**A****d****v****e****rse effects of hunting with hounds on participating animals and human bystanders**

**A****bstract**

Hunting mammals with hounds is little studied. We present two datasets consisting of quantitative and qualitative data from self-selected respondents. The first came from hound handlers’ reports of hound injuries with post hoc verifications by government agents. The second came from by-standers reporting eyewitness encounters with hounds or handlers. 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 wolves. The government did not collect data on wolves or other non-target animals that may have been injured during these encounters. We investigate two wolf-centred hypotheses for wolf-hound interactions, find little support for either and propose new hound-centred hypotheses: (1) some hounds, far from their owners, will attack any wildlife they detect, and (2) lack of law enforcement to discourage handler misconduct leads to unlawful behaviours from trespass to attacking non-target wildlife for which the handler has no permit. We also describe 105 human bystanders’ reports of experiences with hounds, handlers, and law enforcement agents. We discuss the limits to inference of official and NGO surveys whose methods are not fully documented.

**Keywords:** human-carnivore conflict and coexistence, dog, illegal take, poaching, wolf

**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 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 loosed far from their owners.

Despite its long history, hunting with hounds seems under-studied in scientific literature. 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 limited research attention. Additionally, the gap in information is also not found in legal proceedings, judging from one court case in Wisconsin (Brown v Kemp, 2021) where the practice of hound-hunting is protected from outside scrutiny such as video-recording or observing hound handlers in public places.

The practice of hunting mammals with hounds has been recorded for at least 8,000 years (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 & McDonald 2007). 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 (Gompper 2013, Grignolio, et al. 2011). Therefore, we present data derived from reports submitted by self-selected hound-handlers alleging harm to their hounds, following interactions with wolves. We also present self-reported perceptions of human by-standers who experienced the behaviour of hounds during training or hunting, and self-reported interactions with handlers or law enforcement agents that 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 plaints our scope is limited to adverse effects only as with 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 (Gompper 2013, Grignolio, et al. 2011). Dogs are potential predators of both domestic animals and wildlife (Bowers 1953, Ciucci & Boitani 1998) and their presence can often induce behavioural changes in wildlife. For example, American black bears (*U. 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 (Backeryd 2007, Treves, et al. 2002, Wydeven, et al. 2004).

Hounds are often used for pursuit of mammals larger than individual hounds. When hounds encounter animals that can defend themselves effectively, the hounds may be injured. 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 wolves and dogs in many regions (Backeryd 2007, Fritts & Paul 1989, Kaartinen, et al. 2009). The States of Wisconsin and Michigan, USA, have a relatively longer history of such research. Spatial patterns of wolf (*Canis lupus)* attacks on hounds are somewhat predictable (Bump, et al. 2013, Olson, et al. 2014, Treves, et al. 2002, Wydeven, et al. 2004). The risk of an attack appeared to be higher in areas with more public land, larger wolf packs, closer to a wolf pack, and when baits were left out longer. Building on these prior studies, we investigated two hypotheses about wolf-hound interactions (WHI). First, the predation hypothesis predicts WHI occur when 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 assess 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 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 (Ruid, et al. 2009, Treves, et al. 2002, Treves, et al. 2009). In a prior study, a number of wolf deaths caused by other canids were invariably attributed to other wolves (Treves, et al. 2017). 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 by-standers and either handlers or their free-running hounds. Although there are prior studies of hound handlers’ attitudes toward wildlife (Supplementary Material 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 such a study to collect data on by-stander experiences after a request for information from government agencies and law enforcement was returned without data. Therefore, SCWC members led an effort at gathering 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 by-stander experience 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.

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 two data sources carefully and transparently. We recommend avoiding a double standard of believing government surveys but disbelieving NGO surveys. The methods make them accurate or reproducible, not the source. Therefore, we offer the reports as a starting point for understanding and managing interactions between hounds, wildlife, bystanders, and handlers.

