating to WHI such as compensation for hound injuries (Naughton-Treves *et al.* 2003; Treves *et al.* 2013). Handlers reported concerns for safety of the hounds and also concerns with access to land and their ability to pursue this pastime in the face of public and political opposition (Browne-Nuñez *et al.* 2015). Recent research reports that poaching of wolves peaked during seasons of hunting bears and deer and seasons of training hounds (Santiago-Ávila and Treves 2022). Much of poaching involving concealment or destruction of evidence, which reflects intent to break the law, has repeatedly risen in incidence along with policies that permit some legal wolf-killing in several US wolf populations. These findings indicate that would-be poachers profit from governmental laxity to act unlawfully or that would-be poachers use the cover of legal hunting to act unlawfully (Chapron and Treves 2016a,b; Santiago-Ávila *et al.* 2020; Louchouarn *et al.* 2021; Santiago-Ávila and Treves 2022).

Appendix 2: Survey instrument

2.0 Adverse Hound Hunting Related Incidents

The Protecting Native Forests and Wildlife Subcommittee of the Sierra Club-Wisconsin Chapter is conducting a survey to determine the frequency and severity of hounding-related experiences you may have encountered where you reside. The survey is anonymous: no identifying information is being requested. A comments section is provided at the end of this form. Completed surveys may be returned to [redacted for privacy] before conference close, or mailed to: [Redacted for privacy]

What county do you reside in? _____

2.1 Frequency of Events and observations made

1. Have you ever observed hunting hounds on your property? YES / NO
2. Do you recall how many hounds you saw?
   __ 1-4
   __ 5-8
   __ More than 8
3. How often have you observed hunting hounds on your property? Once/2-5 times/More than 5 occurrences/Too many times to count

   If YES, were you also able to observe what animal(s) the hounds were pursuing? YES/NO

   List species if YES _____

4. If you have observed hunting hounds on your property, were they accompanied by (a) handler(s)? YES / NO
5. Have hounds on your property attacked your pets and/or livestock? YES / NO
6. Are you personally aware of incidents of hounds attacking others' pets and/or livestock? YES / NO. If "YES", please describe in comment space below.
7. Have you ever found abandoned/lost hound(s) in or around your property? YES / NO.
8. If "YES", what action did you take if any? Contacted law enforcement/Contacted game warden/ Contacted local humane society or animal control/Took animal in to_____ /Other

Trespassing on private land

9. Were you ever asked by a hound handler for permission to be on your property for the purposes of hunting? YES / NO
10. If you were asked, and you replied "No," did the hound handler trespass on your property anyway? YES / NO
11. If YES, what action did you take? Nothing-fear retribution/Contacted local law enforcement/Contacted local Warden/Contacted WI DNR/Contacted WI Humane Society/Other

Threats to self, property, pets, livestock by hunting hound handlers

12. Have you ever experienced damage to your property that you know or suspected was due to hounding activities? YES / NO If YES, please describe in comments below.

13. Have you ever experienced injury to (a) pet(s) or livestock that you know or suspected was due to hounding activities? YES / NO. If "YES", please describe (text box provided for explanation).

14. Have you ever been chased and/or injured by (a) hound dog(s)? YES / NO. If "YES", please describe with approximate date in comments below.

15. Have you ever been directly confronted by (a) hound handler(s) and threatened with bodily harm? YES / NO If YES, please describe in comments below.

16. Have you ever been left an anonymous note that you suspected to be left by hound handlers that threatened you and/or your pets/livestock with harm? YES / NO

17. Do you personally know of anyone who has experienced real or perceived threats/persecution by hound handlers? YES/NO

If YES please describe in comments below.

18. Do you feel intimidated by hound handlers? YES / NO

19. Do you fear retribution from hound handlers if you report incidents involving their activity to local law enforcement? YES / NO

2.2 Law enforcement / Game Warden response to complaints, and conflicts of interest

20. Have you ever contacted local law enforcement, the local game warden, and/or the WDNR about any problem(s) you have experienced with hound handlers? YES / NO

21. If "YES," what kind of response did you receive?

__Warden or Officer responded, but nothing was done.

__The Warden/Officer followed up by contacting the suspected hound handler(s), and followed up with you.

__The Warden/Officer never responded.

__Other.

22. Do you ever see any local game wardens in the vicinity of your property? Never/On occasion/All the time

If YES, is there any particular time of the year when you see them most often? Circle all that are applicable: Deer season/Bear season/Wolf season/Turkey season/Bobcat season/Other

23. Are you aware of any law enforcement officer and/or game warden who also participates in hounding activities? YES / NO

24. If "YES," have these been the same individuals who have responded to your complaint(s) about hounding? YES / NO

25. Are you aware of law enforcement officers/game wardens who have personal relationships with hound handlers? YES/NO

If "YES," do you suspect a possible conflict of interest in performing their duties? YES / NO

2.3 Thank you for taking the time to respond to this survey. Please add any additional comments below. You may share your contact information if you wish. The Sierra Club, Wisconsin Chapter will not share your contact information without your permission.

