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Research

A ten-year community reporting database reveals rising coyote boldness and associated human concern in Edmonton, Canada

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ABSTRACT. In cities throughout North America, sightings of coyotes (*Canis latrans*) have become common. Reports of human-coyote conflict are also rising, as is the public demand for proactive management to prevent negative human-coyote interactions. Effective and proactive management can be informed by the direct observations of community members, who can report their interactions with coyotes and describe the location, time, and context that led to their interactions. To better understand the circumstances that can predict human-coyote conflict, we used a web-based reporting system to collect 9134 community-supplied reports of coyotes in Edmonton, Canada, between January 2012 and December 2021. We used a standardized ordinal ranking system to score each report on two indicators of human-coyote conflict: coyote boldness, based on the reported coyote behavior, and human concern about coyotes, determined from the emotions or perceptions about coyotes expressed by reporters. We assigned greater scores to behaviors where coyotes followed, approached, charged, or contacted pets or people, and to perceptions where reporters expressed fear, worry, concern, discomfort or alarm. Using ordered logistic regression and chi-square tests, we compared boldness and concern scores to spatial, temporal, and contextual predictors. Our analysis showed that coyotes were bolder in less developed open areas and during the pup-rearing season, but human concern was higher in residential areas and during the dispersal season. Reports that mentioned dogs or cats were more likely to describe bolder coyote behavior, and those that mentioned pets or children had more negative perceptions about coyotes. Coyote boldness and human concern both indicated rising human-coyote conflict in Edmonton over the 10 years of reporting.

Key Words: *Canis latrans; community science; human-wildlife coexistence; urban ecology*

INTRODUCTION

The coyote (*Canis latrans*) is a common example of an urban-adapted species that is also the largest carnivore that is common in cities across North America (Magle et al. 2019, Schell et al. 2020). Coyotes thrive in urban areas largely by avoiding interactions with humans (Mowry et al. 2020, Drake et al. 2021) while benefitting from reduced competition with other predators (Prugh et al. 2009), less human persecution in urban compared to rural areas (Collins and Kays 2011), and abundant urban food resources, such as rodents, garbage, compost, and fruit trees (Fedriani et al. 2001, Murray et al. 2015a, Sugden et al. 2021). Urban coyotes can potentially also improve human quality of life by limiting populations of feral cats that prey on native biodiversity (Crooks and Soulé 1999, Gehrt et al. 2013, Bonacic et al. 2019), supporting a sense of connection with nature (Cox and Gaston 2018), and providing aesthetic enjoyment that is often inherent in seeing wild animals (Soulsbury and White 2015). For these reasons, many people living in cities tolerate, and even appreciate, urban coyotes (Soulsbury and White 2015, Sponarski et al. 2018). However, over the past two decades, there have been increasing reports of bold and aggressive interactions between urban coyotes and people that are indicative of human-coyote conflict and reduce the tolerance of people for populations of urban coyotes (Baker and Timm 2017, Poessel et al. 2017, Draheim et al. 2019). A better understanding of the circumstances associated with conflict could inform approaches to coyote management and public education to support human-coyote coexistence in urban areas.

The level of conflict between humans and coyotes can be assessed in two broad ways: coyote behaviors, such as boldness or aggression, associated with conflict; and human perception of conflict, indicated by people's concern about coyotes (Table 1). Coyote behaviors that contribute to conflict are often studied retroactively on the basis of factors associated with attacks, which represent the highest level of human-coyote conflict (White and Gehrt 2009, Baker and Timm 2017). Coyote attacks on pets are usually attributed to predation or the defense of territories or dens (Gehrt et al. 2013, Poessel et al. 2017, Nation and St. Clair 2019). Attacks on humans are rare but typically generate substantial media attention and degrade public tolerance (Carbyn 1989, Alexander and Quinn 2011, Draheim et al. 2019). These attacks are often preceded by elevated bold or aggressive behavior, which can be caused by increasing coyote habituation to people (Baker and Timm 2017) and associated food conditioning (Lukasik and Alexander 2011). Assessing the factors associated with bold coyote behavior, which refers to their tendency to approach or interact with people or pets, can help mitigate human-coyote conflict before it occurs at its highest level in the form of attacks.

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Table 1. Key terms and definitions relating to human-coyote interactions in Edmonton, Alberta.

Term	Definition
Conflict	Occurs when coyotes present a threat, real or perceived, to the well-being of people, pets, or property.
Coexistence	Co-occurrence of humans and coyotes that minimizes conflict.
Sighting	Observation of a coyote at a distance with no interaction.
Encounter	Interaction between a coyote and a person/pet at close range. Depending on coyote boldness and human concern, encounters may be reported as positive, if conflict does not occur, or negative, if conflict occurs.
Coyote boldness	Ordinal scale indicator of the level of human-coyote conflict determined from the reported coyote behavior/ response toward people or pets.
Human concern	Ordinal scale indicator of the level of human-coyote conflict determined from the human perception of coyotes expressed in the report.

Human perceptions of coyotes may be positive, neutral, or negative, with negative perceptions typically relating to concern of harm to themselves, children, or pets when they see or interact with a coyote. Negative perceptions of coyotes, which are associated with conflict, may not align with the actual risk of a coyote attack but still reduce public tolerance of coyotes and, consequently, public attitudes toward various forms of wildlife management and policy (Sponarski et al. 2018, Draheim et al. 2019). When attacks on people occur or attacks on pets are prevalent, the public demand for lethal management typically increases with rising negative perceptions of coyotes (Baker and Timm 2017, Draheim et al. 2019). These circumstances make the perception of risk by the public, as indicated by their level of concern about coyotes, an informative metric for coyote management and one for which correlates might also be studied to guide proactive, non-lethal management efforts to minimize potential conflict.

Reports of encounters between humans and coyotes that describe coyote behavior and human perceptions can be examined with spatial, temporal, and contextual variables via explanatory models. Spatial variables used to predict negative interactions between people and wildlife can help identify high-conflict areas, especially when measured at relevant scales to support management actions (Delsink et al. 2013, van Bommel et al. 2020). For example, knowing which areas have low, moderate, or high probabilities of interactions between humans and black bears (*Ursus americanus*) allows for management resources to be more efficiently allocated to improve coexistence (Merkle et al. 2011). Temporal variables may apply to scales that range from diel, through seasonal, to inter-annual, again with the goal of predicting when human-wildlife conflict is most likely to occur (Morehouse and Boyce 2017, Soulsbury 2020) so that it can be mitigated more effectively. Additional information for understanding conflict includes contextual variables, such as the presence of pets or children, off-leash dogs, and poor health of individual animals (Poessel et al. 2013, Murray et al. 2015b, Olson et al. 2015), which influence both coyote behavior and human perceptions.

The importance of these spatial, temporal and contextual variables for predicting coyote behavior and human perceptions of conflict can be advanced with large, long-term datasets collected by community members on public reporting interfaces. Such databases allow researchers to gather information over many years and large geographic areas, while simultaneously engaging and educating members of the public (Weckel et al. 2010, Frigerio et al. 2018). Previous studies of this sort have collected voluntary reports of coyote activity using public surveys (Weckel et al. 2010), city reporting databases (Lukasik and Alexander 2011, Poessel et al. 2013), websites (Wine et al. 2015, Mowry et al. 2020), and mobile phone apps (Mueller et al. 2019, Drake et al. 2021). Past analyses of these datasets have shown that reporting varies across levels of urban development, land cover types, and coyote seasons (e.g., breeding, pup rearing, dispersal; Weckel et al. 2010, Poessel et al. 2013), as well as with human demographic variables, such as household income and education (Wine et al. 2015, Mowry et al. 2020). Studies that have used public reports to assess different levels of conflict related to coyote behavior have shown that bold coyote behavior is most prominent during the coyote pup-rearing season (Lukasik and Alexander 2011, Drake et al. 2021). These studies also found more negative interactions in areas where coyotes consume more anthropogenic food (Lukasik and Alexander 2011) and when coyotes were encountered farther from roads (Drake et al. 2021). Although these studies have provided foundational information that can be applied in cities across North America to facilitate human-coyote coexistence, to date, community reports have not been used to examine changes in interactions over time. Therefore, extensive and long-term data can provide invaluable information for the additional quantification of the specific spatial, temporal, and contextual variables associated with conflict-indicative coyote behavior and human perceptions about coyotes.