**Methods**

*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, Treves, et al. 2010). Hound hunters accounted for approximately 40% of the annual take by bear hunters (Olson, et al. 2014, Treves, et al. 2010). 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). WHI 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 one 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). WDNR provided compensation for domestic animals injured or killed by wolves, including hounds (Ruid, et al. 2009, Treves, et al. 2002, Treves, 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 & 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 program. Since the compensation program 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 (Naughton-Treves, et al. 2003, Ruid, et al. 2009, Treves, et al. 2002, Treves, et al. 2009). The current working hypothesis is that most WHI incidents were reported because of a compensation program characterized as more generous than those in other jurisdictions (Naughton-Treves, et al. 2003, Treves, et al. 2009). Corroborating, Bump et al. (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 (*Lynx rufus)*, or coyotes (*C. latrans)*, 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 one of the five listed above, we assumed the WHI occurred while pursuing the above three 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 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 two (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 3.6 pounds per week (Van Ballenberghe & 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 (Kreeger 2003, Ruprecht, et al. 2012, Van Ballenberghe & Mech 1975). 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 analyzed 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 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 (Olson, et al. 2014, Wydeven, et al. 2004). Within WCAs, the WDNR recommended that bear hunters release hounds >2 miles from known rendezvous sites. Prior work documented handlers’ willingness to risk hounds in posted WCAs, even within the same season and even within hours of previous WHI or WCA posting (Olson, et al. 2014, Wydeven, et al. 2004). 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 (Backeryd 2007, Khorozyan, et al. 2020), keeping hounds leashed until the targeted game species is located, or bringing first aid kits on the hunt, although the possible effect of these interventions has not been studied in Wisconsin.

Survey of by-standers

The Sierra Club Wildlife Committee (SCWC) subcommittee on Protecting Native Forests and Wildlife collected information from by-standers experiences with hounds loosed during hunting or training. The SCWC 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-aP061eyQ1hJQTS_8QKulY0IQxCz2WhWVCrNQDw/viewform?c=0&w=1> accessed 1 August 2023. SCWC 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. SCWC also invited any members of the public who described adverse hounding encounters to fill 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. SCWC administrators stripped identifying information from the data and shared the data with LM for publication. We analyzed 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 (Supplementary Material 2) is organized in four sections: Observations; Trespass; Property Damage, Personal Injury or Threats; and Interactions with Law Enforcement, totalling 22 yes/no questions and 4 items that allowed unstructured responses 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 two 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 (Supplementary Material 2). After the screening, the sample presented here appears to come from independent incidents.

We evaluated two 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. 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 availability). 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 of the WHI (i.e., killed or injured) after evaluating if variances were equivalent (*F* test). All statements of statistical significance are based on *P* ≤ 0.05. We used Spearman's rank correlation to detect associations between multiple continuous variables.

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 wolf attacks on dogs, where replicating the events is impossible, and confirming who the aggressor is likewise impossible. In these contexts, one has to trust a government agent’s field verification, even though methods for such verifications have not been described and different agents may differ in skill, bias, uncertainty, and 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 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.

**Results and Discussion**

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

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 & 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%, 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 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 (*X*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 (*X*2 = 8.5, *p =* 0.38, *df* = 8, *n =* 176, Table 1). These two results suggest that seasonality and wolf reproductive timing did not predict injury or death of hounds, which undermine both the predation and territoriality hypotheses but 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 *X*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 (*X*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 (Backeryd 2007, Fritts & Paul 1989, Kaartinen, et al. 2009, Peterson 1995). The Plott breed is also known for its baying vocalizations, which might alert wolves from a long distance, as in (Backeryd 2007, 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 one bite location (46%), 37 provided two 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 (*X*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 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 were both similar to 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; *n* = 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 hypothesis.

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 wolves visit 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 three to seven 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 defense 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 & King 1978, Van Valkenburgh & 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.

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

*Survey of by-standers*

In all, 105 respondents reported adverse incidents with hunting hounds from 51 Wisconsin counties, 4 Michigan counties, and 5 counties from other states. 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 119 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 those 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.

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.

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 aggression. In most cases, assessment of incidents depends on post hoc evaluations by government agents, despite the absence of standardized or fully described verification process and variation of expertise, assumptions and confidence among evaluators. As a result, this data cannot resolve questions for aggressive encounters. 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 behaviour of hunters and hounds exploiting mammals has rarely been investigated in North America. 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. Also, we present self-reported data on the experiences of bystanders exposed to hound behaviour, handler husbandry, and by-stander-handler interactions. We report by-standers 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 by-standers. We note an absence of systematic observations of behaviour of all participants.

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. 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. Nevertheless, we recommend the state obligate veterinary clinics that treat hounds for wildlife injuries to report each such incident so the welfare of hounds and preventive actions taken by handlers can be evaluated by professional veterinarians and wildlife scientists. In light of recent findings that studded leather collars protect cattle against leopards (Khorozyan, et al. 2020), recommending more precautions by handlers seems prudent.

