Title: Removing wolves did not reliably prevent domestic animal losses

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Acknowledgments: This work reflects the views of the authors and not necessarily of their institutions and affiliations. See original articles for acknowledgments and funding related to each of the five original studies. AT was supported by a fellowship from the OECD Co-operative Research Programme: Sustainable Agricultural and Food Systems in 2022. DB-A, RNV, SP-B thank The Israel Nature and Parks Authority for sharing data S5. IK is currently supported by the Higher Education and Science Committee of Armenia (grant 25DD-1F069). MKr was supported by the Slovenian Research and Innovation Agency (grants no. J1-50013 and P4-0059). JVLB thanks the Spanish Ministry of Science and Innovation (grant PID2023-149634OB-I00).

Conflict of interest statement: Authors perceive no competing interests but share their CVs here https://faculty.nelson.wisc.edu/treves/CCC.php to allow readers to judge potentially competing interest whether financial or non-financial.

Data and materials availability: All data are available in SI 2, if the data were not published in the original sources.

Author contributions:

Conceptualization: AT

Methodology: AT, JVLB, MKu

Investigation: all co-authors

Funding acquisition: AT, DB, RV, SP

Project administration: AT

Supervision: AT

Writing – original draft: AT, IK, MKr, MKu, JVLB

Writing – review & editing: all co-authors

Ethics: See the five original papers for individual ethics statements. This review used no research subjects.

Title: Removing wolves did not reliably prevent domestic animal (DA) losses

Abstract: Humans usually try to kill wild animals that they perceive as threats. However, many scientific findings have raised doubts that killing solves wildlife damage to property. With scant, low-quality data, uncertainty persists. We reviewed recent studies of killing gray wolves to protect domestic animals. Our inclusion criteria set a minimum threshold for robust study design and transparent data sharing. In five studies in five countries, killing wolves typically had no effect, may have had the desired effect, but more often killing wolves had the counter-productive undesirable effect of elevating domestic animal losses. We quantified the relative rates of the three outcomes and find the balance in favor of no effect to undesirable effects. We discuss potentially confounding variables and the need for an unbiased, reproducible, transparent, randomized, and controlled trial of predator removal. We find and summarize similarities to other situations from disease transmission to crop damage.

Keywords: carnivores, conflict and coexistence, consensus reviews, livestock, predator control, non-randomized BACI, spatiotemporal recurrence and survival models

Number of Tables and Figures: 1 table in main text (6 tables in SI 2)

Introduction: Humans usually try to kill wild animals that they perceive as threats. Lethal interventions are common policies in agriculture or biodiversity sectors, especially for managing organisms we value less to protect organisms or personal property we value more. However, scientific findings from around the world have recurrently raised doubts about lethal interventions for solving human-wildlife conflicts, such as disease transmission, crop damage, or predation (reviewed in SI 1).

Because high-quality data on the effectiveness of lethal interventions are scant, uncertainty persists. Scientific uncertainties about the effects of killing on survivors and their ecosystems raise reasonable doubts about lethal management, as it is an irreversible intervention. In the absence of scientific consensus, policy-makers often fail to implement effective interventions or vacillate between constituents' interests.

The ongoing recolonization by gray wolves (*Canis lupus*) of several regions in Eurasia and the USA has produced controversies and efforts to ameliorate coexistence (citations below) and has led many jurisdictions to implement wolf removal. Therefore, we present a consensus view on the effectiveness of killing gray wolves to protect domestic animals. We exploited a modest increase in data about killing gray wolves to protect domestic animals (DA) from five studies in five nations conducted independently in the following chronological order: Slovenia, whole country (Krofel et al., 2011), USA state of Michigan (Santiago-Ávila et al., 2018a,b); Slovakia, whole country (Kutal et al., 2024); Latvia, whole country (Šuba et al., 2023); and Israel, Golan (Nadler Valency et al., 2025). Our inclusion and exclusion criteria followed statistical recommendations in (Santiago-Ávila et al., 2018a, Allison et al., 2015; Christie et al., 2020). Naturally, the exclusion of studies is controversial, so interested readers are provided with full citations to prior reviews and individual studies of note in SI 1. Nonetheless, numerous excluded studies parallel our findings (SI 1).

While varying in study design, all five studies in Table 1 strove to answer a very similar question about the effectiveness of removing wolves to protect DA. Therefore, we consolidated these five efforts as 'technical replications with new data' (i.e., very similar methods for addressing the same causal mechanism) following a typology of replication efforts (Treves et al., 2026). The observed killing methods included government agents shooting wolves or live-trapping followed by shooting. Agents also included private individuals or nongovernmental organizations issued permits to shoot wildlife. We use the acronym DA to avoid an anthropocentric bias attached to "stock" and to include dogs and animals that may not fit the former terms well (e.g., equids).

Our study and its findings address ongoing policy debates about wolf-human interactions across the USA and EU especially relating to interventions aimed at reducing conflict or raising tolerance of people for wolves (Chapron et al., 2014; USFWS, 2020; Treves & Bruskotter, 2014).

Table 1. Five studies of wolf killing in five countries and the subsequent effect on domestic animal (DA) losses.

Site, source	Study design (and comment on handling of temporal autocorrelation TAC, dose D, and treatment bias TB †)	Spatial & temporal scale of study and subset for the analysis at right	Increase in DA losses (% and net losses*)	No change in DA losses (% and net losses*)	Decrease in DA losses (% and net losses*)
Slovenia (Krofel et al. 2011, SI 2 for data)	Correlation & nBACI (no control over TAC, D, TB)	Comparing DA losses nationwide in year t to those in year t+1 from 1996-2009	20-27% (net loss +39 DA predation incidents)	0-20%	57-73%
USA, Michigan (Santiago-Ávila et al. 2018a,b)	Cox proportional hazards and frailty models, i.e., spatiotemporal recurrence (no control over TB, tested D, but controlled TAC)	Comparing recurrence of DA losses after wolf killing events to that of no-kill interventions for periods <1 year at 3 spatial scales of the Upper Peninsula, Michigan from 1998-2014 (n=199 buffers with or without wolf killing)	78% increased hazard within 92.2 km^2, (spill-over effects)	Inferred no net effect	27% decrease in hazard (2.56 km^2); 28% decreased hazard within 144 km^2
Slovakia (Kutal et al. 2024, SI 2 for data)	Correlation by negative binomial GLMM and a temporal autocorrelation structure (n= 293 district-years) & subset nBACI (no control over D, TB, but the subset controlled TAC).	Comparing DA losses, at district level, in year t to those in year t+1 from 2014-2019 (General dataset: 25 pairs of sequential years in treatment sites vs. 44 pairs of sequential years in non-randomized set of controls; Refined dataset: 13 pairs in treatment vs. 29 pairs in control). (SI 2)	Treatment 0-8%, control 0-2%	Treatment 62%, control 91%	Treatment 31-38%, control 7-9%
Latvia (Šuba et al. 2023, SI 2 for data)	Correlation by negative binomial regression, n=21 sequential years nationwide (no control over TAC, D, TB)	Comparing DA losses nationwide in year t to those in year t+1 from 2004-2022 with variable wolf killings (never zero) nationwide	33-47% (net loss +20 sheep verified lost, or +195 DA reported killed)	0-20%	53-67%
Israel, Golan (Nadler Valency 2025, SI 2 for data)	Cox proportional hazards & frailty models (spatiotemporal recurrence) n= 468 - 11 excluded records = 457 comprising 245 DA losses + 212 shootings (no control over D, TB, but controlled TAC)	Comparing time to recurrence of DA losses after wolf killing to that of no-kill intervention for periods of 60 days at 2 spatial scales in the Golan Heights 2013-2021	70% increased hazard (unit and segment scales, spill-over effect)		30% decrease in hazard (unit and segment scales)

† Temporal autocorrelation (TAC) refers to sites in which losses in one year correlate to losses in the following year, even when no intervention was attempted. Dose (D) refers to how many wolves were killed or how much effort was made to kill wolves. Treatment bias (TB) refers to killing more wolves where more losses had occurred.

†† The rightmost column is a qualitative and ranked estimate of treatment effects for cross-study comparative measure analogous to what an observer might perceive as the outcome of a change in legal wolf killing from time t to time t+1 across spatial units. The original within-study statistical analyses should be consulted to see estimates of treatment effects in each study. The ranges of values indicate whether one includes years with zero wolf killing or not, and whether the original study presented two measures of DA loss. SI 2 for description of methods.

* %: estimated as the proportion of pairs of replicates for non-randomized before-and-after control impact (nBACI) or correlation studies or % change in hazard for spatiotemporal recurrence. For nBACI and correlation studies, we estimated the net DA loss across all replicates where + signifies an increase (undesirable, counter-productive effect).

Materials and Methods: Because there has never, to our knowledge, been a reliable, randomized study of wolf killing (SI 1), we included all studies of lower standard that we deemed reliable by statistical and research design standards explained next. We avoided overwhelming bias. The phrase ‘overwhelming bias’ refers to problems in design and analysis identified by the statisticians in (Santiago-Ávila et al., 2018a, Allison et al., 2015; Christie et al., 2020; Treves & Khorozyan, 2025); namely, mistaken analysis of clustering which inflates apparent treatment effects; inappropriate baselines; unexplained or arbitrary discarding of data; or unclear methods without presentation of data for replication efforts. We detail inclusion and exclusion criteria in SI 1. Several of the excluded studies reported mixed results as our included studies did, so decisions to exclude were made a priori based on methods (SI 1). We included studies that (a) used either non-randomized before-and-after control-impact (nBACI, see SI 1 for synonymous terms for these designs) or the analogous time-to-event analyses for recurrence of wolf attacks on DA that treated sites or herds as replicates and measured time to the next event of DA loss (hereafter spatiotemporal recurrence); and also (b) studies that shared data and all methods so we could evaluate if the study did not include researcher bias in selection of subjects, treatments, measurements, or reporting. If raw data were not presented in the original study, we include those data in SI 2.

We prioritized qualitative assessment of the treatment effects of killing wolves across the 5 studies rather than a formal meta-analysis for two reasons. We do not consider the field ripe for a quantitative meta-analysis because the field lacks standardized measures of treatments let alone outcomes (SI 1 and 2). Without standardized method of intervention (methods for killing wolves differed somewhat in every study) and outcomes (DA losses were measured, verified, and reported slightly differently), we do not believe the field is ready for formal meta-analysis yet. We inferred the desired effect (DA losses diminished), no effect, or the undesirable effect of an increase in DA losses, separately for each study. Thus, we have a semi-quantitative measure of treatment effect analogous to +1, 0, or -1. We quantified treatment effects within studies in Table 1.

Table 1 here

Here we describe a method for cross-study comparison of domestic animal (DA) losses following wolf-removals. In Table 1, we present that cross-site comparison for each study's quantitative treatment effect for comparison purposes. For the two studies that used time-to-event analyses (Michigan, USA and Golan, Israel) we inferred a net treatment effect of removing wolves directly from hazard ratios in the published studies (Santiago-Ávila et al., 2018a,b) and (Nadler Valency et al., 2025) respectively. For studies that used nBACI or simple correlation, we had to estimate similar, meaningful comparisons of treatment effects across studies (Table 1). For two datasets, we group the studies in Slovenia (Krofel et al., 2011), and Latvia (Šuba et al., 2023), as country-wide nBACI in which pairs of sequential years are treated as the before-and-after measures and the intervention changes from year to year fluctuating up and down including zero wolf-killing in some years (SI 2). For Slovenia and Latvia, we developed the following method that allows comparisons across studies. We calculated the change in the number of wolves killed (year t+1 – year t) and the change in the number of DA lost (year t+1 – year t) as they were reported in the original studies. Our handling of the Latvia and Slovenia studies is distinct from the Slovakia dataset (Kutal et al., 2024) in which, at the district level, the authors selected a non-randomized set of controls (districts with zero wolf-killing in a pair of sequential years) to compare to treatment sites (districts with >0 wolf-killing that occurred at the end of the first year "before", whereas the second year was considered as "after", see (Kutal et al., 2024) for details and SI 2 for data). Our challenge was to devise a method for cross-study comparisons across the three nBACI sites in Table 1, which could be interpretable for a qualitative conclusion about treatment effects. In the Slovakian case, it may be more appropriate to compare the outcome from Slovakia with the other studies focusing on treatment sites (i.e., with wolf-killing >0), because all the Slovakian control sites had zero wolf-killing. However, we consider it also informative to present the outcome from control sites separately (wolf-killing = 0), because it informs us about the heterogeneity in the outcomes of DA losses without intervention. Therefore, Table 1 for Slovakia presents results for both treatment and control (no wolves removed) conditions.

In short, we test the traditional hypothesis that increasing the reported wolf-killing will reduce DA losses or the newer hypothesis that killing more wolves will increase DA losses, “throwing water on the fire” in the former prediction or “adding fuel to the fire” in the latter prediction, following formal hypotheses proposed in (Treves et al., 2019). In both approaches (with or without years with no change in wolf-killing) we then tallied up the number of years in which the desired effect was seen (reduction in the number of DA lost), undesirable effect (increase in the number of DA lost), or no effect (no change in the number of DA lost). For the Slovakian study, we report the average and variability in DA loss in both control and treatment replicates (see Table 1).

In SI 2, we considered the potential problem that wolf-killing rates in one study were not measured equivalently as wolf-killing rates in another study. Relatedly, in the same section of SI 2 we examine the problem of undetected and unmeasured wolf-killing from illegal or unreported causes. These uncertainties in treatment dose could confound a potential cross-site assessment of treatment effects. We discuss the potentially confounding effect of unreported wolf-killing in SI 1, to justify our prediction that the error produced would be random, not systematically under- or over-estimating dose effects of wolf-killing. For these reasons, we assume our inferences about treatment effect are not comparing zero wolf-killing to some wolf-killing but comparing low wolf-killing to higher wolf-killing within the five studies for which we have raw data (SI 2). Such within-site comparisons further preclude a meta-analytic quantification of treatment effect sizes. We limit ourselves to qualitative cross-site comparisons and call for larger, randomized trials to overcome these uncertainties.

Ethics: See the five original studies for ethics disclosures. For this review, we did not need research subjects or permits.

Results: We found that the effect of killing wolves to protect domestic animals (DA) is highly unpredictable, as recently practiced in five studies (Table 1). Killing wolves typically had no effect; less commonly had the desired effect; and also, less commonly had the counter-productive undesirable effect of elevating DA losses (hereafter undesirable effect).

All five studies showed some desirable effects and some undesirable effects (Table 1). The consensus result was no effect. We estimated the relative rates of the three treatment effects, using a cross-study metric described in SI 2. We conclude from that estimate that the balance falls in favor of no effect to undesirable effects.

Three studies originally reported statistically significant effects at $p<0.05$ (Kutal et al., 2024, Šuba et al., 2023, Nadler Valency et al., 2025). Three found a preponderance of undesirable effects yielding higher DA losses (Santiago-Ávila et al., 2018a,b; Kutal et al., 2024, Nadler Valency et al., 2025). The three nBACI studies allowed us to quantify the annual rates of different treatment effects at either national or subnational levels (Table 1, SI 2). The other spatiotemporal recurrence models do not permit such a straightforward description of desirable and undesirable effects, although they agreed on the occurrence of spill-over effects (Santiago-Ávila et al., 2018a,b; Nadler Valency et al., 2025). The spill-over in this context refers to DA losses due to predation in neighboring livestock herds after wolves were killed. Potential spill-over effects emphasize the need for standardized spatiotemporal methods and control over variables that vary between herds, such as herd protection methods (Nadler Valency et al., 2025).

Discussion: From the five field studies with similar methods and shared data, we find consensus that killing wolves to protect domestic animals (DA), as currently practiced, was highly unpredictable. Killing wolves typically had no effect, may have had the desired effect but more often wolf-killing had the counter-productive undesirable effect of elevating DA losses. We quantified the relative rates of the three outcomes to infer qualitatively that the balance favors no effect to undesirable effects.

Our exclusion criteria did not slant our main conclusion of mixed treatment effects, because several of the prominent excluded studies also reported those mixed effects, albeit without sharing the data allowing us to replicate their findings (SI 1). In SI 1, we summarize several proposed explanations for the mixed treatment effects.

Strength of inference was not uniform across the studies (Table 1). Sample sizes differed and study designs differed in robustness (Christie et al., 2020; Treves & Khorozyan, 2025). We agree that the highest standard of a reliable, reproducible randomized, controlled trial (RCT) on removal of wolves is needed. We recognize the obstacles to such an RCT include organizational will, funding, and stringent planning. Yet, the examples of reliable RCTs of lethal interventions against smaller carnivores, e.g. badgers (*Meles meles*) in the UK to prevent transmission of bovine tuberculosis to cattle, and also, poisoning red foxes (*Vulpes vulpes*) and dingoes (*Canis familiaris dingo*) in Australia to prevent sheep losses (Bielby et al., 2016; Greentree et al., 2000; Campbell et al., 2019; Allen et al., 2020; SI 1 for summary of several other badger and dingo studies), suggest that at least some of the obstacles can be practically overcome when favorable conditions align. However, as with wolves, the badger, fox, and dingo studies also reported mixed and unpredictable outcomes of lethal interventions with slight desired effects and occasional undesirable effects (similar results for crop loss and other property are summarized in SI 1).

We report consensus on common, unmeasured confounding variables. We agree on the need to reduce uncertainty surrounding the identification of wolf kills versus scavenging or predation by other species including dogs (studies summarized in SI 1). We also agree on the importance of identifying the wolves killed that were uninvolved, relative to those actually involved in predation on DA. We also agree on the modest quality of the essential evidence collected by governmental agencies in the five studies we reviewed (SI 2). These sources of error may be systematic or random and appear in part or in whole in each of the five studies (Table 1). Following the below discussion of potentially confounding variables, we outline what we see as minimum record-keeping to remedy the current gaps in scientific data.

We also agree on and stress the importance of variability in wolf-DA-human interactions caused by, but not limited to, individual wolf behavior; pack density, dynamics, and distribution including social structures and behaviors before and after any intervention; vulnerability of DAs including human behavior in both husbandry and intervention; and the presence or abundance of surviving predators (of any species) to replace those removed (Summaries in SI 1). All of these variables and perhaps, particularly, wild food availability or appearance in wolf diet and DA protection methods (e.g., fencing, herders) may confound interpretations of treatment effects.

Wolf removal studies have sometimes tried but invariably failed to account for some or all of the above variables scientifically. That is not to say every single variable in a wolf-DA-human landscape should be rigorously measured. Rather, unbiased RCTs or better 'platinum-standard' cross-over designs with blinding (Mukherjee 2010; Treves et al., 2019; Khorozyan 2021; Treves & Khorozyan, 2025) and adequate sample sizes might be needed to overcome much of the complexity of potentially confounding effects below.