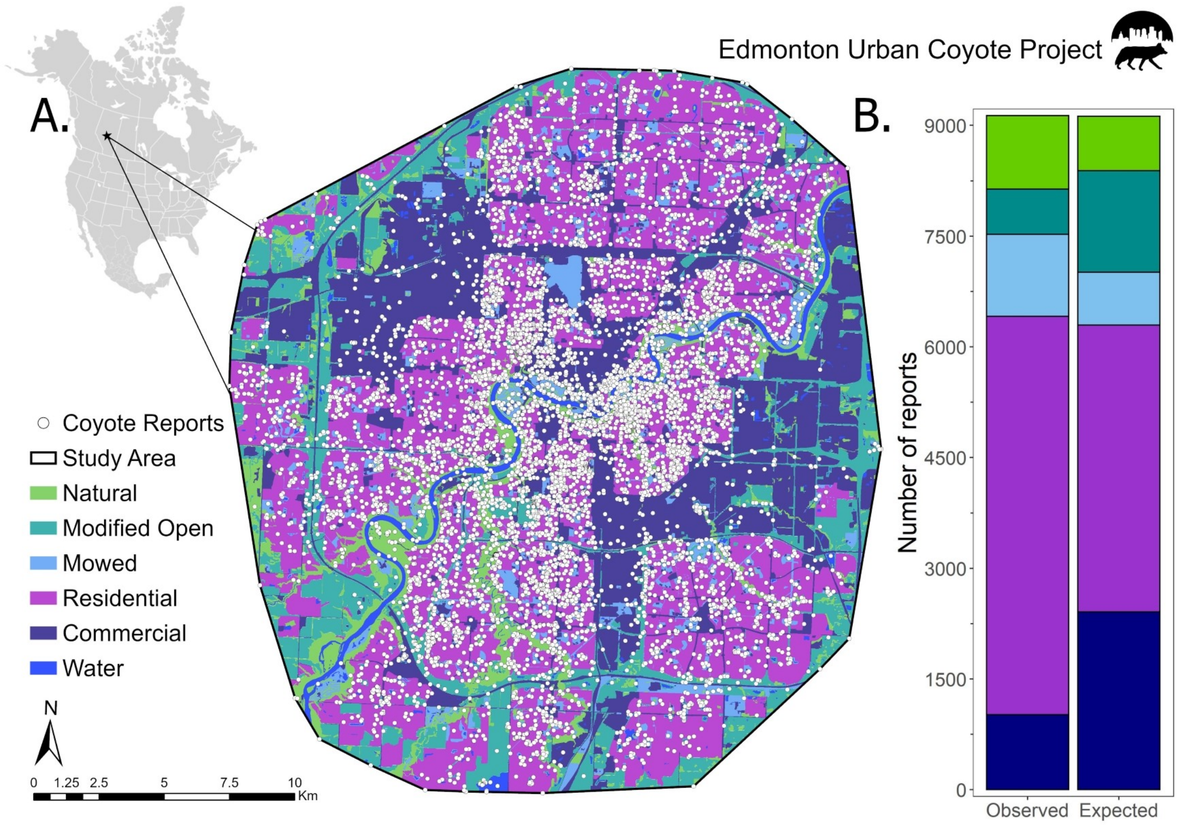
In this study, we used over 9000 community science reports collected over 10 years from a website in Edmonton, Canada, to develop two indicators of human-coyote conflict (Table 1): coyote boldness toward people or pets, based on the reported coyote behavior, and human concern about coyotes, which we inferred from the descriptions of coyotes expressed by study participants. We then used spatial, temporal, and contextual information from the reports to construct exploratory models with the goal of identifying correlates of higher conflict scores for each of these indicators (coyote boldness and human concern). By identifying the predictors of bold behavior by coyotes and greater human concern about coyotes, we hope to support proactive coyote management and effective public education. In turn, these tools could facilitate sustainable coexistence of humans and coyotes to maximize the ecosystem services, including public appreciation, provided by urban coyote populations throughout North America.

METHODS

Study area

This study occurred in Edmonton, Alberta, Canada (latitude 53.54728, longitude -113.50068), which has an area of 684 km² and a population of 976,223 based on the 2019 City of Edmonton Municipal Census (https://www.edmonton.ca/city_government/facts_figures/municipal-census-results). A combination of large area and moderate population density makes Edmonton one of the most sprawling cities in North America, with large areas of

Fig. 1. Distribution of coyote reports across Edmonton, Canada (A), and across land cover categories (B). Reports were collected from 2011 to 2021 through the Edmonton Urban Coyote project website and included the location of the coyote sighting or interaction.



undeveloped land (City of Edmonton 2018). Edmonton has warm summers (June to August daily average = 16.7 °C) and cold winters (December to March daily average = -9.7 °C; Environment and Climate Change Canada 2018). The city is bisected by the North Saskatchewan River valley and several large ravines, which form a network of minimally developed natural areas that provide abundant habitat for coyotes and other wildlife (Fig. 1).

Report collection

Beginning in September 2010, members of the public were able to voluntarily report coyote sightings or encounters through a web-based platform on the Edmonton Urban Coyote Project website (https://www.edmontonurbancoyotes.ca/reportsighting.php). We promoted the website opportunistically during media interviews, public lectures, and social media posts, as well as through word of mouth, on labels attached to wildlife cameras in the city, and via a link on the City of Edmonton website (https://www.edmonton.ca/residential_neighbourhoods/pets_wildlife/Coyotes.aspx) that was added in 2019.

When submitting a report, participants were asked to provide the location, nearest road intersection of the report location, date, and time of day. The website included a map interface to allow people to precisely locate their report by placing a pin on the map. Time of day was submitted by reporters using a drop-down menu with the option to select either hourly times between 5 AM and midnight or a general time window (dawn, morning, afternoon, evening, or night). Participants were also asked to specify whether their report was a "sighting," defined as an observation of a coyote at a distance with no interaction, or "encounter," defined as an interaction with a coyote at close range. Reporters were invited to provide free-form comments, as well as their name and contact information. The high frequency and extensiveness of these comments led to our post hoc decision to quantify and interpret the information in them. For the N = 3366 reports that did not include map coordinates, we determined them post hoc on the basis of the reported nearest street intersection and other information in the comments (e.g., if a specific park or building was named). To encourage participation, no registration or login was required.

Extraction of boldness, concern, and contextual variables from reports

Most reports (96.8%, N = 8859) included optional comments with further details about the human-coyote interaction, including information on coyote behavior, the participant's perception of coyotes, and various contextual factors. We reviewed the database to remove duplicate entries and spam reports, removed the names and contact information of reporters, and then recruited a team of 30 volunteers and undergraduate students who read and classified the comments in each report, following an online form and standardized protocol contained in Appendix 1. Despite clear instructions and training materials for volunteers, there was potential for variation in the interpretation of reporter comments. Thus, for every 100 reports that each volunteer or undergraduate classified, one author (JJF) randomly assessed 10 reports to ensure that the protocol was appropriately followed. To further assess the repeatability between report classifiers, JJF randomly selected and blindly re-classified 100 reports drawn randomly from the entire database. We assessed inter-observer agreement by calculating the percentage of reports that generated the same classifications for each of the seven variables extracted with the classification form.

For reports with comments that described coyote behavior, volunteer report classifiers assessed the degree of boldness on a scale from one (ran away) to nine (made physical contact with pets or people). We later simplified these categories into a four-point ordinal scale of coyote boldness, using avoidance, indifferent, bold, and aggressive as characterizations of coyote behavior (Table 2). We classified human concern about coyotes from reports where participants expressed their perceptions about coyotes to form a three-point scale from the explicit presence of words conveying positive (e.g., beautiful), neutral (e.g., curious or not scared), or negative (e.g., scared) emotions or attitudes (Table 3). We also classified report comments for the presence of five contextual variables: (1) the human activity occurring at the time of the report (e.g., walking, cycling, driving); (2) the presence or mention of vulnerable individuals (children, dogs, or cats); (3) if dogs present were leashed or off leash; (4) the number of coyotes observed; and (5) any mention of the reporter's interpretation of coyote health status (e.g., mangy).

Table 2. Distribution of coyote reports across coyote boldness ordinal scale values.

Coyote boldness (ordinal scale value)	Description and form classification as coyote behavior	Number of reports	Percentage of total reports
Avoidance (1)	Ran away	645	7.2%
	Walked away	348	3.8%
Indifferent (2)	Did not appear to notice or care about people	1105	12.2%
	Watched the person	381	4.2%
	Vocalized at the person	46	0.5%
Bold (3)	Followed or stalked pets or people	464	5.1%
	Approached pets or people	218	2.4%
Aggressive (4)	Chased or charged pets or people	194	2.1%
	Physical contact with pets or people	139	1.5%
Sighting (N/A)	Reports were submitted as sightings or comments indicated no interaction between people and coyote(s)	4770	52.2%
Unknown (N/A)	Reports were submitted as encounters, but coyote boldness could not be determined	824	9.0%

Table 3. Distribution of reports across human concern ordinal scale values.

Human concern† (ordinal scale value)	Description and form classification as human perception about coyotes	Number of reports	Percentage of total reports
Positive (low concern; 1)	Reports containing words such as love, happy, exciting, cool, or beautiful	147	1.6%
Neutral (medium concern; 2)	Reports containing words such as surprised or curious about the coyote, or denying negative reaction to the presence of the coyote	195	2.1%
Negative (high concern; 3)	Reports containing words such as scared, nervous, disturbed, concerned, uncomfortable, or alarmed	718	7.9%
Unknown (N/A)	Human perceptions about coyotes could not be determined	7958	87.1%

† 116 (1.3%) reports where reporters expressed concern for the well-being of the coyote were excluded.

Spatial and temporal variable collection

To quantify the geospatial setting of each report, we imported report locations into ArcGIS Pro v2.7 (Fig. 1). We excluded reports that were located outside of Edmonton city limits or in recently annexed but undeveloped rural land, and we identified our study area by generating a minimum convex polygon around the remaining report locations. Land cover types within our study area were classified by using geospatial data from the City of Edmonton Urban Planning Land and Vegetation Inventory (uPLVI) database, a high-resolution database that uses remotely sensed imagery and Softcopy photogrammetry to identify land cover types for urban land use decisions (City of Edmonton 2018). For our study, we binned uPLVI land cover classifications into six land cover types representing various degrees of human development and coyote habitat quality (Table 4), which were comparable to those used in similar studies in the American cities of New York (Weckel et al. 2010), Denver (Poessel et al. 2013), and Atlanta (Mowry et al. 2020).