Given the equivocal support for wolf-centred hypotheses, we propose two hound-centred hypotheses for WHI. First, some hounds far from their owners will 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. The absence of data on injuries to wolves or other non-target wildlife prevents evaluation of this hypothesis with existing records.

Second, lack of law enforcement to discourage handler misconduct leads to unlawful behaviours, from trespass to attacking non-target wildlife for which the handler has no permit. Our survey of by-standers documented repeated allegations of trespass, intimidation, property damage, and inaction or conflicts of interest among law enforcement officers. These conditions may reduce deterrence and increase the likelihood that handlers release hounds in ways that elevate risks to wildlife, hounds, and people.

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. 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. Regarding numerical superiority, perhaps both the large group sizes of hounds (up to 6 per owner) in Wisconsin and uncertainty about the number of wolves involved, has obscured associations with the fatality rates during WHI.

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.

If even one allegation of unlawful behaviour by handlers was accurate, we recommend attention by law enforcement and hunt managers, as follows from our second hound-centered hypothesis concerning the role of enforcement in handler behaviour. We found little financial or non-financial incentive for the self-reports, other than by-stander 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 program that paid for injured or dead hounds. That program also seems to need reform given that no information on harm to wolves was collected despite legal protections for wolves. It might be impossible to verify that the handlers or hounds were acting lawfully at the time of the WHI. 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 (SM 1). Wolf-poaching is the major cause of mortality in US wolf populations (Treves, et al. 2017). Most recently, data reveal that cryptic poaching of Wisconsin wolves rose during hound training, bear-hunting seasons, and deer-hunting seasons (Santiago-Ávila & 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 hours. Of these, >80% being killed by hunters using hounds; these incidents included at least some hound-inflicted injuries to wolves (Treves, et al. 2021).

The topic of comparing self-reports by handlers and self-reports by by-standers 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 by-standers described here suggests we need more attention to all participants affected by hunting.

In USA wildlife law, the Endangered Species Act (ESA) and federal court cases surrounding it 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). 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, the practice of hound-hunting in wolf pack territories should be prohibited when wolves are a listed species unless it can be regulated to reduce WHI 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 February2026 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 Literature, Leeward College, University of Hawaii and currently a member of the Endangered Species Coalition, Society for the Preservation of Poultry Antiquities, National Wolfwatchers Coalition, Wisconsin Wolf Trackers, Wolf Patrol, Executive Committee, Fox Valley Group, Sierra Club.

**Acknowledgments**

No funding was sought or required for this work.

**[References](https://doi.org/10.1007/s10592-017-1045-4)**

[2015 WildEarth Guardians, et al. v U.S. Department of Justice, p^pp. U.S. District Court Arizona](https://doi.org/10.1007/s10592-017-1045-4)

[2021 Brown, J. et al. v Kemp, J. et al., p^pp. U.S. Court of Appeals, 7th circuit](https://doi.org/10.1007/s10592-017-1045-4)

**[Backeryd J](https://doi.org/10.1007/s10592-017-1045-4)** [2007 Wolf attacks on dogs in Scandinavia 1995-2005](https://doi.org/10.1007/s10592-017-1045-4) *[Ecology Institute](https://doi.org/10.1007/s10592-017-1045-4)*[, p^pp. Swedish University of Agricultural Sciences: Grimso](https://doi.org/10.1007/s10592-017-1045-4)

**[Ballard WB, Carbyn LN, and Smith DW](https://doi.org/10.1007/s10592-017-1045-4)** [2003 Wolf interactions with non-prey, In: Mech L and Boitani L (eds)](https://doi.org/10.1007/s10592-017-1045-4) *[Wolves: behavior, ecology, and conservation](https://doi.org/10.1007/s10592-017-1045-4)* [p^pp 259-271. University of Chicago Press: Chicago](https://doi.org/10.1007/s10592-017-1045-4)

**[Bowers RR](https://doi.org/10.1007/s10592-017-1045-4)** [1953 The free-running dog menace.](https://doi.org/10.1007/s10592-017-1045-4) *[Virginia Wildlife](https://doi.org/10.1007/s10592-017-1045-4)***[14:](https://doi.org/10.1007/s10592-017-1045-4)** [5-7.](https://doi.org/10.1007/s10592-017-1045-4)