We emphasize three common potentially confounding variables (temporal autocorrelation TAC, dose effect D, and treatment bias TB) in Table 1, which often produce errors in non-randomized studies. Such errors include false positives (inferring a treatment when none exists) and reversal of the sign of relationship (inferring the opposite effect than the true effect). The three potential confounding conditions (TAC, D, and TB) deserve special mention because they may frequently produce false discoveries or diametrically opposite inferences about treatment effects in exactly the study designs and animal systems we review here (Treves & Khorozyan, 2025).

Temporal autocorrelation: A common potentially confounding variable in wildlife removal studies is spatial or temporal autocorrelation (TAC in Table 1) between the losses in domestic animal herds or sites in time t and t+1 or location x and adjacent locations (Treves & Khorozyan, 2025). If a herd or site is subject to repeated losses over time, or different herds face losses in the same places (hereafter hotspots), one has to account for autocorrelation independent of a treatment effect. Such autocorrelations are a common condition in wolf-human interactions and a well-known problem for non-randomized study designs (Christie et al., 2020; Treves & Khorozyan, 2025). Hotspots can pose several problems for wildlife removal studies. Hotspots can arise due to neglect of property or inadequate husbandry practices (e.g., grazing near core wolf areas without herd protection); poor health or vulnerable condition of DA; or repeated use of landscape features (e.g., rugged topography or dense vegetation). Under such conditions, losses may escalate independent of predator variables, and morbidity of DA may contribute to perceived predation and elevated scavenging rates. This may lead to temporal or spatial autocorrelation of losses independent of predators or their removals. All of the studies we summarize here reported hotspots of DA losses, yet it can be very challenging to statistically account for spatiotemporal autocorrelation of hotspots before evaluating treatment effects (Santiago-Ávila et al., 2018a). The latter study and (Nadler Valency et al., 2025) used a variant of survival models called frailty models, which accounted for farm identity in the overall pattern of recurrence of losses and also addressed spatial autocorrelation in losses (Santiago-Ávila et al., 2018a, Nadler Valency et al., 2025); one of those studies also excluded farms with chronic losses, (see SI in Santiago-Ávila et al., 2018a). Even in randomized studies, investigators may need to account for spill-over effects and the wider spatiotemporal distribution of effects of wildlife removal. The correlation and nBACI studies in Table 1 could not correct for temporal autocorrelation except when selecting a subset of control and treatment sites (Santiago-Ávila et al., 2018a; Kutal et al., 2024).

Dose (D): A different, potentially confounding variable is the 'dose', by which we mean the intensity of removal of wolves either measured as the number of wolves removed or the intensity of human effort to remove the same number of wolves. Increasing the dose in response to subjective perceptions of a need is a common human reaction to wildlife conflicts (Treves & Khorozyan, 2025, and SI 1). After suspected predation, people tend to kill more predators around sites or herds experiencing higher losses. Using a biomedical analogy, providing more medicine to those who suffer more frequent or more severe symptoms might be sensible. One can imagine when it is sensible (e.g., more serum for the patient who has lost more blood) and when it becomes an unreasonable dose (e.g., massive doses of aspirin for a severe headache). Regardless of how one takes medicines or values wolves, it is unclear if increasing the dose is appropriate when removing wild wolves. Correlations between the dose and prior losses produce high rates of error about the treatment effect of wolf removal if one cannot exploit a randomized study design, as shown by simulations (Treves & Khorozyan, 2025).

Treatment Bias (TB): Varying a dose subjectively as above would constitute TB. Yet other variations of treatment bias exist, particularly in non-randomized studies. Because many wolf attacks on domestic animals occur once without recurring (SI 1), the assumption that one should kill more wolves where more DA were reported lost cannot be practically validated without a control or counterfactual – what would have happened without an intervention? Lack of a 'zero dose' or an appropriate baseline or control condition would also introduce TB, when sites with no wolves killed were not studied. All included studies measured outcomes after zero losses. For example, (Nadler Valency et al., 2025) reported on two herds in farms contrasting sharply in husbandry. One farm implementing frequent wolf shooting faced persistent losses, while the other implementing no wolf shooting had the lowest rate of loss.

Furthermore, regarding TB, the methods used for removing wolves are important and rarely standardized or described scientifically. Namely, the design of interventions — such as the precise, verified locations of wildlife-removal related to locations of losses; the intervals of time elapsing between a loss and an intervention; the deployment and design of removal methods, and whether they are direct (e.g., shooting) or indirect (e.g., trapping) — are all essential to strong inferences about the effectiveness of wildlife-removal. Failing to describe interventions can elevate TB and other biases (Allison et al., 2015). Standard procedures for design and administration of treatments along with 'blinding' (concealing which subject received which condition) should reduce TB (Mukherjee 2010; Treves et al., 2019; Treves & Khorozyan, 2025, Khorozyan 2021).

Limitations: We conclude that no single study can capture the ultimate effect of removing wolves at a site (or probably any other species, see SI 1). That inference seems especially valid when one lacks randomized controls, a large sample of independent replicates (n>100), and accounting for the two key confounding variables of TAC and TB discussed above. Even the results of RCTs can be site-dependent under clinical or field trials. For example, the timing of intervention may critically affect its success. This reminds us that contentious debates between teams of investigators with opposing conclusions demand more evidence because both teams can be correct or both can be wrong (Christie et al., 2020; Treves & Khorozyan 2025).

Conclusions

In conclusion, wolf removal to protect domestic animals as recently practiced in the five studies we reviewed (e.g., government agents arriving at the scene long after the loss of domestic animals, often removing wolves far from the original sites) seems poorly designed for the intended effects. Moreover, the risk of undesirable effects and spill-over effects into neighboring herds or subsequent years raise doubts about removing wolves. Simple adherence to the precautionary principle would warn against such an intervention, as recent Court of Justice of the European Union decisions on wolves declare (Trouwborst 2026). Given the latter judgments that EU member countries will have to use the best scientific knowledge and precautions to maintain wolves at “favourable conservation status”, we suggest government data collection about wolf-killing needs enhancement.

We recommend more care in data collection to avoid the waste of scarce public resources on ineffective interventions and insensitive research. We recommend government agencies train and deploy rapid response teams that would monitor complaints or respond to imminent risks, as follows: (a) visiting all farms in wolf range at least annually; (b) with a systematic protocol for data collection; (c) including zeros (no losses occurred, no wolves killed) in the latter protocol; (d) annually update records of the presence and condition (functional or neglected) of DA protection methods; and (e) herd manager perceptions of wolf presence and wild prey presence (absent, rare, frequent). When such teams respond to imminent risk, we recommend they enhance protections and monitor results faithfully thereafter. When such teams respond to losses, they should be trained and equipped to verify if predation and which predator was involved. Blind trials of the accuracy of verification by the personnel in such teams would go a long way to improving the scientific rigor of data on wolf-DA interactions. Hopefully, such simple data collection methods would improve the field’s deficiencies in measuring some of the confounding variables we described above. Inevitably, some funders might balk at financing field teams visiting all DA properties in a large wolf range. Perhaps, this article and clear explanations of the impossibility of drawing inference about interventions without such data would be persuasive.

Given that wolves and DA lives and human property may be lost and human socio-economic and conservation values are at stake in this issue, this is not a question of wildlife removal versus animal welfare, rights, values or moral concerns. Rather, this is a scientific debate over the rationality and effectiveness of applications of lethal vs non-lethal interventions.

Regardless of scientific evidence, human preferences or value judgments could prevail in some jurisdictions. If that and other undesirable outcomes we have discussed above, were to surface in public policy, then we urge the involved policy-makers to transparently separate values from evidence. This could be done most simply by the final decision-maker stating, "Despite the evidence that removing wolves does not generally protect DA, we will remove wolves anyway because we value X." (Here, X is a normative, moral argument, not an assertion about evidence for effectiveness). For example, X could be 'public safety comes first', 'hunters need more access', 'we don't trust science' (Treves et al., 2024). In short, when decision-makers foreground values over evidence they should transparently disclose that priority rather than claim the value is evidence-based. Such transparency from decision-makers might help the public understand why decisions were made.

References

Agan, S. W., Treves, A., & Willey, E. L. (2021). Estimating poaching risk for the critically endangered wild red wolf (*Canis rufus*). *PLoS One*, *16*(5), e0244261. DOI 10.1371/journal.pone.0244261

Allen, B. L. (2018). And the people's choice award goes to. . . dogs: a comment on Home et al., *Animal Conservation*, *21*, 283–284. DOI 10.1111/acv.12436

Allen, B. L., Allen, L. R., Engeman, R. M., & Leung, L. K.-P. (2014). Sympatric prey responses to lethal top-predator control: predator manipulation experiments. *Frontiers in Zoology*, *11*(56), 1-30. DOI 10.1186/s12983-014-0056-y

Allen, B. L., Geoff Lundie-Jenkins, Neil D. Burrows, Richard M. Engeman, Peter J.S. Fleming, & Leung, L. K.-P. (2016). Does lethal control of top-predators release mesopredators? A re-evaluation of three Australian case studies. *Ecological Management & Restoration*, *15*(3), 193-195. DOI 10.1111/emr.12118

Allen, B. L., & Hampton, J. O. (2020). Minimizing animal welfare harms associated with predation management in agro-ecosystems. *Biological Reviews of the Cambridge Philosophical Society*, *95*(4), 1097-1108. DOI 10.1111/brv.12601

Allen, B. L., L. R., Allen, H., Andrén, G., Ballard, L., Boitani, R. M., Engeman, P. J., Fleming, A. T., Ford, P. M., Haswell, & Kowalczyk, R. (2017). Can we save large carnivores without losing large carnivore science? *Food Webs*, *12*, 64-75. DOI 10.1016/j.fooweb.2017.02.008

Allen, L. R. (2014). Wild dog control impacts on calf wastage in extensive beef cattle enterprises. *Animal Production Science*, *54*(2). DOI 10.1071/an12356

Allen, L. R. (2015). Demographic and functional responses of wild dogs to poison baiting. *Ecological Management & Restoration*, *16*(1), 58-66. DOI 10.1111/emr.12138

Allen, L. R., Barnes, T. S., Fordyce, G., McCosker, K. D., & McGowan, M. R. (2020). Reproductive performance of northern Australia beef herds. 8. Impact of rainfall and wild dog control on percentage fetal and calf loss. *Animal Production Science*, *63*(4), 388-394. DOI 10.1071/an19430

Allen, L. R., & Sparkes, E. C. (2001). The effect of dingo control on sheep and beef cattle in Queensland. *Journal of Applied Ecology*, *38*, 76-87. DOI 10.1046/j.1365-2664.2001.00569.x

Allison, D. B., Brown, A. W., George, B. J., & Kaiser, K. A. (2016). Reproducibility: A tragedy of errors. *Nature*, *530*, 27-29. DOI10.1038/530027a

Behdarvand, N., Kaboli, M., Ahmadi, M., Nourani, E., Mahini, A. S., & Aghbolaghi, M. A. (2014). Spatial risk model and mitigation implications for wolf–human conflict in a highly modified agroecosystem in western Iran. *Biological Conservation*, *177*, 156-164. DOI 10.1016/j.biocon.2014.06.024

Bielby, J., Vial, F., Woodroffe, R., & Donnelly, C. A. (2016). Localised badger culling increases risk of herd breakdown on nearby, not focal, land. *PLoS One*, *11*(10), e0164618. DOI 10.1371/journal.pone.0164618

Bjorge, R. R., & Gunson, J. R. (1985). Evaluation of wolf control to reduce cattle predation in Alberta. *Journal of Range Management*, *38*, 483-486.

Blanco, J., & Sundseth, K. (2023). *The situation of the wolf (canis lupus) in the European union – An in-depth analysis*. online: Publications Office of the European Union Retrieved from https://op.europa.eu/en/publication-detail/-/publication/5d017e4e-9efc-11ee-b164-01aa75ed71a1/language-en, accessed 5 March 2026.

Bradley, E. H. (2004). *An Evaluation of Wolf-Livestock Conflicts and Management in the Northwestern United States. PhD thesis,* University of Montana, Missoula, MT, USA.

Bradley, E. H., Robinson, H. S., Bangs, E. E., Kunkel, K., Jimenez, M. D., Gude, J. A., & Grimm, T. (2015). Effects of Wolf Removal on Livestock Depredation Recurrence and Wolf Recovery in Montana, Idaho, and Wyoming. *Journal of Wildlife Management*, *79*(8), 1337–1346. DOI 10.1002/jwmg.948

Breck, S. W., Davis, A. J., Oakleaf, J. K., Bergman, D. L., deVos, J., Greer, J. P., &, & Pepin, K. (2023). Factors affecting the recovery of Mexican wolves in the Southwest United States. *Journal of Applied Ecology*, *60*, 2199–2209. DOI 10.1111/1365-2664.14483

Broekhuis, F., Cushman, S. A., & Elliot, N. B. (2017). Identification of human-carnivore conflict hotspots to prioritize mitigation efforts. *Ecology & Evolution*, *7*(24), 10630-10639. DOI 10.1002/ece3.3565

Campbell, G., Coffey, A., Miller, H., Read, J. L., Brook, A., Fleming, P. J. S., Bird, P., Eldridge, S., & Allen, B. L. (2019). Dingo baiting did not reduce fetal/calf loss in beef cattle in northern South Australia. *Animal Production Science*, *59*(2), 319-330. DOI 10.1071/an17008

Chapron, G., Kaczensky, P., Linnell, J. D. C., von Arx, M., Huber, D., Andrén, H., López-Bao, J. V., Adamec, M., Álvares, F., Anders, O., Balčiauskas, L., Balys, V., Bedő, P., Bego, F., Blanco, J. C., Breitenmoser, U., Brøseth, H., Bufka, L. k., Bunikyte, R.,…Boitani, L. (2014). Recovery of large carnivores in Europe’s modern human-dominated landscapes. *Science*, *346*(6216), 1517. DOI 10.1126/science.1257553

Chapron, G., & Treves, A. (2016a). Blood does not buy goodwill: allowing culling increases poaching of a large carnivore. *Proceedings of the Royal Society B*, *283*(1830), 20152939. DOI 10.1098/rspb.2015.2939

Chapron, G., & Treves, A. (2016b). Correction to ‘Blood does not buy goodwill: allowing culling increases poaching of a large carnivore’. *Proceedings of the Royal Society B*, *283*(1845), 20162577. DOI 10.1098/rspb.2016.2577

Chapron, G., & Treves, A. (2017a). Reply to comment by Pepin et al., 2017. *Proceedings of the Royal Society B*, *284*(1851), 20162571. DOI 10.1098/rspb.2015.2939

Chapron, G., & Treves, A. (2017b). Reply to comments by Olson et al., 2017 and Stien 2017. *Proceedings of the Royal Society B*, *284*(1867), 20171743. DOI 10.1098/rspb.2017.1743

Christie, A. P., Amano, T., Martin, P. A., Shackelford, G. E., Simmons, B. I., & Sutherland, W. J. (2019). Simple study designs in ecology produce inaccurate estimates of biodiversity responses. *Journal of Applied Ecology*, *56*, 2742–2754. DOI 10.1111/1365-2664.13499

Christie, A. P., Abecasis, D., Adjeroud, M., Alonso, J. C., Anton, A., Baldigo, B. P., Barrientos, R., Bicknell, J. E., Cebrian, J., Ceia, R.S., Cibils-Martina, L., Clarke, S., Claudet, J. Craig, M. D., Davoult, D., De Backer, A., Donovan, M. K., Eddy, T. D., França, F. M.,…Buhl, D. A. (2020). Quantifying and addressing the prevalence and bias of study designs in the environmental and social sciences. *Nature Communications*, *11*, 6377. DOI 10.1038/s41467-020-20142-y

Cope, D., Vickery, J., & Rowcliffe, M. (2005). From conflict to coexistence: a case study of geese and agriculture in Scotland. In R. Woodroffe, S. Thirgood, & A. Rabinowitz (Eds.), *People and Wildlife, Conflict or Coexistence?* (pp. 176-191). Cambridge, UK: Cambridge University Press.

DeCesare, N. J., Wilson, S. M., Bradley, E. H., Gude, J. A., Inman, R. M., Lamce, N. J., L:audon, K., Nelson, A. A., Ross, M. S., & Smucker, T. D. (2018). Wolf-Livestock Conflict and the Effects of Wolf Management. *Journal of Wildlife Management*, *82*(4), 711–722. DOI 10.1002/jwmg.21419

Donnelly, C., & Woodroffe, R. (2012). Reduce uncertainty in UK badger culling. *Nature*, *485*, 582. 10. DOI 10.1038/485582a

Eklund, A., López-Bao, J. V., Tourani, M., Chapron, G., & Frank, J. (2017). Limited evidence on the effectiveness of interventions to reduce livestock predation by large carnivores. *Scientific Reports*, *7*, 2097 | DOI :2010. DOI 1038/s41598-41017-02323-w.