Because coyote boldness and human concern may be affected by a combination of site-specific conditions (van Bommel et al. 2020) and broader landscape characteristics (Murray et al. 2015b, Wine et al. 2015), we measured land cover at five different scales (within 100, 200, 400, 800, and 1600 m radii of each report). Land cover was calculated as the proportional area of each land cover type within the circular area defined by each scale. Proportional land cover measurements were then centered log-ratio transformed; this transformation minimizes the multicollinearity among different land cover proportions, which can otherwise be negatively correlated with each other because they are constrained to a constant sum (i.e., 100% cover; Aitchison 1982). To compare the distribution of reports across different land cover types, we also assigned a single land cover category to each report on the basis of the category with the greatest proportional area within a 100-m radius of the report.

Building density and road distance have previously been associated with human-coyote encounters (Wine et al. 2015, Drake et al. 2021); therefore, we determined building density based on the proportional area of building footprints within each of the five scales around each report (Statistics Canada 2019). We also measured the distance from each report to the nearest road from the single line street network geospatial database from the City of Edmonton. For road distance, we applied an exponential distance decay function ($e^{-0.002d}$, where d = meters to the nearest

Table 4. Land cover classes representing different degrees of human development and coyote habitat suitability in Edmonton, Alberta, as determined from the City of Edmonton Urban Planning Land and Vegetation Inventory (uPLVI) site types.

Land cover (uPLVI site types)	Percentage of study area
Natural (forested, native grass, closed shrub, medial shrub, exposed mineral soil, marsh, treed fen, shrubby fen)	8.2%
Modified open (annual crops, tame pasture, rough pasture, agriculture hygric tillage site, non-maintained grass/shrub, recent clearing, farmyard/acreage, treed shelterbelt, transplant treed site, nursery/tree farm)	16.0%
Mowed (maintained grass site)	7.7%
Residential (established residential community, residential development site, acreage subdivision)	42.0%
Commercial (established commercial/industrial, commercial/industrial development, aggregates or fill sites, building and/or parking complex, oil and gas field site, transportation surface)	23.4%
Water (anthropogenic water, natural water)	2.7%

road) to confine values between zero (far from road) and one (on road; Nielsen et al. 2009). All spatial variables were measured in raster format with a 10 x 10-meter cell size.

To support temporal analyses, we measured changes in reporting, coyote boldness, and human concern across years, months, and time of day, as well as across the coyote seasons of breeding (1 January to 30 April), pup rearing (1 May to 31 August), or dispersal (1 September to 31 December). We manually categorized time of day into either day (after sunrise and before sunset) or night (before sunrise or after sunset). Sunrise and sunset times were specific to Edmonton and were adjusted for seasonal variation.

Statistical methods

We began by categorizing spatial, temporal, and contextual patterns in report submissions. For land cover types, we estimated the expected number of reports on the basis of the total proportion of that land cover type within the study area. We then applied Pearson's chi square test to determine whether reports occurred more or less frequently than expected in each land cover type. To assess how reporting varied over time, we summarized the number of reports in each of the biological coyote seasons for each year from 2012 to 2021, the percentage of reports during each month, and the number of reports from day and nighttime. For each contextual variable we determined the number of reports assigned to categories within each variable.

To identify the best spatial and temporal predictors of coyote boldness and human concern, we used an exploratory modelling framework (Tredennick et al. 2021) based on ordered logistic regression with the *clm* function in the R package ordinal (Christensen 2019). Time of day and contextual variables were strongly correlated with each other (Table A1.1, Appendix 3), so we excluded these variables from our models and examined them separately (see below). We used a pseudo-optimized multiple scale approach (McGarigal et al. 2016) to select which of the five measurement scales for each land cover variable and building density fit best for a multivariate model. This approach involved conducting univariate models for each variable and then retaining the scale with the lowest Akaike's information criterion value (AIC; Burnham and Anderson 2004; Table A3.2 in Appendix 3), which we did separately for coyote boldness and human concern. If a variable's best-fit scale did not improve on the AIC of the null model, we excluded that variable from further analyses. We then assessed correlations between the remaining variables using Spearman's rank correlation coefficient (Tables A3.3 and A3.4 in Appendix 3), and for any pairs of variables where $r > 0.6$, we removed the variable that produced a higher AIC value in univariate models. All numerical variables were mean centered and scaled with a standard deviation of 1.

For each of coyote boldness and human concern, we constructed global models (Table A3.5 in Appendix 3) that included each of the non-correlated spatial variables, year, and coyote biological season (using breeding season as the reference) as additive effects. We included interaction terms for year and each of the spatial variables to test if temporal changes in the response variables were associated with specific spatial factors in the urban environment. In models of coyote boldness, we also included interaction terms for biological season and each of natural and modified open areas to test for seasonal changes in coyote behavior that might be associated with denning in these less-developed areas (Dodge and Kashian 2013). Because we were primarily interested in maximizing the explanatory power of our models to explain each of boldness and human concern (Tredennick et al. 2021), we used AIC-based model selection with the *dredge* function from the package MuMIn (Barton 2022) to identify the variables and interactions that were retained in the top models ($\Delta AIC < 2$). To determine whether reports of coyote boldness or human concern had changed over the course of our 10-year dataset, we explored these relationships in more detail using linear regressions predicting the percentage of reports within each of the ordinal scores as a function of year.

We explored the effects of time of day and contextual factors on each of coyote boldness and human concern using Pearson's chi square tests of independence (Weckel et al. 2010), followed by standardized residual post hoc tests (chisq.posthoc.test.package; Ebbert 2019) to determine which levels of each factor were most strongly associated with boldness or concern. For each of these analyses, we used as a reference category the reports for which the contextual variable could not be determined from reporter comments. We also used chi square tests to determine whether reports that identified bolder coyote behavior also expressed more human concern, and adjusted alpha values for each residual test with Holm's correction for multiple comparisons (MacDonald and Gardner 2000). We conducted all statistical analyses in R version 4.1.3 (R Core Team 2022) and considered effects to be significant if 95% confidence intervals did not overlap zero or if p values < 0.05.

RESULTS

Reporting patterns

From 2 September 2010 to 31 December 2021, 11,239 reports were submitted on the Edmonton Urban Coyote project website. Of these, we removed 1722 spam or duplicate reports, 256 reports that were outside of Edmonton city limits, and 127 reports from 2010 and 2011 because of limited reporting in these years. The resulting dataset included 9134 unique and spatially explicit coyote reports between 1 January 2012 and 31 December 2021. Of the 100 reports that were re-classified to assess classification repeatability, inter-rater agreement for each variable ranged from 85% to 96% (Table A1.1 in Appendix 1), suggesting that our training produced high consistency, but not perfect repeatability, of interpretations among reporters.

Reports were widely distributed across the city and unevenly spread across land cover types (χ^2_4 = 1564, p < 0.001; Fig. 1). Based on the proportion of each land cover type within our study area, we received more reports than expected in residential (59.1%), mowed grass (12.2%), and natural land cover (10.9%) areas and fewer than expected in commercial (11.1%) and modified open areas (6.7%). Reporting increased over years, and, within years, was consistently higher in the breeding and dispersal seasons (Fig. 2A-B). Reports were also 1.4 times more common during the day than at night (Fig. 2C). Human activity was discernible in 48.1% of reports and mostly involved walking (19.1%), being in a home or yard (18.4%), or driving (9.1%; Fig. 3). Vulnerable individuals (mostly dogs, 20.9%) were present or mentioned in 30.8% of reports, and a subset of those reports identified dogs as leashed (11.7%) or off-leash (9.4%). Most reports involved a single coyote (59.4%), and a subset of reports identified coyote health as healthy (13.9%) or unhealthy (6.0%).

Coyote boldness, as determined from the reported coyote behaviors in 3540 reports, was most commonly reported as avoidant or indifferent, followed by bold and aggressive (Table 2). In contrast, human concern, based on the perceptions that people expressed about coyotes in 1060 reports, indicated that negativity toward coyotes was much more common than neutral (3.6 times) or positive responses (4.9 times; Table 3). Reports that mentioned physical contact between people or pets and coyotes consisted mostly of dog attacks (*N* = 85), followed by cat depredations (*N* = 50); in only one report did a coyote contact a human, which occurred while the coyote attempted to take a sled from a child. For the 653 reports for which both boldness and human concern could be classified, the two variables were significantly related (χ^2_6 = 56.3, p < 0.001), with reports of bold or aggressive behavior being more likely to express negative perceptions of coyotes (Fig. 4).