Appendix 3: Qualitative data received from respondents reporting incidents, anonymized, and edited for clarity.

Hounding should not be allowed all over the state. It's a free-for-all in the national forests, and it's wrong. Oconto, WI

Please end this cruel sport. Bayfield, WI

I do not support running animals with hounds as a hunter. Florence, WI

Living in the North woods at this time of year is uncomfortable. Hounders are everywhere, running dogs on bear, blocking roads. Washburn, WI

Bear hounds have a negative impact upon wildlife and forest users. I believe hunting bears and wolves with hounds is one of the cruelest "sports" imaginable and separates bear families. Macon, GA

I live in the UP and am sick of bear hunters' lack of respect for landowners and care for their dogs. This is definitely a sport that should be stopped. Houghton, MI

I respect the Native cultural relationship with the wolf. We have had a gutted bear (left) on our property. Douglas, WI

I have found at least 5 lost hounds along the highway. One had foot injuries. Ontonagon, MI

Huge conflict of interest, but we are afraid. Dane, WI

I believe about ten years ago, Rep. Frank Boyle attempted to pass an ordinance to protect property owners from uncontrolled hounds. Ashland, WI

Bear hunting with hounds promotes unsafe situations for residents in bear country. Burnett, WI

Why run hounds in July when wolves have pups and in areas known to be inhabited by packs? Taxpayers should not be paying for this. It is a scam. Bayfield, WI

Hound hunting is cruel to the hounds and animals being hunted. Gogebic, MI

Bear hunters with hounds seem to feel they can trespass. They have a strong enough lobby to pre-vent any repercussions. Chippewa, WI

Men standing with trucks and ATVs and radios blocked me on a road on Federal public land. Three cubs ran in front of me. Location withheld

People have a right to protect their pets and livestock and not be afraid in their own homes. Fond du Lac, WI

Coyote hunters argued with me when we denied permission to hunt on our land. We do not sup-port hounding at all. Manitowoc, WI

I'm dismayed this form of cruelty is considered a legal form of "hunting" in Wisconsin. It's dread-ful and causes harm to a variety of wildlife species, not just the "target." St Croix, WI

I do not approve of hound hunting and believe it should not be practiced. Grant, WI

I don't believe in hound hunting for any animal. Price, WI
No animal should be taught to attack another animal and kill it. Location withheld

My experience during my 28 years as a municipal clerk is that hound hunting does cause problems. Eau Claire, WI
Hound hunting should be stopped. Under no circumstances should those dogs be paid for by tax payers after fights with wolves. Hunters are well aware what will happen to these dogs. Mara-thon, WI

The few times I've called law enforcement for trespassing, they tell me there's not much they can do. They've told me the hounders have a right to park in front of my driveway and run their dogs on my property. Polk, WI

I am very distressed that my state allows hunting of wolves and that the legislature circumvented the necessary period for monitoring. Hunting wolves and bears with hounds is despicable. Dane, WI
I hate hunting of any kind with dogs. I don't understand why it is ok for bear dogs to "train" in our national forests in the summer, harassing wildlife. Price, WI

Please, please, let's do something to stop this! Langlade, WI
Hounders' lack of respect for private property, and just the peace and quiet of my area are being totally disrupted when they run a bear or wolf through the area. Burnett, WI

There's no reason for hound hunting period. Even when they know (wolves have killed) a dog in the area, they still let them go and the hunter gets repaid. I won't go outside if I see them. Oconto, WI

I do not agree with letting dogs chase wild animals for "sport." It's disgusting. Wood, WI

(They have) no regard for trespassing on private land. Milwaukee, WI

Thank you for investigating this problem with wildlife management. Cuyahoga, OH

Hounding is unethical. Hounders train their dogs to destroy other animals. Hounders trade, sell, or dump their dogs once they stop performing. Bayfield, WI

I am a member of the NRA and Sierra Club. I believe hunting is a right, but the use of dogs to harass, maim, kill other animals is murder. Douglas, WI

I live next to hunting hounds and they are very noisy. There have been a lot of complaints, because we have no noise ordinance. I live in the country for nature, not barking dogs. Polk, WI

This problem is WAY bigger than me bugging [local law enforcement]…We have a very large dangerous problem with armed gangs of armed criminals breaking laws and terrorizing people. Some people find the level of lawlessness downright frightening. Town of draper has elderly residents that are afraid for their safety. Sawyer, WI

They threatened to burn a cabin down not far from my place if the property owner called the warden. They stole the property owner's trail cam[era] which had proof of them trespassing with their hounds. County withheld, WI.