Elbroch, L., & Treves, A. (2023). Why might removing carnivores maintain or increase risks for domestic animals?   . *Biological Conservation*, *283*, 110106. DOI 10.1016/j.biocon.2023.110106

Fernández-Gil, A., Naves, J., Ordiz, A. s., Quevedo, M., Revilla, E., & Delibes, M. (2016). Conflict Misleads Large Carnivore Management and Conservation: Brown Bears and Wolves in Spain. *PLoS One*, *11*(3), e0151541. DOI 10.1371/journal.pone.0151541

Greentree, C., Saunders, G., McLeod, L., & Hone, J. (2000). Lamb predation and fox control in south-eastern Australia. *Journal of Applied Ecology*, *37*, 935-943. DOI 10.1046/j.1365-2664.2000.00530.x

Grente, O. (2021). *Présentation des objectifs et de la méthodologie de la thèse sur l'efficacité des tirs de loup et la gestion adaptative du loup, menée conjointement par l'ONCFS et le CEFE,* Gières, France. ppublic presentation of PhD dissertation]

Grente, O., Bauduin, S., Santostasi, N. L., Chamaillé-Jammes, S., Duchamp, C., Drouet-Hoguet, N., & Gimenez, O. (2024). Evaluating the effects of wolf culling on livestock predation when considering wolf population dynamics in an individual-based model. *Wildlife Biology*, *2024*(6), e01227. DOI 10.1002/wlb3.01227

Grente, O., Opitz, T., Duchamp, C., Drouet-Hoguet, N., Chamaillé-Jammes, S., & Gimenez, O. (2024). Spatio-temporal dynamics of attacks around deaths of wolves: A statistical assessment of lethal control efficiency in France. *bioRxiv* DOI 10.1101/2024.07.18.604079

Harper, E. K., Paul, W. J., Mech, D. L., & Weisberg, S. (2008). Effectiveness of Lethal, Directed Wolf-Depredation Control in Minnesota. *Journal of Wildlife Management*, *72*(3), 778-784. DOI 10.2193/2007-273

Hoare, R. (2001). *A Decision Support System for Managing Human-Elephant Conflict Situations in Africa*. IUCN/SSCA African Elephant Specialist Group, Nairobi, Kenya. \

Humane World for Animals. (2019). *Government data confirm that wolves have a negligible effect on U.S. cattle & sheep industries* https://www.humaneworld.org/sites/default/files/docs/HSUS-Wolf-LivestockReport-Feb2019.pdf accessed 2 August 2026

Imbert, C., Caniglia, R., Fabbri, E., Milanesi, P., Randi, E., Serafini, M., Torretta, E., & Meriggi, A. (2016). Why do wolves eat livestock? Factors influencing wolf diet in northern Italy. *Biological Conservation*, *195*, 156-168. DOI 10.1016/j.biocon.2016.01.003

Khorozyan, I. (2021). Dealing with false positive risk as an indicator of misperceived effectiveness of conservation interventions. *PLoS One*, *16*(5), e0255784. DOI 10.1371/journal.pone.0255784

Khorozyan I. (2022) Defining practical and robust study designs for interventions targeted at terrestrial mammalian predators. *Conservation Biology 36*, e13805. DOI 10.1111/cobi.13805.

Khorozyan, I., & Waltert, M. (2019). How long do anti-predator interventions remain effective? Patterns, thresholds and uncertainty. *Royal Society Open Science*, *6*(9), e190826. DOI 10.1098/rsos.190826

Khorozyan, I., & Waltert, M. (2020). Variation and conservation implications of the effectiveness of anti-bear interventions. *Scientific Reports*, *10*, 15341. DOI 10.1098/rsos.190826

Kompaniyets, L., & Evans, M. (2017). Modeling the relationship between wolf control and cattle depredation. *PLoS One*, *12*(10), e0187264. DOI 10.1371/journal.pone.0187264

Krofel, M., Černe, R., & Jerina, K. (2011). Učinkovitost odstrela volkov (*Canis lupus*) kot ukrepa za zmanjševanje škode na domačih živalih. Effectiveness of wolf (Canis lupus) culling as a measure to reduce livestock depredations. *Acta Silvae et Ligni*, *95*, 11-22. (Slovenian) https://www.researchgate.net/publication/233792224_Effectiveness_of_wolf_Canis_lupus_culling_to_reduce_livestock_depredations

Kutal, M., Duľa, M., Selivanova, A. R., & López-Bao, J. V. (2024). Testing a conservation compromise: No evidence that public wolf hunting in Slovakia reduced livestock losses. *Conservation Letters*, *17*(1), e12994. DOI 10.1111/conl.12994

Lennox, R. J., Gallagher, A. J., Ritchie, E. G., & Cooke, S. J. (2018). Evaluating the efficacy of predator removal in a conflict-prone world. *Biological Conservation*, *224*, 277-289. DOI 10.1016/j.biocon.2018.05.003

Liberg, O., Chapron, G., Wabakken, P., Pedersen, H. C., Hobbs, N. T., & Sand, H. (2012). Shoot, shovel and shut up: cryptic poaching slows restoration of a large carnivore in Europe. *Proceedings of the Royal Society of London Series B*, *270*, 91-98. DOI 10.1098/rspb.2011.1275

Liberg, O., Suutarinen, J., Åkesson, M., Andrén, H., Wabakken, P., Wikenros, C., & Sand, H. (2020). Poaching-related disappearance rate of wolves in Sweden was positively related to population size and negatively to legal culling. *Biological Conservation*, *243*, e108456. DOI 10.1016/j.biocon.2020.108456.

Linnell, J. D. C., Aanes, R., Swenson, J. E., Odden, J., & Smith, M. E. (1997). Translocation of carnivores as a method for managing problem animals: a review. *Biodiversity and Conservation*, *6*, 1245-1257.

Littlewood, N. A., Rocha, R., Smith, R. K., Martin, P. A., Lockhart, S. L., Schoonover, R. F., Wilman, E., Bladon, A. J., Sainsbury, K. A., Pimm S., & Sutherland, W. J. (2020). Terrestrial Mammal Conservation: Global Evidence for the Effects of interventions for terrestrial mammals excluding bats and primates. In *Synopses of Conservation Evidence Series*. Cambridge, UK: University of Cambridge Press.

Louchouarn, N. X. (2023). *Don't judge the roar by its echo: Tests of assumptions, tools and policies for human-carnivore coexistence in North America. PhD thesis,* University of Wisconsin, Madison WI, USA.

Louchouarn, N. X., Santiago-Ávila, F. J., Parsons, D. R., & Treves, A. (2021). Evaluating how lethal management affects poaching of Mexican wolves (registered report). *Royal Society Open Science*, *8*, 200330. DOI 10.1098/rsos.200330

Louchouran, N. X., Renn, E. J., Anderson, G., Parsons, D. R., Putrevu, K., Santiago-Ávila, F. J., & Treves, A. (2025). Mexican wolf management needs transparency in methods and data to support policy decisions. *Journal of Applied Ecology*, *63*, e70059. DOI 10.1111/1365-2664.70059

Mech, L. D., Harper, E. K., Meier, T. J., & Paul, W. J. (2000). Assessing factors that may predispose Minnesota farms to wolf depredations on cattle. *Wildlife Society Bulletin*, *28*, 623-629. DOI 10.2193/0091-7648(2005)33[888:COWDIM]2.0.CO;2

Melzheimer, J., Heinrich, S. K., Wasiolka, B., Mueller, R., & Thalwitzer, S. (2020). Communication hubs of an asocial cat are the source of a human – carnivore conflict and key to its solution. *Proceedings of the National Academy of Sciences*, *117*, 3325–3333. DOI 10.1073/pnas.2002487117. Epub 2020 Dec 7

Miller, J., Stoner, K., Cejtin, M., Meyer, T., Middleton, A., & Schmitz, O. (2016). Effectiveness of Contemporary Techniques for Reducing Livestock Depredations by Large Carnivores. *Wildlife Society Bulletin*, *40*, 806-815.

Miller, J. R. B. (2015). Mapping attack hotspots to mitigate human–carnivore conflict: approaches and applications of spatial predation risk modeling. *Biodiversity and Conservation*, *24*(12), 2887-2911. DOI 10.1007/s10531-015-0993-6

Moreira-Arce, D., Ugarte, C. S., Zorondo-Rodríguez, F., & Simonetti, J. A. (2018). Management Tools to Reduce Carnivore-Livestock Conflicts: Current Gap and Future Challenges. *Rangeland Ecology & Management*, *71*(3), 389-394. DOI 10.1016/j.rama.2018.02.005

Mukherjee, S. (2010). *The Emperor of All Maladies: A Biography of Cancer*. Scribner.

Murtaugh, P. A. (2002). On rejection rates of paired intervention analysis. *Ecology*, *83*(6), 1752–1761. DOI 10.1890/02-3115

Nadler Valency, R., Shavit, G., Preiss-Bloom, S., Margalit, S., Ben-Ami, D., & Dayan, T. (2026). Effects of Lethal and Non-lethal Wolf (*Canis lupus*) Management. *Ecological Solutions and Evidence*, *6*(4), e70157. DOI 10.1002/2688-8319.70157

Nowak, S., Żmihorski, M., Figura, M., Stachyra, P., & Mysłajek, R. W. (2021). The illegal shooting and snaring of legally protected wolves in Poland. *Biological Conservation*, *264*, 109367. DOI 10.1016/j.biocon.2021.109367

Olson, E. R., Crimmins, S., Beyer, D. E., MacNulty, D., Patterson, B., Rudolph, B., Wydeven, A., & Van Deelen, T. R. (2017). Flawed analysis and unconvincing interpretation: a comment on Chapron and Treves 2016. *Proceedings of the Royal Society of London B*, *284*(1867), 20170273. DOI 0.1098/rspb.2017.0273

Olson, E. R., Stenglein, J. L., Victoria Shelley, Adena R. Rissman, Christine Browne-Nuñez, Zachary Voyles, Wydeven, A. P., & Deelen, T. V. (2015). Pendulum swings in wolf management led to conflict, illegal kills, and a legislated wolf hunt. *Conservation Letters*, *8*(5), 351-360. DOI 10.1111/conl.12141

Osborn, F. V., & Parker, G. E. (2003). Towards an integrated approach for reducing the conflict between elephants and people: a review of current research. *Oryx*, *37*(1), 80-84. DOI 10.1017/S0030605303000152

Plumer, L., Talvi, T. n., Männil, P., & Saarma, U. (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. DOI 10.1007/s10592-017-1045-4

Poudyal, N., Baral, N., & T., A. S. (2016). Wolf lethal control and depredations: counter-evidence from respecified models. *PLoS One*, *11*(2), e0148743. DOI 10.1371/journal.pone.0148743

Preiss-Bloom, S., Shamon, H., Ben-Ami, D., & Dayan, T. (2025). Landscape of risk: responses of grey wolves to lethal control in a mosaic landscape. *European Journal of Wildlife Research*, *71*(24), 1-16. DOI 10.1007/s10344-025-01910-x

Santiago-Ávila, F. J., Agan, S., W., Hinton, J. W., & Treves, A. (2022). Evaluating how management policies affect red wolf mortality and disappearance (registered report). *Royal Society Open Science*, *9*, 210400. DOI 10.1098/rsos.2104001

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

Santiago-Ávila, F. J., Cornman, A. M., & Treves, A. (2018a). Killing wolves to prevent predation on livestock may protect one farm but harm neighbors. *PLoS One*, *13*(1), e0189729 DOI 10.1371/journal.pone.0189729

Santiago-Ávila, F., Cornman, A., & Treves, A. (2018b). Correction: Killing wolves to prevent predation on livestock may protect one farm but harm neighbors. *PLoS One*, *13*(2), e0209716. DOI 10.1371/journal.pone.0209716

Santiago-Ávila, F. J., & Treves, A. (2022). Poaching of protected wolves fluctuated seasonally and with non-wolf hunting. *Scientific Reports*, *12*, e1738. DOI 10.1038/s41598-022-05679-w

Stewart-Oaten, A. (2003). On rejection rates of paired intervention analysis: comment. *Ecology*, *84*, 2795–2799. DOI 10.1890/02-3115

Šuba, J., Žunna, A., Bagrade, G., Done, G., Ornicāns, A., Pilāte, D., Stepanova, A., & Ozoliņš, J. (2023). Does Wolf Management in Latvia Decrease Livestock Depredation? An Analysis of Available Data. *Sustainability*, *15*(11). DOI 10.3390/su15118509

Suutarinen, J., & Kojola, I. (2017). Poaching regulates the legally hunted wolf population in Finland. *Biological Conservation*, *215*, 11–18. DOI 10.1016/j.biocon.2017.08.031

Suutarinen, J., & Kojola, I. (2018). One way or another: predictors of wolf poaching in a legally harvested wolf population. *Animal Conservation*, *21*(5), 414-422. DOI 10.1111/acv.12409

Treves, A., Artelle, K. A., Darimont, C. T., & Parsons, D. R. (2017a). Mismeasured mortality: correcting estimates of wolf poaching in the United States. *Journal of Mammalogy*, *98*(5), 1256–1264. DOI 10.1093/jmammal/gyx052

Treves, A., & Bruskotter, J. T. (2014). Tolerance for predatory wildlife. *Science*, *344*(6183), 476-477. DOI 10.1126/science.1252690

Treves, A., Bruskotter, J. T., & Elbroch, L. M. (2024). Evaluating fact claims accompanying policies to liberalize the killing of wolves. In G. Proulx (Ed.), *Wildlife Conservation & Management in The 21st Century–Issues, Solutions, and New Concepts* (pp. Chap. 6, pp 159-180). Alpha Wildlife Publications. https://faculty.nelson.wisc.edu/treves/pubs/Evaluate%20fact%20claims%20about%20killing%20wolves_2024.pdf accessed 2 August 2026

Treves, A., Chinn, S., & Krofel, M. (2026). Irreproducible research and a typology of replication efforts. *Research Integrity and Peer Review*, 1, 19. DOI 10.1186/s41073-026-00203-4.

Treves, A., & Khorozyan, I. (2025). Robust inference and errors in studies of wildlife control. *Scientific Reports*, *15*, 33131. DOI 10.1038/s41598-025-18497-7

Treves, A., Khorozyan, I., Krofel, M., López-Bao, J. V., & Proulx, G. (2026 in review). Comment on Merz et al., 2025 corrected in 2026: Wolf-hunting in the USA does not seem to reduce domestic animal losses. *Science Advances* eLetter in review.

Treves, A., Krofel, M., & McManus, J. (2016). Predator control should not be a shot in the dark. *Frontiers in Ecology and the Environment*, *14*, 380-388. DOI 10.1002/fee.1312

Treves, A., Krofel, M., Ohrens, O., & Van Eeden, L. M. (2019). Predator control needs a standard of unbiased randomized experiments with cross-over design. *Frontiers in Ecology and Evolution*, *7* 402-413. DOI 10.3389/fevo.2019.00462

Treves, A., Langenberg, J. A., López-Bao, J. V., & Rabenhorst, M. F. (2017b). Gray wolf mortality patterns in Wisconsin from 1979 to 2012. *Journal of Mammalogy*, *98*(1), 17-32. DOI 10.1093/jmammal/gyw145

Treves, A., Louchouarn, N. X., & Santiago-Ávila, F.J. (2020). Modelling concerns confound evaluations of legal wolf-killing. *Biological Conservation*, *249*, 108643. DOI 10.1016/j.biocon.2020.108643

Treves, A., Martin, K. A., Wydeven, A. P., & Wiedenhoeft, J. E. (2011). Forecasting environmental hazards and the application of risk maps to predator attacks on livestock. *Bioscience*, *61*, 451-458. DOI 10.1525/bio.2011.61.6.7

Treves, A., & Naughton-Treves, L. (2005). Evaluating lethal control in the management of human-wildlife conflict. In R. Woodroffe, S. Thirgood, & A. Rabinowitz (Eds.), *People and Wildlife, Conflict or Coexistence?* (pp. 86-106). Cambridge University Press.

Treves, A., Naughton-Treves, L., Harper, E. L., Mladenoff, D. J., Rose, R. A., Sickley, T. A., & Wydeven, A. P. (2004). Predicting human-carnivore conflict: A spatial model based on 25 years of wolf predation on livestock. *Conservation Biology*, *18*, 114-125. DOI 10.1111/j.1523-1739.2004.00189.x

Treves, A., & Rabenhorst, M. F. (2017). Risk map for wolf threats to livestock still predictive 5 years after construction. *PLoS One*, *12*(6), e0180043. DOI 10.1371/journal.pone.0180043

Trouwborst, A. (2026). Favourable conservation status: EU Court clarifies crucial yardstick for wildlife preservation and restoration in wave of wolf cases. *RECIEL*, 19. DOI 10.1111/reel.70036

Underwood, A. J. (1992). Beyond BACI: The detection of environmental impacts on populations in the real, but variable, world. *Journal of Experimental Marine Biology and Ecology*, *161*, 145-178. DOI 10.1016/0022-0981(92)90094-Q

USFWS. (2020). Endangered and Threatened Wildlife and Plants; Removing the Gray Wolf (*Canis lupus*) From the List of Endangered and Threatened Wildlife (Final rule). *Federal Register*, *85*(213), 69778-69895 https://www.govinfo.gov/content/pkg/FR-2020-11-03/pdf/2020-24171.pdf?utm_campaign=subscription+mailing+list&utm_source=federalregister.gov&utm_medium=email accessed 2 August 2026

Vial, F., & Donnelly, C. (2012). Localized reactive badger culling increases risk of bovine tuberculosis in nearby cattle herds. *Biology Letters*, *8*, 50-53. DOI 10.1098/rspb.2013.1634

Wielgus, R. B., & Peebles, K. (2014). Effects of wolf mortality on livestock depredations. *PLoS One*, *9*(12), e113505. DOI 10.1371/journal.pone.0113505

Supporting Information

SI 1 Text

SI 2 Text and Tables S1–S6

Title: Removing wolves did not reliably prevent domestic animal (DA) losses

Supporting Information 1. Wildlife removal studies, inclusion and exclusion criteria for wolf-killing studies, findings of mixed effects of lethal interventions, and potential hypotheses to explain undesirable effects of increasing DA losses after predator-removal.

A number of systematic reviews that examined lethal and non-lethal methods covering a broader array of species have emphasized equivocal evidence of the effectiveness of wildlife-removal in protecting human properties (Linnell et al., 1997; Hoare 2001; Osborn & Parker 2003; Cope et al., 2005; Treves & Naughton-Treves 2005; Treves et al., 2016, 2019; Miller et al., 2016; Eklund et al., 2017; van Eeden et al., 2018; Moreira-Arce et al., 2018; Lennox et al., 2018; Khorozyan & Waltert 2019a,b, 2020; Khorozyan 2021). The above include very different taxa and diverse properties, including studies of removals of African elephants (*Loxodonta africana*) and geese (*Anser* spp.), to name only two. Also, the examples of reliable RCTs of lethal interventions against other species report mixed results including undesirable effects, e.g. badgers (*Meles meles*) in the UK to prevent transmission of bovine tuberculosis to cattle (Donnelly & Woodroffe 2012, Vial & Donnelly 2012; Bielby et al., 2016) and poisoning red foxes (*Vulpes vulpes*) or dingoes (*Canis familiaris dingo*) in Australia to prevent sheep losses (Greentree et al., 2000; Allen & Sparkes 2001; Allen 2013 2014, 2015,2018, Allen et al., 2014, 2016, 2017, 2020; Allen & Hamptton 2020), suggest that at least some of the obstacles can be practically overcome when favorable conditions align.

Inclusion and exclusion criteria for wolf-killing studies

There have been numerous reviews of lethal interventions against carnivores in a variety of situations, including hundreds of citations (see above and van Eeden et al., 2018 for the most comprehensive review*),* but few reviews used inclusion criteria reflecting study design and data sharing as we have done here. Because there has never, to our knowledge, been a randomized study of wolf killing without overwhelming bias as defined in main text, our first criterion included the studies that used either non-randomized before-and-after control-impact (nBACI, also called comparison of interventions), or the analogous time-to-event analyses for recurrence of wolf attacks on DA that treated sites or herds as replicates and measured time to the next event of DA loss (hereafter spatiotemporal recurrence). The errors of inference generated by non-randomized, uncontrolled, or small-sampled study designs have been reviewed several times (Underwood 1992; Murtaugh 2002; Stewart-Oaten 2003; Christie et al., 2019, 2020; Treves et al., 2016, 2019; Treves & Khorozyan 2025).