Spatiotemporal predictors of coyote boldness and human concern

Ordered logistic regression analysis revealed a suite of spatial and temporal variables that explained each of coyote boldness and human concern (Fig. 5). We present results from only the top models for these response variables (Fig. 5) because there was little variation among coefficient and confidence estimates within the full set of top-ranked models (ΔAIC_c < 2; Tables A3.6 and A3.7 in Appendix 3). The top model predicting coyote boldness indicated that the likelihood of bolder behavior was higher during the pup-rearing season and in areas with higher proportions of mowed land cover (within a 100 m radius), but lower closer to

Fig. 2. Temporal patterns in coyote reporting across years (A), months (B), coyote seasons (A and B), and time of day (C). Reports were collected through the Edmonton Urban Coyote project website and the date and time of report were submitted by the reporter.

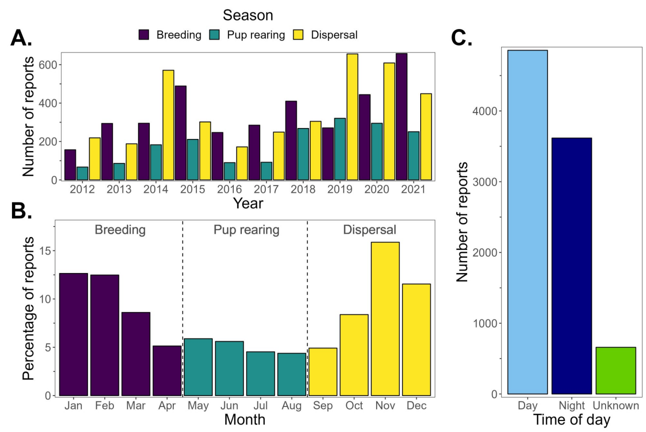


Fig. 3. Coyote report distribution across contextual variables. Percentages were calculated based on the total number of reports (N = 9134) with the exception of dog leash status, which is based on the number of reports that mentioned dogs (N = 1958). The remaining (unplotted) reports for each category did not provide relevant information about the contextual variable.

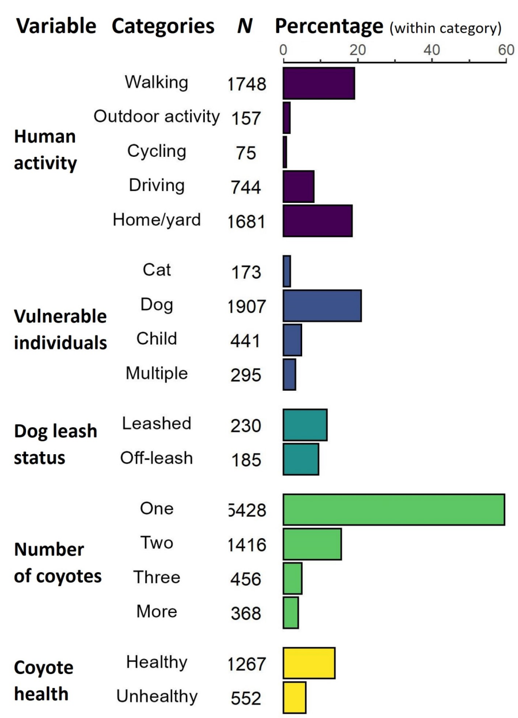
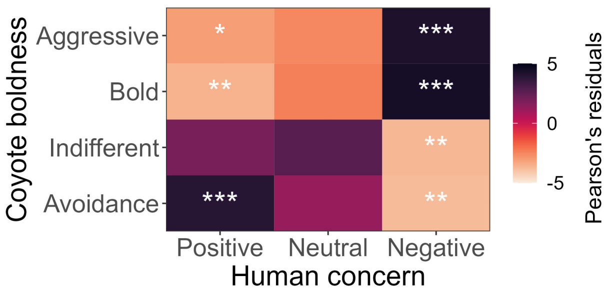


Fig. 4. Relationship between coyote boldness, determined from reported coyote behavior, and human concern about coyotes, determined from participant's perceptions of coyotes. Colors represent Pearson's residual values calculated post hoc from a chi square test, with positive values (dark) indicating positive relationships and negative values (light) indicating negative relationships. Significance is indicated by asterisks (* p < 0.05, ** p < 0.01, *** p < 0.001).



roads and in areas with greater building density (within 200 m). The significant interaction term in this model indicated that boldness was higher during the pup-rearing season, especially in areas with more modified open land cover (400 m buffer size; Fig. A3.1 in Appendix 3). The top model for human concern indicated that a higher likelihood of human concern was associated with increases in the proportion of residential area (within 800 m) and modified open land cover (within 1600 m), as well as during the dispersal season (Fig. 5).

Models for both coyote boldness and human concern indicated a significant increase in the likelihood of human-coyote conflict over years (Fig. 5). None of the interaction terms with year were significant when we considered only the single best model for each response variable (Table A3.6, Table A3.7 in Appendix 3); however, for models predicting human concern, the negative interaction term between residential area and year was retained in 19 of 20 top models and was significant in 13 of these. This interaction indicated that concern was generally higher in residential areas in early years, but increasing levels of concern in non-residential areas reduced the magnitude of the effect of residential area over time (Fig. A3.2 in Appendix 3). Although several other variables and interaction terms appeared in some of the top models ($\Delta AIC_c < 2$) for boldness and concern, their effects were not significant in any of these (Tables A3.6 and A3.7 in Appendix 3).

We examined temporal changes in greater detail by evaluating the percentage of reports within each of the ordinal scores for each year (Fig. 6). Specifically, the percentage of reports describing bold behavior increased significantly ($\beta = 2.19$, $p < 0.001$), whereas avoidance behavior decreased ($\beta = -1.82$, $p < 0.001$), although there were no differences in the percentage of reports describing indifferent ($\beta = -0.71$, $p = 0.21$) and aggressive behavior ($\beta = 0.24$, $p = 0.16$). Similarly, negative perceptions about coyotes became more common over years ($\beta = 1.07$, $p = 0.072$) and positive perceptions became less common ($\beta = -1.07$, $p = 0.005$), with no change in the proportion of neutral perceptions ($\beta = 0.002$, $p = 0.997$).

Analysis of diel patterns in coyote boldness showed that indifferent behavior was significantly more common during the day and avoidance behavior was significantly more common at night ($\chi^2_2 = 30.1$, $p < 0.001$; Fig. A2.1 in Appendix 2). However, human concern did not differ between day and night ($\chi^2_2 = 1.09$, $p = 0.58$).

Contextual influences on boldness and concern

All five contextual variables were significantly related to coyote boldness (Fig. 7, Table A2.3 in Appendix 2). Bold behavior was described more frequently when reporters were walking, when dogs were mentioned, and when two or three coyotes were present. Aggressive coyote behavior was reported more frequently than expected when cats or dogs were mentioned, when dogs were off-leash, and when two or more than three coyotes were observed. The least threatening coyote behaviors, avoidance and indifference, occurred mostly in reports when people were driving, cycling, or in their home or yard; when only one coyote was observed; and when coyotes were perceived as healthy.

Most contextual variables were also related to human concern, demonstrating that they were important factors affecting the perceived risk presented by coyotes (Fig. 7, Table A2.3 in Appendix 2). Concern was more frequently reported when dogs, children, or multiple vulnerable individuals were mentioned; conversely, reports that did not mention any vulnerable individuals expressed less concern. Perceptions were more likely to be positive when only one coyote was observed and when the coyote(s) were described as healthy.

DISCUSSION

Human-coyote conflict is increasing in urban areas throughout North America (White and Gehrt 2009, Baker and Timm 2017), creating a need to better understand the circumstances surrounding conflict to inform proactive management strategies. We used data from a 10-year database of citizen reports to explore which spatial, temporal, and contextual predictors best explained the degree of boldness in descriptions of coyote behaviors and concern in perceptions of coyotes expressed by reporters. We found that descriptions of coyote boldness increased in areas with more mowed grass, with lower building density, and as distance to roads increased; over time and in the pup-rearing season; and when reporters were walking, mentioned a cat or dog, and when more coyotes were present. Human concern was greater in areas with higher proportions of residential and modified open land cover; over time and during the dispersal season; and when reporters mentioned vulnerable individuals. Both boldness and human concern increased significantly from 2012 to 2021.

Spatiotemporal patterns in coyote boldness

We found that coyote boldness was higher in less-developed areas that were mowed or otherwise not naturally vegetated, similar to what was described for open relative to natural areas in Denver, Colorado (Poessel et al. 2013) and in managed clearings in North Carolina (Wine et al. 2015). Collectively, these results suggest that conflict-indicative coyote behaviors are most prevalent in spaces that are at the interface of natural and developed urban areas. Similar interfaces between peri-urban and rural or rural and wildland areas frequently create human-wildlife conflicts in many other species (König et al. 2020). The pattern we observed may arise

Fig. 5. Log odds coefficient values and 95% confidence intervals (CIs) for the explanatory variables retained in the top ordered logistic regression models (lowest Akaike's information criterion value) for coyote boldness and human concern of coyotes. The full set of variables included in each global model is available in Table 5 of Appendix 3. Positive values indicate that the variable causes a higher likelihood of conflict-associated coyote behavior or human concern, whereas negative values suggest reduced likelihoods. Mod., modified.