**[Bump JK, Murawski CM, Kartano LM, Beyer DE, and Roell BJ](https://doi.org/10.1007/s10592-017-1045-4)** [2013 Bear-Baiting May Exacerbate Wolf-Hunting Dog Conflict.](https://doi.org/10.1007/s10592-017-1045-4) *[PLos ONE](https://doi.org/10.1007/s10592-017-1045-4)***[10.1371/journal.pone.0061708](https://doi.org/10.1007/s10592-017-1045-4)**[.](https://doi.org/10.1007/s10592-017-1045-4)

**[Ciucci P, and Boitani L](https://doi.org/10.1007/s10592-017-1045-4)** [1998 Wolf and dog depredation on livestock in central Italy.](https://doi.org/10.1007/s10592-017-1045-4) *[Wildlife Society Bulletin](https://doi.org/10.1007/s10592-017-1045-4)***[26:](https://doi.org/10.1007/s10592-017-1045-4)** [504-514.](https://doi.org/10.1007/s10592-017-1045-4)

**[Fritts SH, and Paul WJ](https://doi.org/10.1007/s10592-017-1045-4)** [1989 Interactions of wolves and dogs in Minnesota.](https://doi.org/10.1007/s10592-017-1045-4) *[Wildlife Society Bulletin](https://doi.org/10.1007/s10592-017-1045-4)***[17:](https://doi.org/10.1007/s10592-017-1045-4)** [121-123.](https://doi.org/10.1007/s10592-017-1045-4)

**[Gompper ME](https://doi.org/10.1007/s10592-017-1045-4)** [2013](https://doi.org/10.1007/s10592-017-1045-4) *[Free-ranging dogs and wildlife conservation](https://doi.org/10.1007/s10592-017-1045-4)*[. Oxford University Press.: Oxford](https://doi.org/10.1007/s10592-017-1045-4)

**[Grignolio S, Merli E, Bongi P, Ciuti S, and Apollonio M](https://doi.org/10.1007/s10592-017-1045-4)** [2011 Effects of hunting with hounds on a non-target species living on the edge of a protected area.](https://doi.org/10.1007/s10592-017-1045-4) *[Biological Conservation](https://doi.org/10.1007/s10592-017-1045-4)***[144:](https://doi.org/10.1007/s10592-017-1045-4)** [641-649.](https://doi.org/10.1007/s10592-017-1045-4)

**[Guagnin M, Perri AR, and Petraglia MD](https://doi.org/10.1007/s10592-017-1045-4)** [2018 Pre-Neolithic evidence for dog-assisted hunting strategies in Arabia.](https://doi.org/10.1007/s10592-017-1045-4) *[Journal of Anthropological Archaeology](https://doi.org/10.1007/s10592-017-1045-4)***[49:](https://doi.org/10.1007/s10592-017-1045-4)** [225-236.](https://doi.org/10.1007/s10592-017-1045-4)

**[Heberlein TA](https://doi.org/10.1007/s10592-017-1045-4)** [2000 The gun, the dog and the thermos: Culture and hunting in Sweden and the United States.](https://doi.org/10.1007/s10592-017-1045-4) *[Sweden & America](https://doi.org/10.1007/s10592-017-1045-4)***[Fall 2000:](https://doi.org/10.1007/s10592-017-1045-4)** [24-29.](https://doi.org/10.1007/s10592-017-1045-4)

**[Hristienko H, and McDonald JEJ](https://doi.org/10.1007/s10592-017-1045-4)** [2007 Going into the 21st century: a perspective on trends and controversies in the management of the American black bear](https://doi.org/10.1007/s10592-017-1045-4) *[Ursus](https://doi.org/10.1007/s10592-017-1045-4)***[18:](https://doi.org/10.1007/s10592-017-1045-4)** [72-88.](https://doi.org/10.1007/s10592-017-1045-4)

**[Kaartinen S, Luoto M, and Kojola I](https://doi.org/10.1007/s10592-017-1045-4)** [2009 Carnivore-livestock conflicts: determinants of wolf (Canis lupus) depredation on sheep farms in Finland.](https://doi.org/10.1007/s10592-017-1045-4) *[Biodiversity and Conservation](https://doi.org/10.1007/s10592-017-1045-4)***[18:](https://doi.org/10.1007/s10592-017-1045-4)** [3503-3517.](https://doi.org/10.1007/s10592-017-1045-4)