The second criterion for inclusion based on transparent data sharing leads us to provide raw data in SI 2 for the five articles we summarize and combine in the main text. Some studies that declined to share data or showed poor designs as above still revealed similar results as ours in main text Table 1. Our study exclusion criteria follow.

Initially, we had included a recent study conducted in France (Grente 2021; Grente et al., 2024a,b), which did share data, but after one co-author joined, then later all co-authors declined to join, citing lack of time, change in their research focus, or lack of technical skills to confirm that we were summarizing their methods properly. Grente et al., *(2024a)* found a preponderance of desired effects, although the dissertation on which that peer-reviewed article was based reported a preponderance of no effect (Grente 2021). We look forward to those authors' reflections on our work and their own.

Starting with all peer-reviewed studies of the effect of killing wolves on DA losses, we set aside all those that did not meet all of the following criteria showing which studies fell out at each step:

(1) Authors shared datasets in the published version, or the authors shared the data for this article in English or translated to English by the authors and the authors agreed to join after we invited them: Grente et al., (2024a,b);

(2) Methods were not reproducible (Bradley et al., 2015 rebutted in Santiago-Ávila et al., 2018a); data were discarded subjectively without documenting criteria (Harper et al., 2008 rebutted in Treves et al., 2016); or measures of DA loss were unclear (Bjorge & Gunson 1985 rebutted in Treves et al., 2016; and Fernandez-Gil et al., 2016). We omitted (Fernandez-Gil et al., 2016), another study finding no desired effects of wolf removal, because their response variable was the number of complaints of DA losses, without some method of field verification that we could ascertain;

(3) Findings from the same region that were currently under debate with diametrically opposed findings and >1 replication effort failing to resolve the debate (Wielgus & Peebles 2014; Bradley et al., 2015; Poudyal et al., 2016; Kompanyets & Evans 2017; DeCesare et al., 2018). The exclusion of these studies and the broader debate over wolf-killing in the Northern Rocky Mountain region of the USA is discussed further below. Moreover, for this region, non-governmental watchdogs have raised questions about the accuracy of the key outcome variable (DA loss) and the differences between state and federal data on DA losses (Humane World for Animals 2019); and

(4) Finally, one study came out after our analysis was submitted (Merz et al., 2025, corrected in 2026). See also Treves et al., (2026 in review) posted as an eLetter in reply to the former.

Despite their exclusion by criteria above, several of the studies found mixed effects of wolf-killing from undesirable, to no effects, to the desired effects (several studies in criteria 2 and 3 above), so the concern that our exclusion criteria biased our conclusions seems unwarranted without first sharing all the data and reproducible methods.

We summarize some of the controversy arising from a conflicting set of analyses of wolf-removal in the Northern Rockies, USA (Bradley 2004; Wielgus & Peebles 2014; Bradley et al., 2015). The most precise and influential study (Bradley et al., 2015) was shown to have irreproducible methods and potential errors in spatiotemporal recurrence (Santiago-Ávila et al., 2018a). Using a combination of private communications and finally a published article (Santiago-Ávila et al., 2018a,b), we encouraged the authors of (Bradley et al., 2016) to share the raw data and clarify their methods 9 years ago. Until the discrepancies are resolved and the transparency of data improves for the Northern Rockies wolves, the relevant studies cannot be considered reliable or included in a consensus paper such as this one, following the statisticians' concerns in (Allen et al., 2015; Christie et al., 2019, 2020). That debate is unresolved.

Misleading results due to potentially confounding variables, poaching of wolves, hotspots, and temporal autocorrelation in nBACI designs.

Seeking to explain higher DA losses after predators were removed, researchers have proposed a set of hypotheses reviewed in (Elbroch & Treves 2023) with a new hypothesis added by (Preiss-Bloom et al., 2025). If one considers the possibility that removal of a predator can remove a culprit, a non-culprit, or an animal that was a culprit but would never repeat the behavior, several outcomes are possible from such a removal.

Removal of predators may create vacancies for yet more conspecifics to become culprits if the underlying vulnerabilities of DA are not remedied (reviewed in Elbroch & Treves 2023). Newcomers are often less experienced animals in that location, who may exploit more livestock than the more experienced former occupants, wolves among several species of carnivores reviewed in Elbroch & Treves (2023). Removing an associated conspecific may leave surviving predators less capable of capturing wild prey, may lead to higher densities of predators as newcomers exploit the vacancies in habitat -- or lower densities but higher proportions of individuals more likely to prey on DA (Preiss-Bloom et al., 2025) -- or may release smaller species of predators that cause more damage reviewed in Elbroch & Treves (2023). There are also other possible explanations that focus on human behavior. Below we summarize literature on human wolf-killing behavior legal and illegal, and then on husbandry of DA.

Unreported wolf-killing would confound analyses of treatment effects in all studies included or excluded in our review here and in Table 1. Unreported wolf-killing is referred to as poaching or cryptic poaching when evidence is concealed (Liberg et al., 2012). A number of studies led by independent authors have inferred that cryptic poaching rises with policies that liberalize wolf-killing and those policies correlate to anti-wolf attitudes, behaviors, or politics (Treves & Bruskotter 2014; Chapron & Treves 2016a,b, 2017a,b; Treves et al., 2017a.b; Santiago-Ávila et al., 2020, 2022; Agan et al., 2021; Nowak et al., 2021; Santiago-Ávila & Treves 2022; Louchouarn et al., 2021, 2025; Louchouarn 2023), although some suggest mixed effects (Suutarinen & Kojola, 2017, 2018), or declines in poaching with legal wolf-killing (Liberg et al., 2020; Olson et al., 2015, 2017; Breck et al., 2023) but see Chaproin et al., 2017a,b; Treves et al., 2017b; 2020; Santiago-Ávila et al., 2020; Santiago-Ávila & Treves 2022; Louchouarn et al., 2025) for concerns about analyses in each of the latter set. Therefore, we framed the hypotheses as a prediction about a change in wolf-killing (increase or decrease) rather than assuming there are true zero. In other words, we believe our comparisons represent tests of dose effects with no true zeroes. Moreover, other uncontrolled human behaviors confound our study and most every study summarized here.

Another human behavior is DA husbandry. Human husbandry of DA and land management are associated with hotspots of conflict, e.g., among wolves and other carnivores (Mech et al., 2000; Treves et al., 2004, 2011; Behdarvand et al., 2014; Miller 2015; Imbert et al., 2016; Treves & Rabenhort 2017; Broekhuis et al., 2017; Melzheimer et al., 2020) to cite just a few. Indeed, carnivore behavior can interact with landscape features, human husbandry or livestock behavior, to affect hotspot location and extent. For example, wolf predation on DA was 91% predictable from a spatial model including three landscape features (Treves et al., 2011), even five years after model construction (Treves & Rabenhorst 2017). Some of those landscape features were human land uses, while others reflected wolf behavioral ecology. Also see hotspots of cheetah (*Acinonyx jubatus*)-DA interaction from Namibia that reflect male cheetah communication behaviors (Melzheimer et al., 2020). Therefore, hotspots may be an intrinsic attribute of human-wildlife-DA interactions and ecologies, not an essential attribute of wolves seeking DA in particular.

Furthermore, human errors may exacerbate the undesirable effects of predator removal if the causes of DA losses were misidentified as predation, or the culprit individuals were misidentified, even if the predator species was identified correctly. For example, in Germany, 8 permits were issued to kill individual wolves that were genetically identified from DA kills, but 7 out of the 8 wolves shot for this reason were the wrong individuals (Blanco & Sundseth, 2023), accessed 4 March 2026). Indeed, genomic analyses reveal not uncommon errors in identifying the species of predators attacking DA, especially when wolves and dogs (*Canis familiaris*) are both present (Plumer et al., 2018).

SI 2. Data from Slovenia, Slovakia, Latvia, and Israel along with a novel method for cross-study comparisons of treatment effects for wolf removal

Here we share the data for the number of wolves reported legally killed, and an estimate of DA losses, in one or two columns depending on the original authors' data. The datasets represent the data from Slovenia (Table S2), Slovakia (Tables S3, S4), Latvia (Table S5), and Israel (Table S6). The names of columns vary based on the original source descriptions and column headers. The data for Michigan, USA were already presented in (Santiago-Ávila et al., 2018a).

The re-analysis of (Krofel et al., 2011) by *(*Treves et al., 2016) used non-randomized, before-and-after comparisons, which allowed us to estimate the numbers of years with desirable effects (rise in wolf kills associated with a decline in DA loss), undesirable (rise in wolf kills associated with an increase in DA losses), and no effect on DA losses. Although before-and-after control-impact (BACI) analyses are a family of study designs with many subtypes we follow the conceptual division into one set of non-randomized (nBACI) and a set of RIA or rBACI (randomized designs with before-and-after comparisons (Christie et al., 2020; Treves & Khorozyan 2025; SI 1 for history of nBACI debate among statisticians). The former set of non-randomized designs all share a similarity in comparing a pair or multiple pairs of replicated subjects when some undergo an intervention and some do not. But even within that fairly narrow set of nBACI, one finds a diverse set of designs, depending if only one replicate undergoes intervention, if multiple measures of effect are collected before and after the intervention, and how spatially and temporally independent are replicates and measures of effect (Murtaugh 2002; Treves & Khorozyan 2025).

Complications arising if studies differ in reported and unreported rates of wolf-killing

To compare treatment effects across studies, one would like a quantitative measure that is consistent and comparable despite different methods for estimating DA losses (or number of animals verified or reported), and a measure of wolf-killing that is unbiased (all wolf mortality legal or illegal), in addition to knowing whether the wolf-killing preceded or followed the nearby DA losses.

One might assume that one can compare all wolf-killing at time t to DA losses due to wolf predation in time t+1. Indeed, for study areas in which wolves are mainly killed in autumn or winter and predation on DA occurs mainly in spring or summer, that approach, with *t* being measured in steps of one year, seems to make sense. However, in areas where wolf-killing and DA losses occur year-round, the one-year time lag makes less sense because some DA losses would precede wolf-killing if the time step *t* were much larger than the interval between wolf-killing and subsequent DA losses. These issues complicate cross-study comparisons using one-year time steps as many of our component studies did. We see no solution to the issue but also it would seem to produce random error not systematic because no study controlled the time to event relationship between DA loss and wolf-killing in the nBACI set of studies. Also, the two spatiotemporal recurrence studies did control the sequence of events within a time step but not between time steps lessening the issue but not eliminating it (Santiago-Ávila et al., 2018a, Nadler Valency et al., 2025).

A related problem that affects the reported dose of wolf-killing comes from unreported wolf-killing. One might measure only legal wolf-killing as a treatment effect, not the difficult to estimate cryptic and reported illegal wolf-killing (Liberg et al., 2012; Santiago-Ávila & Treves 2022; Louchouarn 2023), which usually exceeds other causes of wolf mortality (Treves et al., 2017a). Background undocumented wolf-killing is analogous to a patient in a clinical trial self-medicating. Using a biomedical analogy, we wish to measure the effect of a regulated dose, not the background self-medication by a patient. The problem plagues trials in biomedicine (Mukherjee 2010). We have a similar, possibly ubiquitous problem in studies of lethal intervention against wildlife.

To evaluate the effect of wolf-killing, the field needs randomized designs to avoid self-selection bias and better research control on dose of the treatment, if we wish to conclude with confidence about the effects of a controlled intervention of wolf-removal on DA loss, we need random assignment to the treated condition (the known dose) free of an unknown rate of unreported wolf-killing (the self-medication in our analogy above). In short, we cannot be sure that an observed increase or decrease in legal wolf-killing actually represents an increase or decrease in total wolf-killing (dose) respectively.

This is related to and analogous to the problem of pseudo-absence in presence/absence models and inappropriate controls for comparison in many fields (Allen et al., 2015). For example, did the careful selection of control pairs in (Kutal et al., 2024) succeed in obtaining zero-wolf-killing replicates or only less wolf-killing? And if illegal wolf-killing rises in correlation with legal killing, can we distinguish replicates that experience very similar treatments or should we look for replicates differing ten-fold in dose so that we can more safely assume the cryptic poaching does not change the dose rank orders? This is not academic speculations, as a number of studies led by independent authors have inferred that cryptic poaching rises with policies that liberalize wolf-killing and those policies correlate to anti-wolf attitudes, behaviors, or politics (summarized in SI 1).

Table S1. A method for cross-study comparisons of expected effects of wolf-killing on subsequent domestic animal (DA) losses: desired reduction in DA losses, no effect, and undesirable counter-productive effect of higher DA losses.

Change in DA loss from year t to t+1	Change in wolf-killings from year t to t+1		
	Less	No change	More
Decrease	Contrary to traditional hypothesis	†	Supports traditional hypothesis
No change	No effect	No effect	No effect
Increase	Supports traditional hypothesis	†	Contrary to traditional hypothesis

† In one scenario, we excluded years with no change in wolf-killing or zero wolf-killings (see text above for rationale). In the other scenario, we included such years and tallied the pairs of years with no change In DA losses, increases, or decreases as above.

Table S2. Slovenia raw data shared by lead author of (Krofel et al., 2011).

Year	Legally shot wolves	Entire recorded wolf mortality	Number of depredation events
1995	0	0	12
1996	0	2	19
1997	0	0	10
1998	0	1	30
1999	2	3	24
2000	0	2	64
2001	4	5	81
2002	5	5	154
2003	9	11	56
2004	3	4	77
2005	6	6	57
2006	10	11	174
2007	5	6	410
2008	0	0	430
2009	7	9	405

Table S3. Slovakia raw data shared by lead author of (Kutal et al., 2024).

Note that the latter article presented a non-randomized before-and-after control-impact analysis of a subset of the data. That subset is also presented below as Table S4.

Province	District	Year	Estimated_Killed_Wolves	Sheep_killed	Livestock_Killed
Trenčínský	Bánovce nad Bebravou	2017	0.00	0	0
Trenčínský	Bánovce nad Bebravou	2018	0.00	0	0
Banskobystrický	Banská Bystrica	2014	0.00	67	67
Banskobystrický	Banská Bystrica	2015	0.08	47	47
Banskobystrický	Banská Bystrica	2018	0.00	72	73
Banskobystrický	Banská Bystrica	2019	0.00	59	59
Banskobystrický	Banská Štiavnica	2016	0.00	0	0
Banskobystrický	Banská Štiavnica	2017	0.00	0	0
Banskobystrický	Banská Štiavnica	2018	0.00	0	0
Banskobystrický	Banská Štiavnica	2019	0.17	0	0
Prešovský	Bardejov	2014	0.00	25	25
Prešovský	Bardejov	2015	0.01	0	0
Žilinský	Bytča	2016	0.00	0	0
Žilinský	Bytča	2017	0.00	0	0
Žilinský	Bytča	2018	0.00	0	0
Žilinský	Bytča	2019	0.00	1	1
Žilinský	Čadca	2014	0.00	0	0
Žilinský	Čadca	2015	0.04	5	5
Žilinský	Čadca	2018	0.00	9	9
Žilinský	Čadca	2019	0.00	0	0
Banskobystrický	Detva	2014	0.00	0	0
Banskobystrický	Detva	2015	0.00	0	0
Banskobystrický	Detva	2017	0.00	2	2
Banskobystrický	Detva	2018	0.08	0	0
Prešovský	Humenné	2015	0.00	0	0
Prešovský	Humenné	2016	0.04	0	0
Košický	Košice I	2017	0.00	0	0
Košický	Košice I	2018	0.00	0	0
Košický	Košice-okolie	2014	0.00	0	0
Košický	Košice-okolie	2015	0.01	0	0
Košický	Košice-okolie	2018	0.00	0	0
Košický	Košice-okolie	2019	0.01	0	0
Žilinský	Kysucké Nové Mesto	2014	0.00	0	0
Žilinský	Kysucké Nové Mesto	2015	0.25	0	0
Nitranský kraj	Levice	2016	0.00	0	0
Nitranský kraj	Levice	2017	0.00	0	0
Banskobystrický	Lučenec	2015	0.00	0	0
Banskobystrický	Lučenec	2016	0.00	1	1
Banskobystrický	Lučenec	2018	0.00	10	10
Banskobystrický	Lučenec	2019	0.00	53	53
Žilinský	Martin	2014	0.00	0	0
Žilinský	Martin	2015	0.00	35	35
Žilinský	Martin	2016	0.00	0	0
Žilinský	Martin	2017	0.02	0	0
Košický	Michalovce	2015	0.00	0	0
Košický	Michalovce	2016	0.50	0	0

Trenčínský	Myjava	2014	0.00	0	0
Trenčínský	Myjava	2015	0.00	0	0
Žilinský	Námestovo	2016	0.00	25	25
Žilinský	Námestovo	2017	0.00	26	26
Banskobystrický	Poltár	2014	0.00	4	6
Banskobystrický	Poltár	2015	0.00	11	11
Banskobystrický	Poltár	2017	0.00	2	4
Banskobystrický	Poltár	2018	0.00	10	10
Trenčínský	Považská Bystrica	2018	0.00	1	1
Trenčínský	Považská Bystrica	2019	0.00	22	22
Prešovský	Prešov	2014	0.00	0	0
Prešovský	Prešov	2015	0.00	15	15
Prešovský	Prešov	2016	0.00	38	41
Prešovský	Prešov	2017	0.05	8	8
Trenčínský	Prievidza	2015	0.00	0	0
Trenčínský	Prievidza	2016	0.00	0	0
Trenčínský	Prievidza	2017	0.00	0	0
Trenčínský	Prievidza	2018	0.00	0	0
Banskobystrický	Revúca	2014	0.00	5	5
Banskobystrický	Revúca	2015	0.04	0	0
Banskobystrický	Revúca	2018	0.00	12	12
Banskobystrický	Revúca	2019	0.00	8	13
Banskobystrický	Rimavská Sobota	2016	0.00	45	45
Banskobystrický	Rimavská Sobota	2017	0.08	24	25
Košický	Rožňava	2014	0.00	15	16
Košický	Rožňava	2015	0.02	39	47
Žilinský	Ružomberok	2014	0.00	58	66
Žilinský	Ružomberok	2015	0.04	34	35
Prešovský	Sabinov	2014	0.00	19	19
Prešovský	Sabinov	2015	0.08	1	7
Prešovský	Snina	2014	0.00	0	0
Prešovský	Snina	2015	0.00	32	32
Prešovský	Snina	2016	0.00	0	0
Prešovský	Snina	2017	0.01	0	0
Košický	Sobrance	2015	0.00	0	0
Košický	Sobrance	2016	0.00	0	0
Košický	Sobrance	2018	0.00	0	0
Košický	Sobrance	2019	0.04	0	0
Košický	Spišská Nová Ves	2014	0.00	5	5
Košický	Spišská Nová Ves	2015	0.05	2	2
Prešovský	Stropkov	2014	0.00	12	30
Prešovský	Stropkov	2015	0.04	23	27
Prešovský	Svidník	2015	0.00	0	0
Prešovský	Svidník	2016	0.00	0	0
Prešovský	Svidník	2018	0.00	9	9
Prešovský	Svidník	2019	0.02	7	7
Nitranský kraj	Topoľčany	2016	0.00	0	0
Nitranský kraj	Topoľčany	2017	0.00	0	0
Košický	Trebišov	2014	0.00	0	0
Košický	Trebišov	2015	0.00	0	0
Košický	Trebišov	2016	0.00	0	0
Košický	Trebišov	2017	0.00	0	0