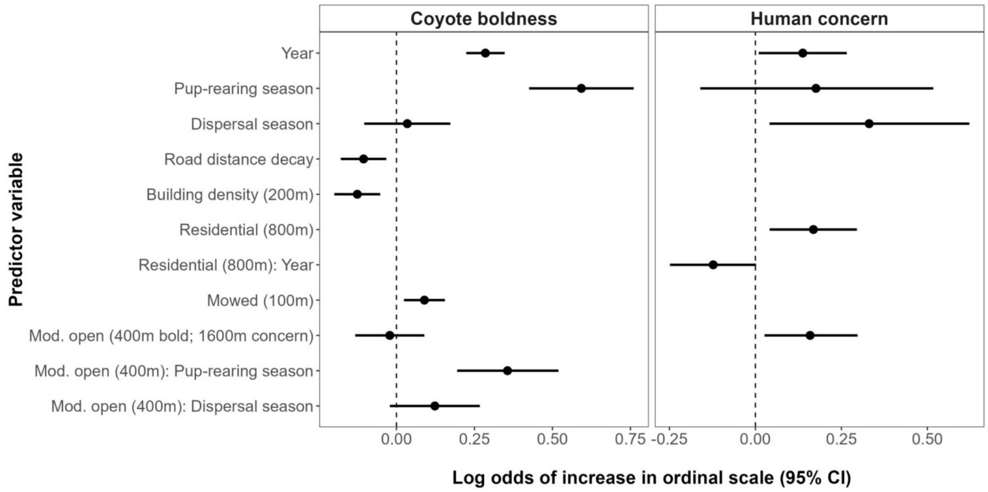
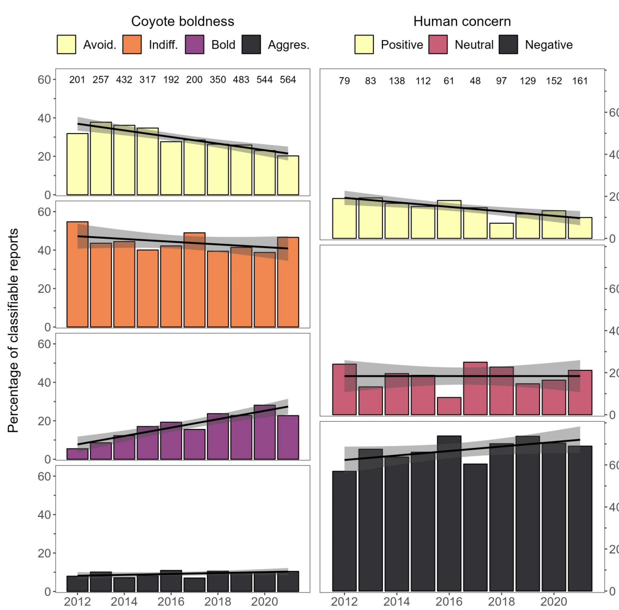


Fig. 6. Long-term (10-year) trends in coyote boldness and human concern of coyotes as indicated by the percentage of reports in each of the boldness or concern categories. Reports were collected through the Edmonton Urban Coyote project website, and boldness and human concern were scored on ordinal scales by using predetermined criteria. Numbers at the top of each chart denote the total number of reports for each year for which an ordinal score could be assigned. Linear trends are shown with 95% confidence intervals shaded in gray and significant trends are indicated by asterisks ($p < 0.05$). Avoid., avoidance; Indiff., indifferent; Aggres., aggressive.

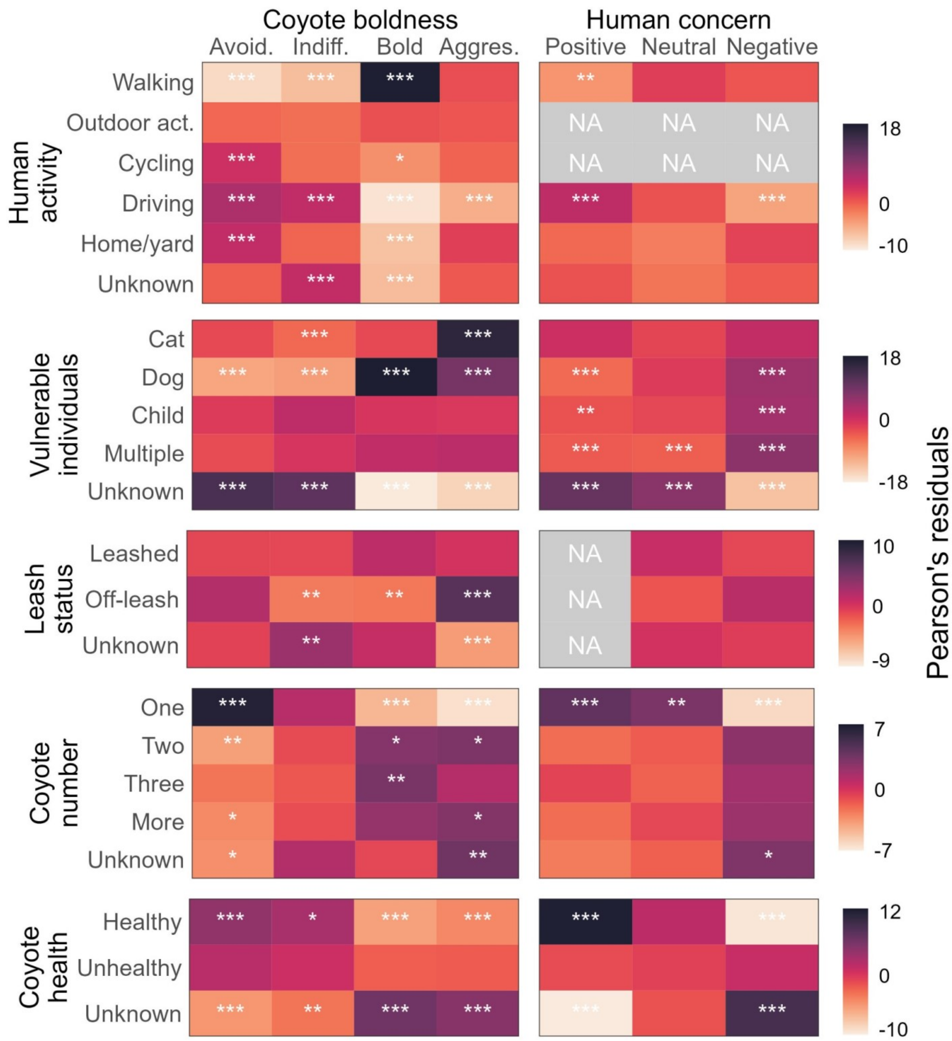


because coyotes in open areas are visible at greater distances and may thus appear to be bolder; alternatively, bolder animals may be more likely to occupy areas with less vegetation cover, as has been reported for brown bears (*Ursus arctos*; Bombieri et al. 2021). This behavior might be expected of coyotes owing to their evolution in the arid southwest of the North American continent (Hody and Kays 2018). Our spatial variables were most explanatory of boldness when measured at smaller spatial scales (≤ 400 m radii from reports; Table A3.2 in Appendix 3), suggesting that boldness is driven by site-specific factors, such as proximity to vegetation cover, territorial boundaries, or den sites. A further influence on this pattern could be a non-random distribution of human observations, such as would occur if dog-walkers targeted similar habitat types.

Seasonally, boldness was significantly more likely during the summer pup-rearing season, which is also consistent with other studies (White and Gehrt 2009, Lukasik and Alexander 2011). The fact that fewer reports were submitted during this period, despite a time of greater outdoor activity by people in our study area, suggests that coyotes avoid humans and pets during pup rearing but behave more aggressively when interactions occur. Aggression by coyotes during the pup-rearing season presumably reflects defense of pups from perceived threats posed by humans or dogs (Bombieri et al. 2018). Many reports described coyotes rushing out of cover to bite large dogs on their hamstrings, suggestive of defensive behavior. There were also more reports of cat depredations during the pup-rearing season (29 of 50 total), probably caused by a combination of coyotes seeking food for their pups and generally greater numbers of free-roaming cats in the summer that might, in turn, be hunting naïve young birds and rodents (Nation and St. Clair 2019).

Boldness during the pup-rearing season was particularly associated with modified open areas, which may have been associated with denning by coyotes. Dens in modified open areas,

Fig. 7. Relationship between each of coyote boldness and human concern of coyotes with contextual independent variables (human activity, the presence or mention of vulnerable individuals, dog leash status, coyote number, and coyote health). Colors represent Pearson's residual values calculated post hoc from statistically significant chi-square tests of independence, with positive values (dark) indicating positive relationships and negative values (light) indicating negative relationships. P values were adjusted for multiple comparisons with Holm's correction and significance is indicated by asterisks (* p < 0.05, ** p < 0.01, *** p < 0.001). Gray boxes (NA) indicate comparisons for which insufficient reports were available to allow for robust chi square tests (< 5 expected reports). Act., activity; Avoid., avoidance; Indiff., indifferent; Aggres., aggressive.



such as utility corridors, meadows within the city's ravine system, or agricultural land near and within the city, have less vegetative cover than dens in natural areas, which might reduce opportunities for avoidant behavior and increase defensive aggression. Indeed, reports from natural areas were more likely to describe avoidance (28.9%) than aggression (12.9%) relative to reports from modified open areas (20.3% avoidance and 20.7% aggression; Table A2.1 in Appendix 2). An alternative hypothesis is that coyotes denning in more disturbed modified open areas may be more prone to boldness because of repeated exposure and thus habituation to humans and their pets in these areas (Young et al. 2019). In either case, our study shows that coyote behavior in modified open areas during the pup-rearing season may often present a risk to the safety of humans and their pets.