**[Khorozyan I, Siavash G, Mobin S, Soofi M, and Waltert M](https://doi.org/10.1007/s10592-017-1045-4)** [2020 Studded leather collars are very effective in protecting cattle from leopard (Panthera pardus) attacks.](https://doi.org/10.1007/s10592-017-1045-4) *[Ecological S;lutions and Evidence](https://doi.org/10.1007/s10592-017-1045-4)***[1:](https://doi.org/10.1007/s10592-017-1045-4)** [e12013.](https://doi.org/10.1007/s10592-017-1045-4)

**[Kojola I, and Kuittinen J](https://doi.org/10.1007/s10592-017-1045-4)** [2002 Wolf Attacks on Dogs in Finland.](https://doi.org/10.1007/s10592-017-1045-4) *[Wildlife Society Bulletin](https://doi.org/10.1007/s10592-017-1045-4)***[30:](https://doi.org/10.1007/s10592-017-1045-4)** [498-501.](https://doi.org/10.1007/s10592-017-1045-4)

**[Kreeger T](https://doi.org/10.1007/s10592-017-1045-4)** [2003 The internal wolf: physiology, pathology, and pharmacology., In: Mech LD BL (ed)](https://doi.org/10.1007/s10592-017-1045-4) *[Wolves: behavior, ecology, and conservation](https://doi.org/10.1007/s10592-017-1045-4)* [p^pp 192-217. University of Chicago Press: Chicago](https://doi.org/10.1007/s10592-017-1045-4)

**[Mech LD](https://doi.org/10.1007/s10592-017-1045-4)** [1970](https://doi.org/10.1007/s10592-017-1045-4) *[The Wolf: The Ecology and Behavior of an Endangered Species](https://doi.org/10.1007/s10592-017-1045-4)*[. University of Minnesota Press, Minneapolis.](https://doi.org/10.1007/s10592-017-1045-4)

**[Merkle J, Stahler D, and DW S](https://doi.org/10.1007/s10592-017-1045-4)** [2009 Interference competition between gray wolves and coyotes in Yellowstone National Park.](https://doi.org/10.1007/s10592-017-1045-4) *[Canadian Journal of Zoology](https://doi.org/10.1007/s10592-017-1045-4)***[87:](https://doi.org/10.1007/s10592-017-1045-4)** [56-63.](https://doi.org/10.1007/s10592-017-1045-4)

**[Naughton-Treves L, Grossberg R, and Treves A](https://doi.org/10.1007/s10592-017-1045-4)** [2003 Paying for tolerance: The impact of livestock depredation and compensation payments on rural citizens' attitudes toward wolves.](https://doi.org/10.1007/s10592-017-1045-4) *[Conservation Biology](https://doi.org/10.1007/s10592-017-1045-4)***[17:](https://doi.org/10.1007/s10592-017-1045-4)** [1500-1511.](https://doi.org/10.1007/s10592-017-1045-4)

**[Newcomer E, Palladini M, and Jones L](https://doi.org/10.1007/s10592-017-1045-4)** [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.](https://doi.org/10.1007/s10592-017-1045-4) *[Animal Law](https://doi.org/10.1007/s10592-017-1045-4)***[17:](https://doi.org/10.1007/s10592-017-1045-4)** [241-271.](https://doi.org/10.1007/s10592-017-1045-4)

**[Newsome T, Bruskotter JT, and Ripple WJ](https://doi.org/10.1007/s10592-017-1045-4)** [2015 When shooting a coyote kills a wolf: Mistaken identity or misguided management?](https://doi.org/10.1007/s10592-017-1045-4) *[Biodiversity and Conservation](https://doi.org/10.1007/s10592-017-1045-4)***[24:](https://doi.org/10.1007/s10592-017-1045-4)** [3145-3149.](https://doi.org/10.1007/s10592-017-1045-4)

**[Olson ER, Treves A, Wydeven AP, and Ventura S](https://doi.org/10.1007/s10592-017-1045-4)** [2014 Landscape predictors of wolf attacks on bear-hunting dogs in Wisconsin, USA.](https://doi.org/10.1007/s10592-017-1045-4) *[Wildlife Research](https://doi.org/10.1007/s10592-017-1045-4)***[41:](https://doi.org/10.1007/s10592-017-1045-4)** [584–597.](https://doi.org/10.1007/s10592-017-1045-4)