Košický	Trebišov	2018	0.00	0	0
Košický	Trebišov	2019	0.00	0	0
Žilinský	Turčianske Teplice	2016	0.00	0	0
Žilinský	Turčianske Teplice	2017	0.00	0	0
Žilinský	Turčianske Teplice	2018	0.00	0	0
Žilinský	Turčianske Teplice	2019	0.04	0	0
Žilinský	Tvrdošín	2014	0.00	0	2
Žilinský	Tvrdošín	2015	0.00	3	5
Žilinský	Tvrdošín	2016	0.00	4	5
Žilinský	Tvrdošín	2017	0.00	44	44
Žilinský	Tvrdošín	2018	0.00	0	0
Žilinský	Tvrdošín	2019	0.00	0	0
Banskobystrický	Veľký Krtíš	2014	0.00	0	0
Banskobystrický	Veľký Krtíš	2015	0.00	0	0
Banskobystrický	Veľký Krtíš	2016	0.00	0	0
Banskobystrický	Veľký Krtíš	2017	0.00	0	0
Banskobystrický	Veľký Krtíš	2018	0.00	0	0
Banskobystrický	Veľký Krtíš	2019	0.00	4	4
Prešovský	Vranov nad Topľou	2014	0.00	0	0
Prešovský	Vranov nad Topľou	2015	0.03	0	0
Banskobystrický	Žarnovica	2015	0.00	0	0
Banskobystrický	Žarnovica	2016	0.00	0	0
Banskobystrický	Žarnovica	2017	0.00	0	0
Banskobystrický	Žarnovica	2018	0.00	0	0
Banskobystrický	Žiar nad Hronom	2015	0.00	0	0
Banskobystrický	Žiar nad Hronom	2016	0.00	4	6
Banskobystrický	Žiar nad Hronom	2018	0.00	4	12
Banskobystrický	Žiar nad Hronom	2019	0.05	5	5
Žilinský	Žilina	2014	0.00	0	0
Žilinský	Žilina	2015	0.00	1	1
Žilinský	Žilina	2016	0.00	14	20
Žilinský	Žilina	2017	0.00	3	3
Žilinský	Žilina	2018	0.00	3	3
Žilinský	Žilina	2019	0.00	2	2
Nitranský kraj	Zlaté Moravce	2014	0.00	0	0
Nitranský kraj	Zlaté Moravce	2015	0.00	0	0
Nitranský kraj	Zlaté Moravce	2016	0.00	0	0
Nitranský kraj	Zlaté Moravce	2017	0.00	0	0
Nitranský kraj	Zlaté Moravce	2018	0.00	0	0
Nitranský kraj	Zlaté Moravce	2019	0.00	0	0

Table S4. A subset of data from Slovakia (Table S3) provided by the lead author of (Kutal et al., 2024). The latter study described their nBACI analysis of this subset. Their supporting information presented the rules that they used for selection of sequential pairs for our analyses: (i) all pair of years selected, either in "Treatment" (T) or "Control" (C) groups, should be separated at least by 1 year without wolf-killing in the district; (ii) for a given district with wolf-killing, only the first year of wolf-killing was considered, in order to avoid the influence of consecutive years with wolf-killing on our design; (iii) for those time series without wolf-killing, we randomly selected the first year (Period: “Before”) of the two consecutive years of the case.

Treatment	BACI_COR_EXTREME	Province	District	Year	Estimated_Killed_Wolves	Sheep_killed	Livestock_Killed
C	B	Trenčínský	Bánovce nad Bebravou	2017	0.00	0	0
C	A	Trenčínský	Bánovce nad Bebravou	2018	0.00	0	0
T	B	Banskobystrický	Banská Štiavnica	2018	0.00	0	0
T	A	Banskobystrický	Banská Štiavnica	2019	0.17	0	0
C	B	Žilinský	Bytča	2018	0.00	0	0
C	A	Žilinský	Bytča	2019	0.00	1	1
C	B	Žilinský	Čadca	2017	0.00	0	0
C	A	Žilinský	Čadca	2018	0.00	9	9
C	B	Banskobystrický	Detva	2015	0.00	0	0
C	A	Banskobystrický	Detva	2016	0.00	3	3
T	B	Banskobystrický	Detva	2017	0.00	2	2
T	A	Banskobystrický	Detva	2018	0.08	0	0
T	B	Prešovský	Humenné	2015	0.00	0	0
T	A	Prešovský	Humenné	2016	0.04	0	0
C	B	Košický	Košice I	2017	0.00	0	0
C	A	Košický	Košice I	2018	0.00	0	0
T	B	Košický	Košice-okolie	2018	0.00	0	0
T	A	Košický	Košice-okolie	2019	0.01	0	0
C	B	Nitranský kraj	Levice	2016	0.00	0	0
C	A	Nitranský kraj	Levice	2017	0.00	0	0
C	B	Banskobystrický	Lučenec	2015	0.00	0	0
C	A	Banskobystrický	Lučenec	2016	0.00	1	1
C	B	Banskobystrický	Lučenec	2018	0.00	10	10
C	A	Banskobystrický	Lučenec	2019	0.00	53	53
T	B	Žilinský	Martin	2016	0.00	0	0
T	A	Žilinský	Martin	2017	0.02	0	0
T	B	Košický	Michalovce	2015	0.00	0	0

T	A	Košický	Michalovce	2016	0.50	0	0
C	B	Žilinský	Námestovo	2016	0.00	25	25
C	A	Žilinský	Námestovo	2017	0.00	26	26
C	B	Banskobystrický	Poltár	2015	0.00	11	11
C	A	Banskobystrický	Poltár	2016	0.00	4	6
C	B	Banskobystrický	Poltár	2017	0.00	2	4
C	A	Banskobystrický	Poltár	2018	0.00	10	10
C	B	Trenčínský	Považská Bystrica	2018	0.00	1	1
C	A	Trenčínský	Považská Bystrica	2019	0.00	22	22
T	B	Prešovský	Prešov	2016	0.00	38	41
T	A	Prešovský	Prešov	2017	0.05	8	8
C	B	Trenčínský	Prievidza	2015	0.00	0	0
C	A	Trenčínský	Prievidza	2016	0.00	0	0
C	B	Trenčínský	Prievidza	2017	0.00	0	0
C	A	Trenčínský	Prievidza	2018	0.00	0	0
C	B	Banskobystrický	Revúca	2018	0.00	12	12
C	A	Banskobystrický	Revúca	2019	0.00	8	13
T	B	Banskobystrický	Rimavská Sobota	2016	0.00	45	45
T	A	Banskobystrický	Rimavská Sobota	2017	0.08	24	25
T	B	Prešovský	Snina	2016	0.00	0	0
T	A	Prešovský	Snina	2017	0.01	0	0
C	B	Košický	Sobrance	2015	0.00	0	0
C	A	Košický	Sobrance	2016	0.00	0	0
T	B	Košický	Sobrance	2018	0.00	0	0
T	A	Košický	Sobrance	2019	0.04	0	0
C	B	Prešovský	Svidník	2015	0.00	0	0
C	A	Prešovský	Svidník	2016	0.00	0	0
T	B	Prešovský	Svidník	2018	0.00	9	9
T	A	Prešovský	Svidník	2019	0.02	7	7
C	B	Košický	Trebišov	2016	0.00	0	0
C	A	Košický	Trebišov	2017	0.00	0	0
C	B	Košický	Trebišov	2018	0.00	0	0
C	A	Košický	Trebišov	2019	0.00	0	0
C	B	Žilinský	Turčianske Teplice	2016	0.00	0	0
C	A	Žilinský	Turčianske Teplice	2017	0.00	0	0
T	B	Žilinský	Turčianske Teplice	2018	0.00	0	0

T	A	Žilinský	Turčianske Teplice	2019	0.04	0	0
C	B	Žilinský	Tvrdošín	2016	0.00	4	5
C	A	Žilinský	Tvrdošín	2017	0.00	44	44
C	B	Žilinský	Tvrdošín	2018	0.00	0	0
C	A	Žilinský	Tvrdošín	2019	0.00	0	0
C	B	Banskobystrický	Veľký Krtíš	2016	0.00	0	0
C	A	Banskobystrický	Veľký Krtíš	2017	0.00	0	0
C	B	Banskobystrický	Veľký Krtíš	2018	0.00	0	0
C	A	Banskobystrický	Veľký Krtíš	2019	0.00	4	4
C	B	Banskobystrický	Žarnovica	2017	0.00	0	0
C	A	Banskobystrický	Žarnovica	2018	0.00	0	0
C	B	Banskobystrický	Žiar nad Hronom	2015	0.00	0	0
C	A	Banskobystrický	Žiar nad Hronom	2016	0.00	4	6
T	B	Banskobystrický	Žiar nad Hronom	2018	0.00	4	12
T	A	Banskobystrický	Žiar nad Hronom	2019	0.05	5	5
C	B	Žilinský	Žilina	2016	0.00	14	20
C	A	Žilinský	Žilina	2017	0.00	3	3
C	B	Žilinský	Žilina	2018	0.00	3	3
C	A	Žilinský	Žilina	2019	0.00	2	2
C	B	Nitranský kraj	Zlaté Moravce	2017	0.00	0	0
C	A	Nitranský kraj	Zlaté Moravce	2018	0.00	0	0

Table S5. Latvia raw data shared by the lead author of (Šuba et al., *2023*).

Year	Number of reported attacks on sheep	Number of killed, injured or lost sheep	Number of hunted wolves
2004	11	20	113
2005	3	12	130
2006	7	33	114
2007	6	43	150
2008	10	40	200
2009	7	87	175
2010	12	70	139

2011	22	173	201
2012	35	163	247
2013	10	99	292
2014	18	123	267
2015	19	188	275
2016	22	141	279
2017	14	104	280
2018	25	160	280
2019	36	305	280
2020	27	109	281
2021	40	164	281
2022	66	471	300
Data source: State Forest Service, https://www.vmd.gov.lv/lv			

Table S6. Data on wolf shootings from the Golan Heights, Israel from the lead author of (Nadler Valency et al., 2025).

The column "eventtype" refers to a site with DA loss but no wolf-killing "predation" or a site with wolf-killing "shooting". Remaining column names are explained in the original (Nadler Valency et al., 2025) *.

wkt_geom	event_ID	Date	ITM - LONG	ITM - LAT	eventType	layer	Section_ID	Township_ID	comment	exclude
Point (274000 777000)	802914	1/1/13	274000	777000	predation	predation_S	1044	26		
Point (262746.47850000002654269 795945.018999999971129)	802804	1/7/13	262746.5	795945	shooting	Golan shooting 2013-2021	257	1		
Point (262533.81439999997382984 795881.94900000002235174)	802805	1/7/13	262533.8	795881.9	shooting	Golan shooting 2013-2021	257	1	two shooting events per day see also	

									8028 04	
Point (277000 767000)	8022 06	2/4/1 3	27700 0	76700 0	predati on	predati on_S	1246	38		
Point (266132.416099999 97308478 786961.574200000 03185123)	8017 42	2/21/ 13	26613 2.4	78696 1.6	shooti ng	Golan shootin g 2013- 2021	522	13		
Point (264710.576000000 00093132 786379.249399999 97150153)	8015 97	2/28/ 13	26471 0.6	78637 9.2	shooti ng	Golan shootin g 2013- 2021	395	13		
Point (262303.886799999 97839332 783162.142800000 03054738)	8015 67	3/1/1 3	26230 3.9	78316 2.1	shooti ng	Golan shootin g 2013- 2021	270	3		
Point (267000 785000)	8015 40	3/3/1 3	26700 0	78500 0	predati on	predati on_S	588	13		
Point (261881.620200000 00484288 756909.280799999 94952232)	8009 40	4/7/1 3	26188 1.6	75690 9.3	shooti ng	Golan shootin g 2013- 2021	232	7		
Point (274000 777000)	8008 25	4/11/ 13	27400 0	77700 0	predati on	predati on_S	1044	26		
Point (266324.367499999 99301508 742088.028099999 99590218)	7991 18	6/18/ 13	26632 4.4	74208 8	shooti ng	Golan shootin g 2013- 2021	567	21		
Point (263286.527200000 01136214 786667.779100000 04339963)	7969 02	9/30/ 13	26328 6.5	78666 7.8	shooti ng	Golan shootin g 2013- 2021	330	2		
Point (263000 786000)	7968 85	10/1/ 13	26300 0	78600 0	predati on	predati on_S	331	2		
Point (262323.618599999 98705462 738966.096999999 9506399)	7965 97	10/13 /13	26232 3.6	73896 6.1	shooti ng	Golan shootin g 2013- 2021	314	10		
Point (275404.812099999 98100102 750550.007400000 00223517)	7965 76	10/13 /13	27540 4.8	75055 0	shooti ng	Golan shootin g 2013- 2021	1135	30		
Point (268979.292699999 99087304 765627.117300000 04172325)	7964 53	10/19 /13	26897 9.3	76562 7.1	shooti ng	Golan shootin g 2013- 2021	735	17		
Point (263000 786000)	7962 94	10/25 /13	26300 0	78600 0	predati on	predati on_S	331	2		
Point (264000 794000)	7961 78	10/30 /13	26400 0	79400 0	predati on	predati on_S	387	12		
Point (265813.817199999 99040738	7961 74	10/30 /13	26581 3.8	74871 0.2	shooti ng	Golan shootin g 2013- 2021	496	19		

748710.220699999 94710088)										
Point (276620.532000000 00651926 765004.797000000 0204891)	7958 62	11/11 /13	27662 0.5	76500 4.8	shooti ng	Golan shootin g 2013-2021	1184	39		
Point (262492.475299999 99096617 790240.218400000 01247972)	7958 43	11/12 /13	26249 2.5	79024 0.2	shooti ng	Golan shootin g 2013-2021	263	2		
Point (262265.941500000 01536682 790071.959000000 03166497)	7957 69	11/15 /13	26226 5.9	79007 2	shooti ng	Golan shootin g 2013-2021	263	2		
Point (263000 786000)	7957 39	11/17 /13	26300 0	78600 0	predati on	predati on_S	331	2		
Point (276618.749200000 0202097 765002.592399999 96498227)	7957 21	11/17 /13	27661 8.7	76500 2.6	shooti ng	Golan shootin g 2013-2021	1184	39		
Point (269000 790000)	7954 00	12/1/ 13	26900 0	79000 0	predati on	predati on_S	711	13		
Point (269000 789000)	7954 01	12/1/ 13	26900 0	78900 0	predati on	predati on_S	712	13		
Point (267000 785000)	7951 47	12/12 /13	26700 0	78500 0	predati on	predati on_S	588	13		
Point (267000 788000)	7943 88	1/11/ 14	26700 0	78800 0	predati on	predati on_S	585	13		
Point (274000 785000)	7939 88	1/29/ 14	27400 0	78500 0	predati on	predati on_S	1036	24		
Point (274612.591100000 01965091 784590.312999999 96554106)	7939 89	1/29/ 14	27461 2.6	78459 0.3	shooti ng	Golan shootin g 2013-2021	1037	25		
Point (268000 783000)	7936 62	2/12/ 14	26800 0	78300 0	predati on	predati on_S	654	14		
Point (272212.965099999 97215346 752474.096000000 01955777)	7936 77	2/12/ 14	27221 3	75247 4.1	shooti ng	Golan shootin g 2013-2021	941	30		
Point (261438.344799999 99166466 788185.470300000 04451722)	7931 98	3/3/1 4	26143 8.3	78818 5.5	shooti ng	Golan shootin g 2013-2021	201	2		
Point (258377.780900000 01247972 734438.410400000 05159527)	7931 02	3/7/1 4	25837 7.8	73443 8.4	shooti ng	Golan shootin g 2013-2021	63	11		
Point (264785.064699999 98807907 786954.371000000 04284084)	7928 59	3/21/ 14	26478 5.1	78695 4.4	shooti ng	Golan shootin g 2013-2021	394	13		
Point (277074.662599999	7907 01	6/15/ 14	27707 4.7	77679 8.8	shooti ng	Golan shootin	1236	37		

98146668 776798.77190000005066395)						g 2013-2021				
Point (259384.21340000000782311 766439.82090000004973263)	788544	8/31/14	259384.2	766439.8	shooting	Golan shooting 2013-2021	95	6		
Point (274000 760000)	788438	9/2/14	274000	760000	predation	predation_S	1061	29		
Point (263000 787000)	788378	9/3/14	263000	787000	predation	predation_S	330	2		
Point (264000 793000)	788334	9/5/14	264000	793000	predation	predation_S	388	12		
Point (264000 793000)	788306	9/6/14	264000	793000	predation	predation_S	388	12		
Point (260000 770000)	788101	9/11/14	260000	770000	predation	predation_S	155	5		
Point (265162.18089999997755513 786861.7084000000031665)	787801	9/22/14	265162.2	786861.7	shooting	Golan shooting 2013-2021	458	13		
Point (274155.16529999999329448 776605.67909999995026737)	787003	10/26/14	274155.2	776605.7	shooting	Golan shooting 2013-2021	1045	26		
Point (261091.63190000000759028 795019.70739999995566905)	786723	11/11/14	261091.6	795019.7	shooting	Golan shooting 2013-2021	194	1		
Point (263249.23570000001927838 787242.04639999999199063)	786716	11/12/14	263249.2	787242	shooting	Golan shooting 2013-2021	330	2		
Point (259415.95759999999427237 769999.39670000004116446)	786477	11/29/14	259416	769999.4	shooting	Golan shooting 2013-2021	91	5		
Point (268830.17340000002877787 789081.11829999997280538)	786238	12/15/14	268830.2	789081.1	shooting	Golan shooting 2013-2021	648	13		
Point (263179.04680000001098961 763938.52489999996032566)	786038	12/28/14	263179	763938.5	shooting	Golan shooting 2013-2021	353	6		
Point (272000 752000)	861245	1/14/15	272000	752000	predation	predation_S	941	30		
Point (274000 786000)	830051	1/21/15	274000	786000	predation	predation_S	1035	24		
Point (274023.72690000000875443 776722.412999999942258)	1040010	6/11/15	274023.7	776722.4	shooting	Golan shooting 2013-2021	1044	26		