We found that coyote boldness increased over the 10-year reporting period, potentially explaining the mechanism for rising coyote attacks on people in North America (White and Gehrt 2009, Baker and Timm 2017). Both patterns may reflect the greater boldness of urban relative to rural coyotes that others have reported and attributed to reduced persecution by people, repeated benign interactions with humans, and access to anthropogenic food (Breck et al. 2019, Young et al. 2019, Brooks et al. 2020). There is evidence that coyote boldness toward humans is passed from parents to offspring (Schell et al. 2018) and increases with greater exposure to people (Young et al. 2019), both of which could increase coyote boldness over time to accelerate boldness-driven conflict. Separate from these interactions with people, higher coyote population density within cities may lead to intraspecific competition that favors bolder individuals (Bateman and Fleming 2012). Our top ordinal regression models did not include any interactions between spatial variables and year, suggesting that these changes in boldness were relatively consistent across the urban environment. Despite increases in boldness over time, we did not find a similar increase in aggressive behavior, possibly because the most aggressive individuals were targeted for removal by city managers, which is an effective means of reducing conflict in the short term (Baker 2007, Farrar 2007, Breck et al. 2017).

Spatiotemporal patterns in human concern

We classified human perceptions of coyotes described in reports as positive, neutral, and negative to create a metric of human concern that increased with the amount of residential area within 800 m of the report. This observation is similar to previous findings that people are less tolerant of coyotes near their homes despite being generally tolerant of coyotes in cities (Bonnell and Breck 2017, Drake et al. 2020). A similar pattern occurred for cougars (*Puma concolor*) at a rural-wildland interface in Alberta (Knopff et al. 2016). Such effects show how human concern may not align with the actual risk of a coyote behaving boldly or aggressively; concern was higher in residential areas, but boldness was negatively associated with building density and road proximity, which were correlated with residential area in our study (Table A3.3 in Appendix 3).

Human concern about coyotes was also higher in areas with more modified open land cover, where bold interactions are more likely during the pup-rearing season. This land cover may also be disproportionally responsible for the positive correlation we found between reports that described bolder coyotes and greater human concern. Such a correlation might be amplified if people gain awareness over time of the bold or aggressive coyote interactions that are more common in those areas, which has previously been shown to increase the risk people perceive from coyotes (Sponarski et al. 2018, Draheim et al. 2019). Again, dog walkers may have also been more likely to target these areas and dogs were often associated with reports of coyote aggression (below). People may respond most to the visibility of coyotes, which is likely highest during the fall dispersal season when our database received more reports and higher levels of concern. Interestingly, human concern correlated with land cover predictors measured at larger scales (≥ 800 m radii; Table A3.2 in Appendix 3) than did the measures of boldness derived from descriptions of coyote behavior. This difference may reveal that coyote behavior and human perceptions are affected by spatial variables at different scales, or, simply, that coyote behavior is more readily described for animals that are nearby.

Like boldness, human concern about coyotes increased over the 10-year reporting period (Figs. 5 and 6), and our study demonstrates that these perceptual changes may be quite nuanced across the urban landscape. For example, concern was initially higher in areas with more residential land cover, but this effect was reduced over time because of growing human concern across most other land cover types. Whereas some studies have predicted that humans will habituate to the presence of urban coyotes over time (Lawrence and Krausman 2011, Jackman and Rutberg 2015), as has been reported in Alaskan brown bears (Smith et al. 2005), our findings support suggestions by others that this does not occur with carnivores if people fear for their safety (Williams et al. 2002, Kaltenborn et al. 2006). Expecting that human concern will naturally decrease as coyotes become more prevalent in cities may not be an effective strategy to facilitate coexistence, because public concern about any carnivore may typically increase with increasing carnivore prevalence, with negative interactions, or if conflict is emphasized by the media (Lute and Carter 2020).

Contextual factors affecting coyote boldness and human concern

Coyote boldness and human concern were each strongly explained by several contextual variables. Reports describing the presence or mention of vulnerable individuals exhibited higher scores for both coyote boldness and human concern. The mention of dogs or cats was associated with descriptions of bolder and more aggressive coyote behavior, supporting the findings of others that human-coyote interactions involving pets are more likely to cause conflict (Poessel et al. 2013, Baker and Timm 2017). Coyotes were described as "aggressive" less often when dogs were leashed (14.6%) compared to when they were described as off leash (32.5%; Table A2.1 in Appendix 2), but bold behavior was more common when dogs were leashed (39.2%) than off leash (22.3%). This result suggests that leashed dogs may still engender coyote behavior that is associated with conflict even if they are less likely to be attacked than when they are off leash. Many of these interactions during the pup-rearing season may have involved escorting behavior, wherein coyotes do not attack, but follow people with leashed dogs out of areas near their den sites. We did not find a significant relationship between the presence or mention of children and coyote boldness or aggression. Nonetheless, human concern was significantly higher when reports mentioned dogs, children, or multiple vulnerable individuals, perhaps because occasional coyote attacks on children are well publicized and can lead to serious injuries (Carbyn 1989, White and Gehrt 2009, Alexander and Quinn 2011, Baker and Timm 2017). A higher perceived risk of coyote attacks on pets and children likely reduces tolerance for coyotes in cities (Draheim et al. 2019).

With respect to other contextual variables, coyotes were described as being bolder when they were observed with other coyotes and when people were walking, whereas expressions of human concern were lower when people were driving or when only a single coyote was mentioned. Coyotes in poor health may be more conflict-prone (Murray at el. 2015b) and people were more likely to perceive healthy coyotes positively. However, we found no evidence that people found unhealthy animals to be bolder or feared them more. In fact, coyotes perceived to be healthy were more likely to be described as avoidant or indifferent. It could be that reporters were less likely to notice and characterize a coyote's health in encounters where coyotes were behaving boldly or aggressively.

Limitations

Our study had several limitations. First, reports were collected non-randomly and non-independently, which introduces several potential biases inherent to most community reporting databases (Poessel et al. 2013, Sullivan et al. 2014). These biases include greater tendencies for repeat reporting by some residents with particularly strong views about coyotes, uneven advertising of the reporting database across neighborhoods or over years, potentially higher reporting from affluent neighborhoods with higher education levels (Wine et al. 2015, Mowry et al. 2020), and varying visibility of coyotes across seasons, time of day, or land cover types because of differences in vegetative cover, human activity, and daylight (Quinn 1995, Poessel et al. 2013). We attempted to mitigate these effects by focusing on measures of coyote boldness and human concern, rather than spatiotemporal influences on the number or distribution of reports, but interactions with contextual variables and habitat types are likely. We attempted to overcome spatial and temporal autocorrelation in the reports that could contribute to Type 1 statistical errors by restricting analyses to those with large sample sizes and verifying modelling results with chi-square tests (Table A2.3 in Appendix 2). Despite these precautions, our post hoc method of quantifying coyote boldness and human concern from a community reporting database cannot be compared to empirical behavioral observations of animals (e.g., Breck et al. 2019) or randomized public surveys (e.g., Drake et al. 2020). Urban coyote management in Edmonton may have also affected our findings. A suite of management tools has been applied by civic personnel over the course of our study. These included public education via websites and media, warnings about attractants at specific residences, signage about aggressive coyotes in particular areas, high-intensity hazing by wildlife professionals at sites with recurrent complaints (since 2018), and targeted removal of aggressive individual coyotes. In 2021, a community-based hazing program was initiated in some of Edmonton's neighborhoods (Lajeunesse 2023). These actions undoubtedly affected our results; for example, recurrent actions to reduce coyote occupancy of, or boldness in, residential areas likely contributed to the lower boldness that we identified in these areas. Despite various actions by wildlife managers, both boldness and human concern increased over time in the public reports we examined.

Management implications

Despite some limitations, our findings do support the increased implementation of several management actions in our study area and elsewhere by identifying areas, seasons, and contexts that are associated with higher rates of human-coyote conflict. The rise in both coyote boldness and human concern we reported from 2012 to 2021 may continue in cities across North America without more effective and extensive implementation of strategies to reduce negative human-coyote interactions (Kaltenborn et al. 2006, Lute and Carter 2020), facilitate positive wildlife experiences (Kretser et al. 2009), and increase public knowledge about risk reduction (Riley and Decker 2000). Spatially, coyote boldness was generally higher in less developed and open areas (Poessel et al. 2013, Wine et al. 2015) where managers might emphasize public education and protection of pets via leashing and fencing (Draheim et al. 2019). Managers could also target these areas for initiatives to train community members to haze coyotes that behave boldly (Bonnell and Breck 2017, Breck et al. 2017, Lajeunesse 2023). Both awareness campaigns and community-based hazing programs might target conflict-prone areas in and near residential neighborhoods, where human concern of coyotes is highest, and especially during the breeding season to prevent denning in these areas and proactively limit negative interactions (Bonnell and Breck 2017). Coyote attractants of food and shelter should be more actively identified, secured, and removed in residential areas (Murray and St. Clair 2017). When these steps fail and aggressive coyotes pose ongoing threats to the security of leashed pets and people, targeted removal may be both necessary and effective at reducing conflict (Baker 2007, Farrar 2007, Breck et al. 2017). Although lethal removal is controversial (Breck et al. 2017, Draheim et al. 2019), its use can prevent attacks on pets or people that generate substantial media attention and erode public tolerance of coyotes (Alexander and Quinn 2011, Alexander and Quinn 2012, Draheim et al. 2019). Finally, proactive management of coyote-human conflict is especially important where it potentially endangers children, such as in parks, schoolyards, and playgrounds, which may require greater attention to the surrounding areas (e.g., residential neighborhoods).