**[Peterson R](https://doi.org/10.1007/s10592-017-1045-4)** [1995 Wolves as interspecific competitors in canid ecology, In: Carbyn L, Fritts S and Seip D (eds)](https://doi.org/10.1007/s10592-017-1045-4) *[Ecology and conservation of wolves in a changing world.](https://doi.org/10.1007/s10592-017-1045-4)* [p^pp 315-323. Canadian Circumpolar Institute.: Edmonton, Alberta, Canada](https://doi.org/10.1007/s10592-017-1045-4)

**[Plumer L, Talvi Tn, Männil P, and Saarma U](https://doi.org/10.1007/s10592-017-1045-4)** [2018 Assessing the roles of wolves and dogs in livestock predation and suggestions for mitigating human-wildlife conflict and conservation of wolves.](https://doi.org/10.1007/s10592-017-1045-4) *[Conservation Genetics](https://doi.org/10.1007/s10592-017-1045-4)***<https://doi.org/10.1007/s10592-017-1045-4>**.

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

**Roosevelt TD** 1902 *Hunting the Grisly and Other Sketches*. G. P. Putnam's Sons: New York

**Ruid DB, Paul WJ, Roell BJ, Wideven AP, Willging RC, Jurewicz RL, and Lonsway DH** 2009 Wolf–human conflicts and management in Minnesota, Wisconsin, and Michigan, In: Wydeven AP, Van Deelen TR and Heske EJ (eds) *Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story* p^pp 279-295. Springer: New York

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

**Sandstrom C, Pellikka J, Ratamaki O, and Sande A** 2009 Management of Large Carnivores in Fennoscandia: New Patterns of Regional Participation. *Human Dimensions of Wildlife* **14:** 37-50.

**Santiago-Ávila FJ, and Treves A** 2022 Poaching of protected wolves fluctuated seasonally and with non-wolf hunting. *Scientific Reports* **12:** e1738

**SAS Institute I** 2013 JMP 11.0, p^pp: Cary, North Carolina.

**Steklis HD, and King GE** 1978 The craniocervical killing bite: Toward an ethology of primate predatory behavior. *Journal of Human Evolution* **7:** 567-581.

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

**Treves A, Artelle KA, Darimont CT, and Parsons DR** 2017 Mismeasured mortality: correcting estimates of wolf poaching in the United States. *Journal of Mammalogy* **98:** 1256–1264.

**Treves A, Jurewicz RL, Naughton-Treves L, Rose RA, Willging RC, and Wydeven AP** 2002 Wolf depredation on domestic animals: control and compensation in Wisconsin, 1976-2000. *Wildlife Society Bulletin* **30:** 231-241.

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

**Treves A, Kapp KJ, and Macfarland DM** 2010 American black bear nuisance complaints and hunter take. *Ursus* **21:** 30–42.

**Treves A, Langenberg JA, López-Bao JV, and Rabenhorst MF** 2017 Gray wolf mortality patterns in Wisconsin from 1979 to 2012. *Journal of Mammalogy* **98:** 17-32.

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

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

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

**von Essen E, Hansen HP, Kallstrom HN, Peterson MN, and Peterson TR** 2015 The radicalisation of rural resistance: How hunting counterpublics in the Nordic countries contribute to illegal hunting. *Journal of Rural Studies* **39:** 199-209.

**Willging R, and Wydeven AP** 1997 Cooperative wolf depredation management in Wisconsin, In: Lee CD and Hygnstrom SE (eds) *Thirteenth Great Plains Wildlife Damage Control Workshop Proceedings.* p^pp 46-51. Kansas State University Agricultural Experiment Station and Cooperative Extension Service: Lincoln, NE

**Wydeven AP, Treves A, Brost B, and Wiedenhoeft JE** 2004 Characteristics of wolf packs in Wisconsin: Identification of traits influencing depredation, In: Fascione N, Delach A and Smith ME (eds) *People and Predators: From Conflict to Coexistence* p^pp 28-50. Island Press: Washington, D. C.

**Table 1.** The number of hounds 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** |

Table 2. By-stander reports (n=105) of 119 adverse interactions with hounds or their handlers across counties of Wisconsin, USA. Because a respondent might report more than one interaction, we present the counties from most reports 6) to fewest (1), the names of the 51 counties mentioned in reports, the sum of interactions per row, and the maximum number of hounds reported in a single interaction. When multiple reports were filed about the same interaction and the number of hounds differed, we counted only one interaction and averaged the number of hounds, rounding to the higher integer.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reports per county** | **Sum of the 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 |