Point (274032.23220000002766028 761564.09739999996963888)	858884	6/28/15	274032.2	761564.1	shooting	Golan shooting 2013-2021	1060	28		
Point (274032.23220000002766028 761564.09739999996963888)	858885	6/28/15	274032.2	761564.1	shooting	Golan shooting 2013-2021	1060	28	duplicate report of 858884	TRUE
Point (275000 762000)	829400	6/28/15	275000	762000	predation	predation_S	1123	28		
Point (275000 762000)	829401	6/28/15	275000	762000	predation	predation_S	1123	28	duplicate report of 829400	TRUE
Point (275048.0851000000257045 761491.0518999999621883)	858575	7/24/15	275048.1	761491.1	shooting	Golan shooting 2013-2021	1124	28		
Point (263779.77980000001844019 750011.65170000004582107)	847178	7/26/15	263779.8	750011.7	shooting	Golan shooting 2013-2021	367	8		
Point (277319.39289999997708946 773255.78590000001713634)	858521	7/28/15	277319.4	773255.8	shooting	Golan shooting 2013-2021	1240	37		
Point (274168.11949999997159466 776609.47560000000521541)	858469	8/3/15	274168.1	776609.5	shooting	Golan shooting 2013-2021	1045	26		
Point (275466.45439999998779967 761644.49150000000372529)	858453	8/4/15	275466.5	761644.5	shooting	Golan shooting 2013-2021	1123	28		
Point (277000 765000)	846140	8/4/15	277000	765000	predation	predation_S	1248	39		
Point (272297.33809999999357387 759653.86640000005718321)	858383	8/9/15	272297.3	759653.9	shooting	Golan shooting 2013-2021	933	29		
Point (271000 751000)	845263	8/10/15	271000	751000	predation	predation_S	878	30		
Point (278000 759000)	842007	9/6/15	278000	759000	predation	predation_S	1318	40		
Point (269000 763000)	849588	10/1/15	269000	763000	predation	predation_S	738	17		
Point (271369.27480000001378357 751268.31050000002142042)	849675	10/1/15	271369.3	751268.3	shooting	Golan shooting 2013-2021	878	30		

Point (269167.22499999997671694 786816.48270000005140901)	849363	10/4/15	269167.2	786816.5	shooting	Golan shooting 2013-2021	714	13		
Point (269000 787000)	849364	10/4/15	269000	787000	predation	predation_S	714	13		
Point (265881.10869999998249114 760863.11149999999906868)	853236	10/8/15	265881.1	760863.1	shooting	Golan shooting 2013-2021	484	17		
Point (262000 774000)	851250	10/9/15	262000	774000	predation	predation_S	279	4		
Point (271000 764000)	851251	10/9/15	271000	764000	predation	predation_S	865	28		
Point (265000 771000)	852728	10/14/15	265000	771000	predation	predation_S	474	16		
Point (274820.83460000000195578 751807.59429999999701977)	871919	11/1/15	274820.8	751807.6	shooting	Golan shooting 2013-2021	1069	30		
Point (263000 786000)	857571	11/6/15	263000	786000	predation	predation_S	331	2		
Point (262000 788000)	857551	11/7/15	262000	788000	predation	predation_S	265	2		
Point (267954.23629999998956919 779069.11800000001676381)	870601	11/9/15	267954.2	779069.1	shooting	Golan shooting 2013-2021	658	14		
Point (268000 779000)	870602	11/9/15	268000	779000	predation	predation_S	658	14		
Point (265806.10450000001583248 760632.33209999999962747)	871842	11/13/15	265806.1	760632.3	shooting	Golan shooting 2013-2021	484	17		
Point (277000 760000)	872532	11/16/15	277000	760000	predation	predation_S	1253	40		
Point (272000 764000)	933654	12/2/15	272000	764000	predation	predation_S	929	28		
Point (270000 742000)	933868	12/13/15	270000	742000	predation	predation_S	823	32		
Point (269000 761000)	941766	12/15/15	269000	761000	predation	predation_S	740	17		
Point (270000 763000)	941706	12/29/15	270000	763000	predation	predation_S	802	28		
Point (271000 778000)	975719	12/30/15	271000	778000	predation	predation_S	851	26		
Point (266000 789000)	941655	1/9/16	266000	789000	predation	predation_S	520	13		
Point (266000 789000)	941891	1/9/16	266000	789000	predation	predation_S	520	13	duplicate report of 941655	TRUE
Point (271000 777000)	975163	1/26/16	271000	777000	predation	predation_S	852	26		

Point (271000 764000)	975168	1/26/16	271000	764000	predation	predation_S	865	28		
Point (272199.59989999997196719 790397.08570000005420297)	945637	1/28/16	272199.6	790397.1	shooting	Golan shooting 2013-2021	903	24		
Point (268168.62959999998565763 776553.03910000005271286)	975093	1/31/16	268168.6	776553	shooting	Golan shooting 2013-2021	661	15		
Point (275465.26990000001387671 762223.23049999994691461)	975090	1/31/16	275465.3	762223.2	shooting	Golan shooting 2013-2021	1123	28		
Point (268000 787000)	950153	2/20/16	268000	787000	predation	predation_S	650	13		
Point (272027.53000000002793968 784351.71030000003520399)	980721	3/1/16	272027.5	784351.7	shooting	Golan shooting 2013-2021	909	25		
Point (275000 762000)	982915	3/9/16	275000	762000	predation	predation_S	1123	28		
Point (272000 758000)	1006347	5/17/16	272000	758000	predation	predation_S	935	29		
Point (272310.70929999998770654 752414.76329999999143183)	1028034	6/26/16	272310.7	752414.8	shooting	Golan shooting 2013-2021	941	30		
Point (275499.86499999999068677 759844.61499999999068677)	1028434	6/29/16	275499.9	759844.6	shooting	Golan shooting 2013-2021	1125	29		
Point (265797.93180000002030283 760624.23770000005606562)	1054501	7/1/16	265797.9	760624.2	shooting	Golan shooting 2013-2021	484	17		
Point (264027.79920000000856817 762546.456499999971129)	1054487	7/8/16	264027.8	762546.5	shooting	Golan shooting 2013-2021	419	17		
Point (276051.48009999998612329 769539.04749999998603016)	1054488	7/8/16	276051.5	769539	shooting	Golan shooting 2013-2021	1180	38		
Point (265526.69280000001890585 786535.32949999999254942)	1047443	7/16/16	265526.7	786535.3	shooting	Golan shooting 2013-2021	459	13		
Point (265341.06130000000121072 791760.43530000001192093)	1051351	7/27/16	265341.1	791760.4	shooting	Golan shooting 2013-2021	453	12		

Point (266846.39079999999376014 778116.83979999995790422)	1054560	8/7/16	266846.4	778116.8	shooting	Golan shooting 2013-2021	531	15		
Point (270171.14299999998183921 782053.34669999999459833)	1054559	8/7/16	270171.1	782053.3	shooting	Golan shooting 2013-2021	783	25		
Point (274324.2579000000259839 776034.47620000003371388)	1057454	8/14/16	274324.3	776034.5	shooting	Golan shooting 2013-2021	1045	26		
Point (276000 762000)	1058722	8/15/16	276000	762000	predation	predation_S	1187	39		
Point (276000 760000)	1058721	8/16/16	276000	760000	predation	predation_S	1189	40		
Point (280000 770000)	1066859	8/30/16	280000	770000	predation	predation_S	1435	38		
Point (276000 762000)	1066883	8/31/16	276000	762000	predation	predation_S	1187	39		
Point (276000 762000)	1073945	9/13/16	276000	762000	predation	predation_S	1187	39		
Point (266000 781000)	1074285	9/16/16	266000	781000	predation	predation_S	528	14		
Point (260000 760000)	1086305	9/29/16	260000	760000	predation	predation_S	165	7		
Point (272063.12050000001909211 753062.38679999997839332)	1090419	10/28/16	272063.1	753062.4	shooting	Golan shooting 2013-2021	940	30		
Point (279514.15289999998640269 766019.61930000002030283)	1092978	11/5/16	279514.2	766019.6	shooting	Golan shooting 2013-2021	1375	39		
Point (270000 765000)	1107651	12/18/16	270000	765000	predation	predation_S	800	28		
Point (270000 765000)	1126221	12/18/16	270000	765000	predation	predation_S	800	28	duplicate report of 1107651	TRUE
Point (270000 765000)	1126119	1/15/17	270000	765000	predation	predation_S	800	28		
Point (259745.22959999999914784 757623.63939999998547137)	1133519	1/26/17	259745.2	757623.6	shooting	Golan shooting 2013-2021	103	7		
Point (260000 758000)	1133518	1/26/17	260000	758000	predation	predation_S	167	7		
Point (263000 786000)	1130181	1/30/17	263000	786000	predation	predation_S	331	2		
Point (263511.5408000000170432 789075.68500000005587935)	1131451	1/31/17	263511.5	789075.7	shooting	Golan shooting 2013-2021	328	2		

Point (270000 765000)	1137453	2/7/17	270000	765000	predation	predation_S	800	28		
Point (265965.29749999998603016 791409.7362000000430271)	1141332	2/16/17	265965.3	791409.7	shooting	Golan shooting 2013-2021	518	12		
Point (270000 751000)	1140584	2/16/17	270000	751000	predation	predation_S	814	30		
Point (270000 751000)	1141114	2/16/17	270000	751000	predation	predation_S	814	30	duplicate reoprt of 1140584	TRUE
Point (262000 764000)	1144521	2/19/17	262000	764000	predation	predation_S	289	6		
Point (271000 752000)	1142843	2/20/17	271000	752000	predation	predation_S	877	30		
Point (269642.07229999999981374 751988.07979999994859099)	1146661	2/23/17	269642.1	751988.1	shooting	Golan shooting 2013-2021	749	19		
Point (271000 765000)	1153346	3/3/17	271000	765000	predation	predation_S	864	28		
Point (265770.31479999999282882 760560.65309999999590218)	1171240	3/17/17	265770.3	760560.7	shooting	Golan shooting 2013-2021	485	18		
Point (264791.70270000002346933 786937.03870000003371388)	1186268	4/9/17	264791.7	786937	shooting	Golan shooting 2013-2021	394	13		
Point (274000 753000)	1191112	4/16/17	274000	753000	predation	predation_S	1068	30		
Point (268139.03149999998277053 741046.12630000000353903)	1209782	5/15/17	268139	741046.1	shooting	Golan shooting 2013-2021	696	21		
Point (266311.49339999997755513 752696.60439999995287508)	1228053	6/20/17	266311.5	752696.6	shooting	Golan shooting 2013-2021	556	19		
Point (279000 774000)	1238119	7/13/17	279000	774000	predation	predation_S	1367	37		
Point (277000 773000)	1244865	7/26/17	277000	773000	predation	predation_S	1240	37		
Point (277521.35460000002058223 773263.36250000004656613)	1270292	8/20/17	277521.4	773263.4	shooting	Golan shooting 2013-2021	1240	37		
Point (277000 773000)	1270293	8/20/17	277000	773000	predation	predation_S	1240	37		
Point (277000 765000)	1275902	8/28/17	277000	765000	predation	predation_S	1248	39		
Point (261582.731100000	1280485	9/12/17	261582.7	765749.9	shooting	Golan shootin	223	6		

00451691 765749.869199999 95734543)						g 2013-2021				
Point (275000 762000)	1282 412	9/17/ 17	27500 0	76200 0	predati on	predati on_S	1123	28		
Point (277000 773000)	1282 413	9/17/ 17	27700 0	77300 0	predati on	predati on_S	1240	37		
Point (271000 762000)	1288 644	10/1/ 17	27100 0	76200 0	predati on	predati on_S	867	28		
Point (260316.314899999 99757856 766230.634500000 04377216)	1291 248	10/2/ 17	26031 6.3	76623 0.6	shooti ng	Golan shootin g 2013-2021	159	6		
Point (275765.944799999 99748543 764723.802400000 04414469)	1291 244	10/6/ 17	27576 5.9	76472 3.8	shooti ng	Golan shootin g 2013-2021	1120	28		
Point (272555.244400000 02505258 770753.942299999 99515712)	1290 944	10/7/ 17	27255 5.2	77075 3.9	shooti ng	Golan shootin g 2013-2021	922	27		
Point (277703.248599999 99171123 766006.599999999 97671694)	1295 938	10/17 /17	27770 3.2	76600 6.6	shooti ng	Golan shootin g 2013-2021	1247	39		
Point (259694.529399999 99944121 766457.205700000 04954636)	1296 427	10/18 /17	25969 4.5	76645 7.2	shooti ng	Golan shootin g 2013-2021	95	6		
Point (277393.503399999 98686835 773177.495299999 95138496)	1296 176	10/18 /17	27739 3.5	77317 7.5	shooti ng	Golan shootin g 2013-2021	1240	37		
Point (277000 773000)	1296 179	10/18 /17	27700 0	77300 0	predati on	predati on_S	1240	37		
Point (276128.943399999 98919666 750421.741099999 98472631)	1299 582	10/23 /17	27612 8.9	75042 1.7	shooti ng	Golan shootin g 2013-2021	1199	41		
Point (259698.651600000 0119675 766226.293199999 9564141)	1301 397	10/24 /17	25969 8.7	76622 6.3	shooti ng	Golan shootin g 2013-2021	95	6		
Point (261753.886800000 00749715 779282.931800000 02030283)	1308 284	11/5/ 17	26175 3.9	77928 2.9	shooti ng	Golan shootin g 2013-2021	210	3		
Point (266000 762000)	1306 740	11/5/ 17	26600 0	76200 0	predati on	predati on_S	547	17		
Point (266000 763000)	1306 828	11/6/ 17	26600 0	76300 0	predati on	predati on_S	546	17		
Point (267000 764000)	1309 475	11/9/ 17	26700 0	76400 0	predati on	predati on_S	609	17		

Point (266000 764000)	1311086	11/12/17	266000	764000	predation	predation_S	545	17		
Point (269118.33319999999366701 754990.71939999994356185)	1311978	11/13/17	269118.3	754990.7	shooting	Golan shooting 2013-2021	746	18		
Point (269120.3239000000017602 754985.62760000000707805)	1312026	11/14/17	269120.3	754985.6	shooting	Golan shooting 2013-2021	746	18		
Point (269000 773000)	1315148	11/16/17	269000	773000	predation	predation_S	728	15		
Point (269000 763000)	1317815	11/19/17	269000	763000	predation	predation_S	738	17		
Point (268688.7890999999945052 762902.62609999999403954)	1323201	11/30/17	268688.8	762902.6	shooting	Golan shooting 2013-2021	674	17		
Point (260233.5744000000124689 766093.93169999995734543)	1328443	12/12/17	260233.6	766093.9	shooting	Golan shooting 2013-2021	159	6		
Point (267000 765000)	1328465	12/12/17	267000	765000	predation	predation_S	608	17		
Point (278404.97289999999338761 765215.03720000002067536)	1330828	12/17/17	278405	765215	shooting	Golan shooting 2013-2021	1312	39		
Point (262000 774000)	1331958	12/19/17	262000	774000	predation	predation_S	279	4		
Point (260000 770000)	1331957	12/19/17	260000	770000	predation	predation_S	155	5		
Point (273000 765000)	1331962	12/19/17	273000	765000	predation	predation_S	992	28		
Point (279000 766000)	1331961	12/19/17	279000	766000	predation	predation_S	1375	39		
Point (259422.13550000000395812 766427.75959999999031425)	1333738	12/23/17	259422.1	766427.8	shooting	Golan shooting 2013-2021	95	6		
Point (271774.66529999999329448 765362.65069999999832362)	1336007	12/28/17	271774.7	765362.7	shooting	Golan shooting 2013-2021	864	28		
Point (269467.7858000000001238659 763168.40780000000004451722)	1336572	12/30/17	269467.8	763168.4	shooting	Golan shooting 2013-2021	738	17		
Point (269433.2503000000001424924 763193.74140000000005718321)	1336785	12/30/17	269433.3	763193.7	shooting	Golan shooting 2013-2021	738	17	two shooting events per day see	

									also 1336 572	
Point (267000 764000)	1338 525	1/2/1 8	26700 0	76400 0	predati on	predati on_S	609	17		
Point (272000 765000)	1338 742	1/3/1 8	27200 0	76500 0	predati on	predati on_S	928	28		
Point (272000 767000)	1341 059	1/8/1 8	27200 0	76700 0	predati on	predati on_S	926	27		
Point (267000 764000)	1341 534	1/9/1 8	26700 0	76400 0	predati on	predati on_S	609	17		
Point (267000 764000)	1342 838	1/11/ 18	26700 0	76400 0	predati on	predati on_S	609	17		
Point (268000 777000)	1345 661	1/14/ 18	26800 0	77700 0	predati on	predati on_S	660	15		
Point (278392.544400000 01341105 765885.198100000 0378117)	1351 544	1/17/ 18	27839 2.5	76588 5.2	shooti ng	Golan shootin g 2013-2021	1311	39		
Point (261958.131800000 00284053 769036.639300000 03892928)	1355 700	1/24/ 18	26195 8.1	76903 6.6	shooti ng	Golan shootin g 2013-2021	284	5		
Point (263000 771000)	1358 784	1/31/ 18	26300 0	77100 0	predati on	predati on_S	346	5		
Point (263000 771000)	1358 785	1/31/ 18	26300 0	77100 0	predati on	predati on_S	346	5	duplic ate report of 1358 784	TRU E
Point (263000 770000)	1358 783	1/31/ 18	26300 0	77000 0	predati on	predati on_S	347	5		
Point (269557.649800000 01378357 764855.345899999 95660037)	1359 120	1/31/ 18	26955 7.6	76485 5.3	shooti ng	Golan shootin g 2013-2021	736	17		
Point (263269.463899999 97336417 770357.222300000 0230968)	1379 217	2/11/ 18	26326 9.5	77035 7.2	shooti ng	Golan shootin g 2013-2021	347	5		
Point (272352.342599999 97448176 752498.006000000 05215406)	1397 073	3/14/ 18	27235 2.3	75249 8	shooti ng	Golan shootin g 2013-2021	941	30		
Point (272322.802800000 00493601 752508.495099999 94188547)	1397 074	3/14/ 18	27232 2.8	75250 8.5	shooti ng	Golan shootin g 2013-2021	941	30	two shooti ng event s per day see also 1397 073	
Point (268000 762000)	1399 649	3/18/ 18	26800 0	76200 0	predati on	predati on_S	675	17		