Proactive management is made more possible with rapid information about the locations and contexts of bold coyote behavior, such as can be provided by public reporting databases. Our study demonstrated the utility of a community reporting interface for understanding human-coyote interactions, and we suggest that similar efforts should be integrated within urban wildlife management programs across North America. Increased specificity in reporting interfaces on apps or websites that are built with collaboration among managers, social scientists, and wildlife ecologists could increase both quantity and quality of the information collected from reporters (e.g., likert scales for the degree of reporter concern or degree of coyote aggression). In turn, reported information could increase the ability of managers to target education, policy, and enforcement to facilitate human-coyote coexistence in cities across North America.

Author Contributions:

All authors have contributed to performing the research and writing the manuscript.

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Data Availability:

The data and R code that support the findings of this study are openly available on GitHub at https://github.com/jfarr99/EdmontonUrbanCoyotes.

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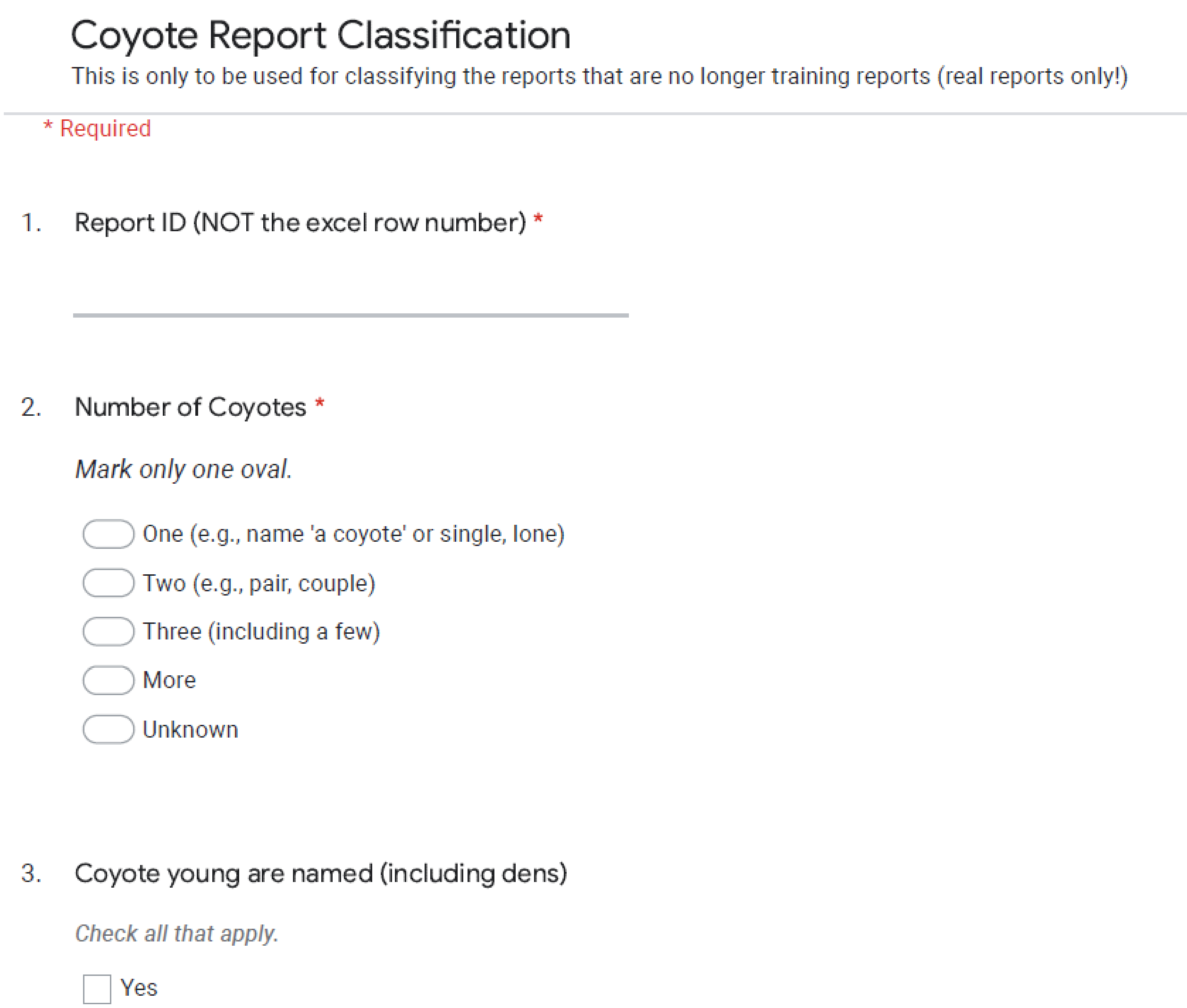
APPENDIX 1. COYOTE REPORT CLASSIFICATION

Figure A1.1. The report classification form used to extract information from coyote reports. Volunteers read each report and completed this form.



Coyote Report Classification

This is only to be used for classifying the reports that are no longer training reports (real reports only!)

* Required

1. Report ID (NOT the excel row number) *

2. Number of Coyotes *

   Mark only one oval.

   - One (e.g., name 'a coyote' or single, lone)
   - Two (e.g., pair, couple)
   - Three (including a few)
   - More
   - Unknown

3. Coyote young are named (including dens)

   Check all that apply.

   - Yes

4. Human activity

Mark only one oval.

- Walking
- Driving
- In home or yard
- Cycling
- Designated outdoor activity: jogging, golfing, hiking
- Unknown
- Other: ______________________

5. Vulnerable individual present or implied *

Mark only one oval.

- Child
- Dog
- Cat
- Multiple (e.g., pets and children)
- Unknown
- Other: ______________________

6. If a dog was present, was it: *

Mark only one oval.

- Leashed
- Off-leash
- In home / yard
- Unknown
- Other: ______________________

7. Did the person try hazing the coyote? *

Mark only one oval.

- Yes
- No
- Unknown

8. Coyote response to people *

Mark only one oval.

- 0. Did not / could not see the people
- 1. Ran away
- 2. Walked away
- 3. Did not appear to notice or care about people
- 4. Watched the person
- 5. Howled at the person
- 6. Followed or stalked pets or people
- 7. Approached the person
- 8. Chased or charged pets or people
- 9. Made physical contact with pets or people
- Unknown
- Other: ____________________

9. Human Perception *

Mark only one oval.

- Reporter expresses negative perception of coyote or emotion
- Reporter expresses neutral perception or emotion
- Reporter expresses positive perception or emotion
- Reporter expresses concern for coyote
- Unable to determine

10. Coyote health is mentioned *

Mark only one oval.

- Healthy (e.g., Healthy, strong, beautiful, or majestic)
- Unhealthy (e.g., Injured, limping, hobbling, hurt, unhealthy, mange, mangy, scruffy, or wounded)
- Unknown
- Other: ______________________

11. Classifier ID (first initial and last name) *

____

12. Additional Comments

____

13. Report Classification should be reviewed

Check all that apply.

- [ ] Yes

Text A1.1. The protocol used to train volunteers and inform their use of the report classification form.

Volunteer Training Protocol

1) Initial Training: Volunteers will be sent 30 reports to classify, following the classification protocol outlined below. Each of these reports has been previously classified by Author. Once volunteers have classified the 30 reports, they will notify Author and a virtual meeting will be scheduled to go over the reports and examine where answers differ from author's classifications. Author will explain why he classified the report differently to help the volunteer adjust their coding to minimize variability.

2) Secondary Training: Volunteers will then classify another 30 practice reports, and compare their answers to the classification done by Author (on their own time). If necessary, they will contact Author with any questions.

3) Report Classification: Once volunteers feel confident in their classification ability (steps 1 and 2 can be repeated as needed) they will be sent 100 reports at a time to be classified. All reports shared with volunteers will have all personal identifiers (name, contact, location) removed.

Google Form Report Classification Protocol

The descriptions below are stepwise guidelines to help volunteers classify reports. Please direct any questions to Author (Author@email.com). Remember, it is important to avoid making inferences when classifying the reports.

1) Report ID
- Record the unique ID of the report being classified (not the spreadsheet case/row)

2) Number of coyotes
- Select the bullet point that best matches the number of coyotes defined in the report

3) Coyote young are named
- Select the box only if coyote young (young/pups/babies) or dens are named explicitly (NOT small/little/tiny)

4) Human activity
- Select the box that best fits the activity described in the report. If no activity is explicitly mentioned (for example, if a report says "saw coyote in alley") select *Unknown.*

5) Vulnerable individual present or implied
- The vulnerable individual does not need to be explicitly present, if reports say "near a school" or "worried because children play in this area," select *Child.*

6) If a dog was present, was it:
- Select *Leashed*, *Off-leash* or *In home / yard* if explicitly stated or if dog is mentioned, if dog is not mentioned or is not explicitly stated, select unknown.