Point (275000 752000)	1407771	4/2/18	275000	752000	predation	predation_S	1133	30		
Point (263151.85570000001462176 778903.93740000005345792)	1416472	4/20/18	263151.9	778903.9	shooting	Golan shooting 2013-2021	338	3		
Point (265580.59309999999823049 792662.47210000001359731)	1421080	4/30/18	265580.6	792662.5	shooting	Golan shooting 2013-2021	452	12		
Point (272000 752000)	1421217	5/1/18	272000	752000	predation	predation_S	941	30		
Point (272333.35690000001341105 752512.76619999995455146)	1421218	5/1/18	272333.4	752512.8	shooting	Golan shooting 2013-2021	941	30		
Point (264702.07579999999143183 791731.12459999998100102)	1442235	5/28/18	264702.1	791731.1	shooting	Golan shooting 2013-2021	389	12		
Point (271531.8655000000144355 788698.67810000001918525)	1442573	5/29/18	271531.9	788698.7	shooting	Golan shooting 2013-2021	840	24		
Point (271000 765000)	1442798	5/29/18	271000	765000	predation	predation_S	864	28		
Point (272000 752000)	1448568	6/10/18	272000	752000	predation	predation_S	941	30		
Point (264000 770000)	1480716	7/27/18	264000	770000	predation	predation_S	411	16		
Point (268000 774000)	1482332	7/31/18	268000	774000	predation	predation_S	663	15		
Point (264511.65690000000176951 770382.14130000001750886)	1482223	7/31/18	264511.7	770382.1	shooting	Golan shooting 2013-2021	411	16		
Point (268312.92420000000856817 773766.4355999999679625)	1483267	8/2/18	268312.9	773766.4	shooting	Golan shooting 2013-2021	663	15		
Point (262325.01589999999850988 790022.76329999999143183)	1502801	8/31/18	262325	790022.8	shooting	Golan shooting 2013-2021	263	2		
Point (265343.6745000000228174 747361.63439999998081475)	1512104	9/20/18	265343.7	747361.6	shooting	Golan shooting 2013-2021	498	20		
Point (261760.63899999999557622 779225.34499999997206032)	1512456	9/21/18	261760.6	779225.3	shooting	Golan shooting 2013-2021	210	3		

Point (264455.0590000000083819 770337.18539999995846301)	1514844	9/26/18	264455.1	770337.2	shooting	Golan shooting 2013-2021	411	16		
Point (276000 762000)	1515165	9/27/18	276000	762000	predation	predation_S	1187	39		
Point (276114.45030000002589077 762095.98210000002291054)	1515167	9/27/18	276114.5	762096	shooting	Golan shooting 2013-2021	1187	39		
Point (264736.31339999998454005 792568.6735999999800697)	1519982	10/7/18	264736.3	792568.7	shooting	Golan shooting 2013-2021	389	12		
Point (279000 759000)	1534270	10/26/18	279000	759000	predation	predation_S	1382	40		
Point (264000 794000)	1534627	10/28/18	264000	794000	predation	predation_S	387	12		
Point (264117.96679999999469146 793575.12509999994654208)	1538936	11/6/18	264118	793575.1	shooting	Golan shooting 2013-2021	388	12		
Point (264420.74520000000484288 792939.32440000004135072)	1540560	11/10/18	264420.7	792939.3	shooting	Golan shooting 2013-2021	388	12		
Point (264475.49499999999534339 790953.79969999997410923)	1546130	11/21/18	264475.5	790953.8	shooting	Golan shooting 2013-2021	390	12		
Point (270859.00239999999757856 765052.04650000005494803)	1549180	11/26/18	270859	765052	shooting	Golan shooting 2013-2021	800	28		
Point (264264.70510000002104789 793162.87100000004284084)	1551706	12/4/18	264264.7	793162.9	shooting	Golan shooting 2013-2021	388	12		
Point (264037.1934999999939464 792691.11430000001564622)	1552482	12/7/18	264037.2	792691.1	shooting	Golan shooting 2013-2021	388	12		
Point (269650.24020000000018626 754193.54520000005140901)	1554248	12/11/18	269650.2	754193.5	shooting	Golan shooting 2013-2021	747	19		
Point (274000 762000)	1557062	12/17/18	274000	762000	predation	predation_S	1059	28		
Point (262879.70779999997466803 788470.56620000000111759)	1560409	12/25/18	262879.7	788470.6	shooting	Golan shooting 2013-2021	265	2		

Point (266654 791367)	2094553	1/14/19	266654	791367	shooting	Golan shooting 2013-2021	518	12		
Point (272000 758000)	1655063	2/3/19	272000	758000	predation	predation_S	935	29		
Point (261522.59520000001066364 742565.89659999997820705)	1655241	2/4/19	261522.6	742565.9	shooting	Golan shooting 2013-2021	247	10		
Point (260787 766293)	2094560	2/9/19	260787	766293	shooting	Golan shooting 2013-2021	159	6	doplicate report of 1867784	TRUE
Point (274299 761536)	2094555	2/20/19	274299	761536	shooting	Golan shooting 2013-2021	1060	28		
Point (261000 796000)	1678930	2/22/19	261000	796000	predation	predation_S	193	1		
Point (263000 763000)	1682215	2/26/19	263000	763000	predation	predation_S	354	6		
Point (263000 761000)	1682221	2/26/19	263000	761000	predation	predation_S	356	6		
Point (265000 763000)	1682209	2/26/19	265000	763000	predation	predation_S	482	17		
Point (274438.79930000001331791 761572.75150000001303852)	1699604	3/12/19	274438.8	761572.8	shooting	Golan shooting 2013-2021	1060	28		
Point (265473.49080000002868474 777131.57730000000447035)	1702099	3/14/19	265473.5	777131.6	shooting	Golan shooting 2013-2021	468	15		
Point (265000 777000)	1703166	3/15/19	265000	777000	predation	predation_S	468	15		
Point (269381.35769999999320135 762530.35510000004433095)	1715971	3/27/19	269381.4	762530.4	shooting	Golan shooting 2013-2021	739	17		
Point (274000 787000)	1734864	4/9/19	274000	787000	predation	predation_S	1034	24		
Point (270000 785000)	1756186	5/6/19	270000	785000	predation	predation_S	780	24		
Point (278000 760000)	1757491	5/8/19	278000	760000	predation	predation_S	1317	40		
Point (279000 759000)	1757493	5/8/19	279000	759000	predation	predation_S	1382	40		
Point (264206.74040000000968575 780337.78330000001005828)	1782216	6/3/19	264206.7	780337.8	shooting	Golan shooting 2013-2021	401	14		
Point (269000 763000)	1782215	6/3/19	269000	763000	predation	predation_S	738	17		

Point (277000 765000)	1797783	6/21/19	277000	765000	predation	predation_S	1248	39		
Point (270000 765000)	1799656	6/23/19	270000	765000	predation	predation_S	800	28		
Point (277000 765000)	1810825	6/25/19	277000	765000	predation	predation_S	1248	39		
Point (276568.61259999999310821 764917.72329999995417893)	1811085	6/26/19	276568.6	764917.7	shooting	Golan shooting 2013-2021	1184	39		
Point (268992.28970000002300367 778716.90800000005401671)	1813769	6/28/19	268992.3	778716.9	shooting	Golan shooting 2013-2021	722	14		
Point (259000 761000)	1817665	7/6/19	259000	761000	predation	predation_S	100	6		
Point (268000 790000)	1821952	7/10/19	268000	790000	predation	predation_S	647	13		
Point (268120.37359999999171123 790751.14630000002216548)	1823018	7/11/19	268120.4	790751.1	shooting	Golan shooting 2013-2021	646	12		
Point (268966.70209999999497086 791183.42029999999795109)	1823133	7/12/19	268966.7	791183.4	shooting	Golan shooting 2013-2021	710	12		
Point (271000 797000)	1826332	7/15/19	271000	797000	predation	predation_S	0	0		
Point (276571 764843)	2094559	7/27/19	276571	764843	shooting	Golan shooting 2013-2021	1184	39		
Point (277000 765000)	1837916	7/28/19	277000	765000	predation	predation_S	1248	39		
Point (273516.69040000002132729 747021.26670000003650784)	1838919	7/29/19	273516.7	747021.3	shooting	Golan shooting 2013-2021	1010	31		
Point (275031.35639999998966232 765950.70019999996293336)	1842574	8/1/19	275031.4	765950.7	shooting	Golan shooting 2013-2021	1119	28		
Point (277000 765000)	1842575	8/1/19	277000	765000	predation	predation_S	1248	39		
Point (270000 763000)	1844102	8/2/19	270000	763000	predation	predation_S	802	28		
Point (277000 775000)	1851459	8/8/19	277000	775000	predation	predation_S	1238	37		
Point (277000 765000)	1850503	8/8/19	277000	765000	predation	predation_S	1248	39		
Point (270000 763000)	1853398	8/12/19	270000	763000	predation	predation_S	802	28		
Point (261000 796000)	1854833	8/15/19	261000	796000	predation	predation_S	193	1		
Point (266000 791000)	1861790	8/21/19	266000	791000	predation	predation_S	518	12		

Point (267000 775000)	1863 300	8/25/ 19	26700 0	77500 0	predati on	predati on_S	598	15		
Point (271000 765000)	1863 940	8/26/ 19	27100 0	76500 0	predati on	predati on_S	864	28		
Point (260786.531900000 00176951 766293.323199999 98435378)	1867 784	9/2/1 9	26078 6.5	76629 3.3	shooti ng	Golan shootin g 2013- 2021	159	6		
Point (261000 796000)	1869 765	9/5/1 9	26100 0	79600 0	predati on	predati on_S	193	1		
Point (268735.905599999 99823049 775849.454600000 05550683)	1870 283	9/6/1 9	26873 5.9	77584 9.5	shooti ng	Golan shootin g 2013- 2021	661	15		
Point (268000 774000)	1870 296	9/6/1 9	26800 0	77400 0	predati on	predati on_S	663	15		
Point (265088.096599999 98984858 789224.529600000 0089407)	1871 654	9/7/1 9	26508 8.1	78922 4.5	shooti ng	Golan shootin g 2013- 2021	456	13		
Point (270792.655900000 01247972 764886.223299999 95417893)	1873 751	9/10/ 19	27079 2.7	76488 6.2	shooti ng	Golan shootin g 2013- 2021	800	28		
Point (261000 766000)	1879 549	9/18/ 19	26100 0	76600 0	predati on	predati on_S	223	6		
Point (261000 765000)	1879 557	9/18/ 19	26100 0	76500 0	predati on	predati on_S	224	6		
Point (267000 778000)	1879 613	9/18/ 19	26700 0	77800 0	predati on	predati on_S	595	15		
Point (272841.435500000 02142042 750861.866000000 03818423)	1884 292	9/25/ 19	27284 1.4	75086 1.9	shooti ng	Golan shootin g 2013- 2021	942	30		
Point (272807.954399999 98779967 750821.093100000 05643815)	1884 830	9/25/ 19	27280 8	75082 1.1	shooti ng	Golan shootin g 2013- 2021	942	30	two event s per day see also 1884 292	
Point (277000 765000)	1885 385	9/26/ 19	27700 0	76500 0	predati on	predati on_S	1248	39		
Point (266000 790000)	1889 786	10/2/ 19	26600 0	79000 0	predati on	predati on_S	519	13		
Point (263000 764000)	1890 691	10/3/ 19	26300 0	76400 0	predati on	predati on_S	353	6		
Point (270000 764000)	1893 393	10/5/ 19	27000 0	76400 0	predati on	predati on_S	801	28		
Point (271000 765000)	1893 110	10/6/ 19	27100 0	76500 0	predati on	predati on_S	864	28		
Point (261000 766000)	1893 511	10/7/ 19	26100 0	76600 0	predati on	predati on_S	223	6		
Point (272401.751700000 02253801	1898 300	10/7/ 19	27240 1.8	75155 6.7	shooti ng	Golan shootin	942	30		

751556.665599999 94933605)						g 2013-2021				
Point (266000 761000)	1900 024	10/11 /19	26600 0	76100 0	predati on	predati on_S	548	17		
Point (267000 763000)	1900 022	10/11 /19	26700 0	76300 0	predati on	predati on_S	610	17		
Point (270884.195100000 01173466 764810.617599999 99776483)	1900 631	10/12 /19	27088 4.2	76481 0.6	shooti ng	Golan shootin g 2013-2021	800	28		
Point (271000 765000)	1900 975	10/12 /19	27100 0	76500 0	predati on	predati on_S	864	28		
Point (265000 763000)	1913 081	10/27 /19	26500 0	76300 0	predati on	predati on_S	482	17		
Point (266000 760000)	1913 075	10/27 /19	26600 0	76000 0	predati on	predati on_S	549	18		
Point (264704.995600000 02384186 793491.432900000 01434237)	1914 041	10/28 /19	26470 5	79349 1.4	shooti ng	Golan shootin g 2013-2021	388	12		
Point (272278.510999999 99860302 753037.398799999 96628612)	1913 554	10/28 /19	27227 8.5	75303 7.4	shooti ng	Golan shootin g 2013-2021	940	30		
Point (270000 763000)	1915 225	10/30 /19	27000 0	76300 0	predati on	predati on_S	802	28		
Point (261171.979099999 9968335 795452.899300000 04824251)	1917 716	11/3/ 19	26117 2	79545 2.9	shooti ng	Golan shootin g 2013-2021	194	1		
Point (266000 760000)	1917 727	11/3/ 19	26600 0	76000 0	predati on	predati on_S	549	18		
Point (264716 792604)	2094 561	11/4/ 19	26471 6	79260 4	shooti ng	Golan shootin g 2013-2021	389	12		
Point (264609.016599999 97355044 792822.405700000 00298023)	1922 539	11/9/ 19	26460 9	79282 2.4	shooti ng	Golan shootin g 2013-2021	388	12		
Point (273352.600299999 99096617 784721.117599999 99776483)	1928 048	11/16 /19	27335 2.6	78472 1.1	shooti ng	Golan shootin g 2013-2021	972	24		
Point (268942.624300000 02495944 753716.178300000 02868474)	1928 824	11/17 /19	26894 2.6	75371 6.2	shooti ng	Golan shootin g 2013-2021	747	19		
Point (274000 777000)	1928 793	11/17 /19	27400 0	77700 0	predati on	predati on_S	1044	26		
Point (264506.988799999 99189749 793297.416199999 97783452)	1935 293	11/25 /19	26450 7	79329 7.4	shooti ng	Golan shootin g 2013-2021	388	12		

Point (270000 763000)	1935046	11/25/19	270000	763000	predation	predation_S	802	28		
Point (269316.22999999998137355 752806.06779999996069819)	1936270	11/26/19	269316.2	752806.1	shooting	Golan shooting 2013-2021	748	19		
Point (271000 765000)	1937624	11/28/19	271000	765000	predation	predation_S	864	28		
Point (276000 762000)	1937625	11/28/19	276000	762000	predation	predation_S	1187	39		
Point (269000 774000)	1940587	12/1/19	269000	774000	predation	predation_S	727	15		
Point (271000 765000)	1940136	12/1/19	271000	765000	predation	predation_S	864	28		
Point (276000 762000)	1941102	12/2/19	276000	762000	predation	predation_S	1187	39		
Point (276000 762000)	1942525	12/4/19	276000	762000	predation	predation_S	1187	39		
Point (276305.37910000002011657 762357.94279999996069819)	1943433	12/4/19	276305.4	762357.9	shooting	Golan shooting 2013-2021	1187	39		
Point (265000 793000)	1944209	12/5/19	265000	793000	predation	predation_S	452	12		
Point (271000 765000)	1953927	12/18/19	271000	765000	predation	predation_S	864	28		
Point (276000 762000)	1953932	12/18/19	276000	762000	predation	predation_S	1187	39		
Point (269000 774000)	1961335	12/22/19	269000	774000	predation	predation_S	727	15		
Point (262000 767000)	1962924	12/26/19	262000	767000	predation	predation_S	286	5		
Point (261000 765000)	1962923	12/26/19	261000	765000	predation	predation_S	224	6		
Point (260000 765000)	1969471	1/7/20	260000	765000	predation	predation_S	160	6		
Point (266000 792000)	1970861	1/10/20	266000	792000	predation	predation_S	517	12		
Point (269338.08539999998174608 753426.8144000000320375)	1971864	1/11/20	269338.1	753426.8	shooting	Golan shooting 2013-2021	748	19		
Point (260424.27290000001084991 764808.75130000000353903)	1973371	1/14/20	260424.3	764808.8	shooting	Golan shooting 2013-2021	160	6		
Point (268000 774000)	1974379	1/15/20	268000	774000	predation	predation_S	663	15		
Point (263527.78759999998146668 791966.97939999995287508)	1975191	1/17/20	263527.8	791967	shooting	Golan shooting 2013-2021	325	1		
Point (263000 775000)	1975672	1/17/20	263000	775000	predation	predation_S	342	4		
Point (262000 775000)	1975812	1/18/20	262000	775000	predation	predation_S	278	4		

Point (264960.084199999 9829568 792317.833100000 04712492)	1975 742	1/18/ 20	26496 0.1	79231 7.8	shooti ng	Golan shootin g 2013-2021	453	12		
Point (272000 767000)	1976 015	1/18/ 20	27200 0	76700 0	predati on	predati on_S	926	27		
Point (273376.875999999 98928979 784616.106000000 028871)	1976 637	1/19/ 20	27337 6.9	78461 6.1	shooti ng	Golan shootin g 2013-2021	973	25		
Point (266000 752000)	1980 191	1/22/ 20	26600 0	75200 0	predati on	predati on_S	557	19		
Point (267000 753000)	1980 190	1/22/ 20	26700 0	75300 0	predati on	predati on_S	620	19		
Point (268000 774000)	1980 470	1/23/ 20	26800 0	77400 0	predati on	predati on_S	663	15		
Point (268811.539099999 9945052 771264.580500000 04004687)	1981 278	1/24/ 20	26881 1.5	77126 4.6	shooti ng	Golan shootin g 2013-2021	666	16		
Point (266000 752000)	1984 993	1/28/ 20	26600 0	75200 0	predati on	predati on_S	557	19		
Point (266000 764000)	1985 146	1/29/ 20	26600 0	76400 0	predati on	predati on_S	545	17		
Point (279000 764000)	1986 366	1/31/ 20	27900 0	76400 0	predati on	predati on_S	1377	39		
Point (274000 775000)	1991 980	2/7/2 0	27400 0	77500 0	predati on	predati on_S	1046	26		
Point (263807.314799999 99282882 792038.121999999 97392297)	1992 239	2/8/2 0	26380 7.3	79203 8.1	shooti ng	Golan shootin g 2013-2021	325	1		
Point (261000 768000)	1993 710	2/11/ 20	26100 0	76800 0	predati on	predati on_S	221	5		
Point (261000 768000)	1993 914	2/11/ 20	26100 0	76800 0	predati on	predati on_S	221	5	duplic ate report of 1993 710	TRU E
Point (262000 768000)	1993 705	2/11/ 20	26200 0	76800 0	predati on	predati on_S	285	5		
Point (262000 768000)	1993 707	2/11/ 20	26200 0	76800 0	predati on	predati on_S	285	5	duplic ate report of 1993 705	TRU E
Point (261867.071599999 99566935 768009.013400000 05438924)	1996 025	2/14/ 20	26186 7.1	76800 9	shooti ng	Golan shootin g 2013-2021	221	5		
Point (270000 765000)	1998 494	2/16/ 20	27000 0	76500 0	predati on	predati on_S	800	28		
Point (270000 770000)	2001 844	2/20/ 20	27000 0	77000 0	predati on	predati on_S	795	27		

Point (271000 771000)	2001845	2/20/20	271000	771000	predation	predation_S	858	27		
Point (263210.70230000000447035 792017.2360999999800697)	2002836	2/22/20	263210.7	792017.2	shooting	Golan shooting 2013-2021	325	1		
Point (270000 763000)	2004870	2/25/20	270000	763000	predation	predation_S	802	28		
Point (263708.76620000001275912 791876.96210000000428408)	2006786	2/28/20	263708.8	791877	shooting	Golan shooting 2013-2021	325	1		
Point (270082.77319999999599531 786237.66130000003613532)	2009411	3/1/20	270082.8	786237.7	shooting	Golan shooting 2013-2021	779	24		
Point (278000 759000)	2010835	3/3/20	278000	759000	predation	predation_S	1318	40		
Point (276020.75329999998211861 785402.78870000003371388)	2012878	3/5/20	276020.8	785402.8	shooting	Golan shooting 2013-2021	1164	35		
Point (263000 793000)	2017950	3/8/20	263000	793000	predation	predation_S	324	1		
Point (263403.45250000001396984 792561.57380000001285225)	2017946	3/8/20	263403.5	792561.6	shooting	Golan shooting 2013-2021	325	1		
Point (271000 765000)	2022841	3/13/20	271000	765000	predation	predation_S	864	28		
Point (278000 760000)	2053982	4/14/20	278000	760000	predation	predation_S	1317	40		
Point (261000 772000)	2057252	4/17/20	261000	772000	predation	predation_S	217	5		
Point (265243.55050000001210719 789202.6317999999737367)	2058513	4/18/20	265243.6	789202.6	shooting	Golan shooting 2013-2021	456	13		
Point (273004.0121999999973923 785223.30090000003110617)	2074798	5/2/20	273004	785223.3	shooting	Golan shooting 2013-2021	972	24		
Point (264000 780000)	2133088	6/1/20	264000	780000	predation	predation_S	401	14		
Point (271693.2579000000259839 788843.18350000004284084)	2145272	6/6/20	271693.3	788843.2	shooting	Golan shooting 2013-2021	840	24		
Point (262044.59349999998812564 754037.22829999995883554)	2153848	6/11/20	262044.6	754037.2	shooting	Golan shooting 2013-2021	299	8		
Point (274000 760000)	2283658	6/28/20	274000	760000	predation	predation_S	1061	29		

Point (277000 765000)	2433756	7/8/20	277000	765000	predation	predation_S	1248	39		
Point (271707.93819999997504056 789253.7571000000461936)	2488106	7/11/20	271707.9	789253.8	shooting	Golan shooting 2013-2021	840	24		
Point (265000 782000)	2695897	7/20/20	265000	782000	predation	predation_S	463	14		
Point (264636.77899999998044223 793431.50569999997969717)	2872526	8/5/20	264636.8	793431.5	shooting	Golan shooting 2013-2021	388	12		
Point (268607.86670000001322478 789842.68409999995492399)	2878958	8/13/20	268607.9	789842.7	shooting	Golan shooting 2013-2021	647	13		
Point (264302.43839999998454005 791669.31579999998211861)	2887197	8/23/20	264302.4	791669.3	shooting	Golan shooting 2013-2021	389	12		
Point (267000 783000)	2887724	8/24/20	267000	783000	predation	predation_S	590	14		
Point (265000 772000)	2901047	8/28/20	265000	772000	predation	predation_S	473	16		
Point (259407.38140000001294538 766412.82889999996405095)	2903328	8/31/20	259407.4	766412.8	shooting	Golan shooting 2013-2021	95	6		
Point (265000 772000)	2903286	8/31/20	265000	772000	predation	predation_S	473	16		
Point (275000 763000)	2904191	8/31/20	275000	763000	predation	predation_S	1122	28		
Point (276000 762000)	2905092	9/1/20	276000	762000	predation	predation_S	1187	39		
Point (264000 794000)	2907291	9/3/20	264000	794000	predation	predation_S	387	12		
Point (269000 774000)	2908635	9/4/20	269000	774000	predation	predation_S	727	15		
Point (265000 772000)	2908627	9/4/20	265000	772000	predation	predation_S	473	16		
Point (264214.05119999998714775 793335.83239999995566905)	2909917	9/5/20	264214.1	793335.8	shooting	Golan shooting 2013-2021	388	12		
Point (264906.1753000000026077 771541.00959999999031425)	2912822	9/6/20	264906.2	771541	shooting	Golan shooting 2013-2021	410	16		
Point (265000 772000)	2914949	9/8/20	265000	772000	predation	predation_S	473	16		
Point (265000 772000)	2917369	9/10/20	265000	772000	predation	predation_S	473	16		
Point (262000 773000)	2921029	9/13/20	262000	773000	predation	predation_S	280	4		

Point (265000 772000)	2920 546	9/13/ 20	26500 0	77200 0	predati on	predati on_S	473	16		
Point (265624.869799999 9858439 790876.244100000 01080334)	2921 531	9/14/ 20	26562 4.9	79087 6.2	shooti ng	Golan shootin g 2013- 2021	454	12		
Point (265554.261300000 01285225 790231.834400000 05066395)	2921 510	9/14/ 20	26555 4.3	79023 1.8	shooti ng	Golan shootin g 2013- 2021	455	13		
Point (265275.476100000 02896413 789318.479099999 9968335)	2923 542	9/16/ 20	26527 5.5	78931 8.5	shooti ng	Golan shootin g 2013- 2021	456	13		
Point (269000 775000)	2924 448	9/16/ 20	26900 0	77500 0	predati on	predati on_S	726	15		
Point (265127.711599999 98053536 792953.758799999 95231628)	2932 249	9/25/ 20	26512 7.7	79295 3.8	shooti ng	Golan shootin g 2013- 2021	452	12		
Point (266000 792000)	2931 928	9/25/ 20	26600 0	79200 0	predati on	predati on_S	517	12		
Point (265066.298899999 99431893 792990.405499999 99348074)	2932 373	9/26/ 20	26506 6.3	79299 0.4	shooti ng	Golan shootin g 2013- 2021	452	12		
Point (264830.463199999 99832362 793272.135099999 95585531)	2933 369	9/27/ 20	26483 0.5	79327 2.1	shooti ng	Golan shootin g 2013- 2021	388	12		
Point (264745.102799999 99329448 793307.895900000 0031665)	2933 375	9/27/ 20	26474 5.1	79330 7.9	shooti ng	Golan shootin g 2013- 2021	388	12	two shooti ng event s per day see also 2933 369	
Point (265000 771000)	2934 940	9/30/ 20	26500 0	77100 0	predati on	predati on_S	474	16		
Point (271000 781000)	2936 388	10/2/ 20	27100 0	78100 0	predati on	predati on_S	848	25		
Point (275000 762000)	2941 311	10/8/ 20	27500 0	76200 0	predati on	predati on_S	1123	28		
Point (265000 772000)	2943 624	10/11 /20	26500 0	77200 0	predati on	predati on_S	473	16		
Point (265068.747900000 01667067 792984.982199999 96945262)	2945 149	10/12 /20	26506 8.7	79298 5	shooti ng	Golan shootin g 2013- 2021	452	12		
Point (265386.844700000 01601875	2951 898	10/20 /20	26538 6.8	79307 2.4	shooti ng	Golan shootin g 2013- 2021	452	12		

793072.434699999 98342246)										
Point (264649.673499999 97531995 793344.276199999 96386468)	2965 289	11/2/ 20	26464 9.7	79334 4.3	shooti ng	Golan shootin g 2013- 2021	388	12		
Point (264257.600399999 99571592 793817.842599999 97448176)	2976 176	11/15 /20	26425 7.6	79381 7.8	shooti ng	Golan shootin g 2013- 2021	387	12		
Point (276000 751000)	2976 460	11/15 /20	27600 0	75100 0	predati on	predati on_S	1198	41		
Point (262000 773000)	2980 642	11/19 /20	26200 0	77300 0	predati on	predati on_S	280	4		
Point (261674.863299999 9972526 772194.480400000 00037253)	2980 264	11/19 /20	26167 4.9	77219 4.5	shooti ng	Golan shootin g 2013- 2021	217	5		
Point (261000 760000)	2981 576	11/20 /20	26100 0	76000 0	predati on	predati on_S	229	7		
Point (260000 766000)	2983 259	11/22 /20	26000 0	76600 0	predati on	predati on_S	159	6		
Point (259415.252100000 01243316 766385.022800000 03520399)	2987 081	11/25 /20	25941 5.3	76638 5	shooti ng	Golan shootin g 2013- 2021	95	6		
Point (265000 772000)	2986 599	11/25 /20	26500 0	77200 0	predati on	predati on_S	473	16		
Point (264450.499899999 99525025 794067.511799999 97839332)	2996 538	12/4/ 20	26445 0.5	79406 7.5	shooti ng	Golan shootin g 2013- 2021	387	12		
Point (273154.568499999 9939464 784972.766300000 01750886)	3001 797	12/7/ 20	27315 4.6	78497 2.8	shooti ng	Golan shootin g 2013- 2021	972	24		
Point (263000 774000)	3002 927	12/8/ 20	26300 0	77400 0	predati on	predati on_S	343	4		
Point (261928.967000000 00419095 772512.114300000 01564622)	3004 545	12/9/ 20	26192 9	77251 2.1	shooti ng	Golan shootin g 2013- 2021	217	5		
Point (263160.049500000 0228174 791379.302000000 02514571)	3007 515	12/11 /20	26316 0	79137 9.3	shooti ng	Golan shootin g 2013- 2021	326	1		
Point (264000 785000)	3007 794	12/11 /20	26400 0	78500 0	predati on	predati on_S	396	13		
Point (259455.298000000 00977889 766374.538399999 96125698)	3009 534	12/12 /20	25945 5.3	76637 4.5	shooti ng	Golan shootin g 2013- 2021	95	6		
Point (259394.898500000	3014 085	12/15 /20	25939 4.9	76642 5.6	shooti ng	Golan shootin	95	6		

01024455 766425.643599999 95213002)						g 2013-2021					
Point (261000 756000)	3013869	12/15/20	261000	756000	predation	predation_S	233	7			
Point (265688.043599999 97541308 791828.073100000 0378117)	3018084	12/19/20	265688	791828.1	shooting	Golan shooting 2013-2021	453	12			
Point (261000 766000)	3026243	12/23/20	261000	766000	predation	predation_S	223	6			
Point (263468.954099999 97355044 792299.609999999 98603016)	3026205	12/24/20	263469	792299.6	shooting	Golan shooting 2013-2021	325	1			
Point (263113.278799999 97094274 792101.249799999 99050051)	3032325	12/31/20	263113.3	792101.2	shooting	Golan shooting 2013-2021	325	1			
Point (270000 763000)	3036285	1/4/21	270000	763000	predation	predation_S	802	28			
Point (267000 770000)	3041812	1/10/21	267000	770000	predation	predation_S	603	16			
Point (264000 782000)	3044144	1/12/21	264000	782000	predation	predation_S	399	14			
Point (269652.421900000 01573935 750478.208800000 02216548)	3049115	1/17/21	269652.4	750478.2	shooting	Golan shooting 2013-2021	751	19			
Point (264000 784000)	3049611	1/18/21	264000	784000	predation	predation_S	397	14			
Point (266102.900699999 99832362 792313.190700000 03557652)	3056075	1/25/21	266102.9	792313.2	shooting	Golan shooting 2013-2021	517	12			
Point (270000 781000)	3055647	1/25/21	270000	781000	predation	predation_S	784	25			
Point (270316.003900000 01061708 780954.273399999 94728714)	3058323	1/27/21	270316	780954.3	shooting	Golan shooting 2013-2021	784	25			
Point (270000 750000)	3060793	1/30/21	270000	750000	predation	predation_S	815	30			
Point (262860.672100000 02523884 790776.925500000 01210719)	3061365	1/31/21	262860.7	790776.9	shooting	Golan shooting 2013-2021	262	1			
Point (270240.482699999 99320135 781281.407299999 96256083)	3063383	2/2/21	270240.5	781281.4	shooting	Golan shooting 2013-2021	784	25			
Point (270000 781000)	3063388	2/2/21	270000	781000	predation	predation_S	784	25			
Point (269000 768000)	3065919	2/5/21	269000	768000	predation	predation_S	733	16			

Point (271698.73879999999189749 749592.00430000002961606)	3066323	2/6/21	271698.7	749592	shooting	Golan shooting 2013-2021	880	30		
Point (272000 750000)	3066324	2/6/21	272000	750000	predation	predation_S	943	30		
Point (263389.08950000000186265 792004.66319999995175749)	3069329	2/9/21	263389.1	792004.7	shooting	Golan shooting 2013-2021	325	1		
Point (274000 773000)	3070653	2/10/21	274000	773000	predation	predation_S	1048	26		
Point (272000 768000)	3070647	2/10/21	272000	768000	predation	predation_S	925	27		
Point (266679.69679999997606501 785366.5659999999916181)	3072297	2/11/21	266679.7	785366.6	shooting	Golan shooting 2013-2021	524	13		
Point (264000 782000)	3072163	2/11/21	264000	782000	predation	predation_S	399	14		
Point (263066.8829000000259839 792928.23540000000502914)	3072603	2/12/21	263066.9	792928.2	shooting	Golan shooting 2013-2021	324	1		
Point (264030.2674000000115484 782260.10930000001098961)	3072737	2/12/21	264030.3	782260.1	shooting	Golan shooting 2013-2021	399	14		
Point (264287.3184999999939464 793861.45759999996516854)	3073271	2/13/21	264287.3	793861.5	shooting	Golan shooting 2013-2021	387	12		
Point (264400.36540000000968575 790689.7345000000204891)	3076243	2/15/21	264400.4	790689.7	shooting	Golan shooting 2013-2021	390	12		
Point (274072.22869999997783452 760816.90060000005178154)	3089673	3/4/21	274072.2	760816.9	shooting	Golan shooting 2013-2021	1060	28		
Point (272000 774000)	3092116	3/7/21	272000	774000	predation	predation_S	919	26		
Point (278000 759000)	3092124	3/7/21	278000	759000	predation	predation_S	1318	40		
Point (263069.76829999999608845 792095.9529999999795109)	3093306	3/9/21	263069.8	792096	shooting	Golan shooting 2013-2021	325	1		
Point (264051.6578999999910593 782255.43759999994654208)	3093641	3/9/21	264051.7	782255.4	shooting	Golan shooting 2013-2021	399	14		

Point (271000 777000)	3101917	3/17/21	271000	777000	predation	predation_S	852	26		
Point (264780.78169999999227002 786951.50020000000949949)	3390737	5/9/21	264780.8	786951.5	shooting	Golan shooting 2013-2021	394	13		
Point (265603.49520000000484288 790605.51340000005438924)	3420652	6/8/21	265603.5	790605.5	shooting	Golan shooting 2013-2021	455	13		
Point (271000 779000)	3429053	6/17/21	271000	779000	predation	predation_S	850	25		
Point (267000 790000)	3431495	6/20/21	267000	790000	predation	predation_S	583	13		
Point (270155.84700000000884756 750434.19590000004973263)	3433900	6/22/21	270155.8	750434.2	shooting	Golan shooting 2013-2021	815	30		
Point (277000 766000)	3457341	7/14/21	277000	766000	predation	predation_S	1247	39		
Point (276574.87949999998090789 748958.94070000003557652)	3466149	7/22/21	276574.9	748958.9	shooting	Golan shooting 2013-2021	1200	41		
Point (270000 780000)	3507921	9/1/21	270000	780000	predation	predation_S	785	25		
Point (263000 773000)	3534744	9/21/21	263000	773000	predation	predation_S	344	4		
Point (263000 773000)	3534846	9/21/21	263000	773000	predation	predation_S	344	4	duplicate report of 3534744	TRUE
Point (278000 773000)	3541193	9/27/21	278000	773000	predation	predation_S	1304	37		
Point (264000 772000)	3544323	9/30/21	264000	772000	predation	predation_S	409	16		
Point (264000 787000)	3573506	10/27/21	264000	787000	predation	predation_S	394	13		
Point (265000 791000)	3592018	11/7/21	265000	791000	predation	predation_S	454	12		
Point (271000 778000)	3608446	11/23/21	271000	778000	predation	predation_S	851	26		
Point (272000 778000)	3609437	11/24/21	272000	778000	predation	predation_S	915	26		
Point (273000 782000)	3610442	11/26/21	273000	782000	predation	predation_S	975	25		
Point (264000 783000)	3622181	12/8/21	264000	783000	predation	predation_S	398	14		
Point (267000 785000)	3627342	12/14/21	267000	785000	predation	predation_S	588	13		
Point (264000 794000)	3630011	12/17/21	264000	794000	predation	predation_S	387	12		
Point (264000 791000)	3637007	12/26/21	264000	791000	predation	predation_S	390	12		

Point (269000 755000)	3648338	1/8/22	269000	755000	predation	predation_S	746	18	out of dates range	TRUE

*See Appendix 1 in (Nadler Valency et al., *2025*) for the Cox modeling methods.