7) Did the person try hazing the coyote?
- Select *Yes* only if the person explicitly mentions trying to haze the coyote by chasing, shouting, kicking, throwing things or honking at the coyote.
- Select *No* if the person explicitly attempts to avoid interaction with the coyote by walking away, running away or standing still. Also select *No* if the person was in a situation where hazing was not possible, for example if the coyote did not notice the person, if they saw the coyote on security footage, or viewed it from a distance.
- Select *Unknown* for all other situations.

8) Coyote response to people
- In this section, it is important to read the entire report then select the highest option that the report indicates. For example, if the coyote watched the person then approached them

and bit their dog, select *Made physical contact with pets or people*, NOT *Watched the person* or *Approached the person.*

  - Select *Did not / could not see the people* if the coyote is described as being seen from a distance, or from indoors, or if the coyote is explicitly described as not seeing the person. If the coyote is described as preoccupied (hunting, sniffing around) without giving any further details, select *Did not / could not see the people*
  - Select *Ran away* if the coyote explicitly avoided human interaction by running away. A report saying they saw a coyote running across a street should not be classified as *Ran away*. If the coyote is running away from an off leash dog, make note of this in the comment
  - Select *Walked away* if the coyote explicitly avoided human interaction by walking away. A report saying they saw a coyote walking across a street should not be classified as *Walked away*.
  - Select *Did not appear to notice or care about people* if the coyote is described as being indifferent to people.
  - Select *Watched the person* only if the coyote is explicitly described as watching the person (looking at them) without approaching them
  - Select *Howled at the person* only if the coyote is howling/yipping at the person directly. Reports that are auditory descriptions of coyotes howling outside at night in the ravine or neighbourhood should not be classified as *Howled at the person.*
  - Select *Followed or stalked pets or people* only if the coyote is described as following/escorting/stalking the people without attempting to approach them.
  - Select *Approached the person* only if the coyote is described as approaching/nearing/sneaking up on the person.
  - Select *Chased or charged pets or people* if the coyote lunges/chases/bites at the person, and does not make contact because it is hazed by the person or decides not to make contact for another unknown reason
  - Select *Made physical contact with pets or people* only if the coyote bites or is kicked/punched/bitten by a person or pet.
  - Select *Unknown* if the report is too vague to infer any of the other responses. For example "Saw coyote in field" or "Coyote ran/walked across street" would be classified as *Unknown*

9) Human Perception

- *Reporter expressed negative perception of coyote or emotion* should be selected if the report uses words such as terrified, scared, uncomfortable, nervous, worried, frightened, disturbing, fear, concern, or alarm.
- *Reporter expresses neutral perception or emotion* should be selected if the report uses words such as surprised, curious or denied a negative reaction, such as "wasn't scared."
- *Reporter expresses positive perception or emotion* should be selected if the report uses words such as love, happy, exciting, cool, and beautiful.
- *Reporter expresses concern for coyote* should be selected only if the person explicitly expresses worry or concern for the coyote's well-being.
- *Unable to determine* should be selected for all reports where the reporter does not describe the coyote using one of the words above, or does not address their emotional response to the coyote sighting/encounter using one of the words above.

10) Coyote health is mentioned

- Select the box that best describes the health of the coyote if described in the report.

11) Additional comments

- Please record any additional comments you may have

12) Classifier ID (first initial and last name)

- The first initial and last name of the person who classified the report (ex: A. Author)

13) Reporter comments should be reviewed

- Select only if you desire for your comments to be reviewed by Author. You may also email Author@email.com or text XXX-XXX-XXXX with any questions that may come up.

Table A1.1. Inter-observer agreement between report classifiers.

Variable	Inter-rater agreement†
Coyote boldness	85 %
Human concern	96 %
Human activity	87 %
Vulnerable individual	97 %
Dog leash status	85 %
Number of coyotes observed	92 %
Coyote health	89 %

† Percentage of reports out of 100 classified the same between two classifiers

APPENDIX 2. COYOTE BOLDNESS AND HUMAN CONCERN ACROSS VARIABLES

Table A2.1. Distribution of coyote boldness categories across land cover, temporal and contextual variable categories. Reports are expressed as number (percentage); percentage is calculated as a function of the total number of reports within each category, so that each row sums to 100%.

Independent Variables		**Coyote Boldness Number of reports (percentage)**			
Variable	**Categories**	**Avoidance**	**Indifferent**	**Bold**	**Aggressive**
Land Cover	Natural	143 (28.9%)	178 (36%)	110 (22.2%)	64 (12.9%)
	Modified Open	45 (20.3%)	77 (34.7%)	54 (24.3%)	46 (20.7%)
	Mowed	107 (22%)	209 (42.9%)	124 (25.5%)	47 (9.7%)
	Residential	606 (30.4%)	888 (44.6%)	341 (17.1%)	158 (7.9%)
	Commercial	92 (26.8%)	180 (52.5%)	53 (15.5%)	18 (5.2%)
Season	Breeding	352 (28.3%)	611 (49.1%)	189 (15.2%)	93 (7.5%)
	Pup-Rearing	185 (23.4%)	275 (34.7%)	193 (24.4%)	139 (17.6%)
	Dispersal	456 (30.3%)	646 (43%)	300 (20%)	101 (6.7%)
Time of Day	Day	490 (25.2%)	889 (45.7%)	365 (18.8%)	201 (10.3%)
	Night	449 (33%)	544 (40%)	264 (19.4%)	103 (7.6%)
	Unknown	54 (23%)	99 (42.1%)	53 (22.6%)	29 (12.3%)
Human Activity	Cycling	30 (52.6%)	21 (36.8%)	1 (1.8%)	5 (8.8%)
	Driving	174 (42.2%)	228 (55.3%)	3 (0.7%)	7 (1.7%)
	Home/Yard	221 (36.7%)	257 (42.7%)	52 (8.6%)	72 (12%)
	Outdoor Activity	33 (26.4%)	49 (39.2%)	29 (23.2%)	14 (11.2%)
	Unknown	246 (28.2%)	441 (50.6%)	99 (11.4%)	86 (9.9%)
	Walking	289 (19.6%)	536 (36.4%)	498 (33.8%)	149 (10.1%)
Vulnerable Individual	Cat	21 (17.5%)	24 (20%)	12 (10%)	63 (52.5%)
	Child	35 (23.3%)	77 (51.3%)	27 (18%)	11 (7.3%)
	Dog	274 (18.6%)	494 (33.4%)	495 (33.5%)	214 (14.5%)
	Multiple	35 (19.1%)	77 (42.1%)	45 (24.6%)	26 (14.2%)
	Unknown	628 (39%)	860 (53.4%)	103 (6.4%)	19 (1.2%)
Dog Leash Status	Leashed	33 (15.6%)	65 (30.7%)	83 (39.2%)	31 (14.6%)
	Off-Leash	38 (24.2%)	33 (21%)	35 (22.3%)	51 (32.5%)
	Unknown	199 (17.5%)	410 (36.1%)	399 (35.1%)	128 (11.3%)
Coyote Number	One	780 (31.6%)	1086 (43.9%)	425 (17.2%)	181 (7.3%)
	Two	124 (21.5%)	240 (41.5%)	138 (23.9%)	76 (13.1%)
	Three	35 (20.2%)	66 (38.2%)	51 (29.5%)	21 (12.1%)
	More	22 (16.4%)	52 (38.8%)	37 (27.6%)	23 (17.2%)
	Unknown	32 (17.5%)	88 (48.1%)	31 (16.9%)	32 (17.5%)
Health	Healthy	219 (35.7%)	301 (49.1%)	65 (10.6%)	28 (4.6%)
	Unhealthy	64 (35.4%)	85 (47%)	23 (12.7%)	9 (5%)
	Unknown	710 (25.9%)	1146 (41.7%)	594 (21.6%)	296 (10.8%)

Table A2.2. Distribution of human concern of coyote categories across land cover, temporal and contextual variable categories. Reports are expressed as number (percentage); percentage is calculated as a function of the total number of reports within each category, so that each row sums to 100%.

Independent Variables		**Human Concern Number of reports (category percentage)**		
Variable	**Categories**	**Negative**	**Neutral**	**Positive**
Land Cover	Natural	80 (65%)	25 (20.3%)	18 (14.6%)
	Modified Open	54 (68.4%)	13 (16.5%)	12 (15.2%)
	Mowed	93 (66.9%)	35 (25.2%)	11 (7.9%)
	Residential	425 (69.8%)	99 (16.3%)	85 (14%)
	Commercial	66 (60%)	23 (20.9%)	21 (19.1%)
Season	Breeding	260 (64%)	85 (20.9%)	61 (15%)
	Pup Rearing	155 (67.4%)	45 (19.6%)	30 (13%)
	Dispersal	303 (71.5%)	65 (15.3%)	56 (13.2%)
Time of Day	Day	365 (65.6%)	108 (19.4%)	83 (14.9%)
	Night	290 (68.1%)	82 (19.2%)	54 (12.7%)
	Unknown	63 (80.8%)	5 (6.4%)	10 (12.8%)
Human Activity	Cycling	2 (16.7%)	8 (66.7%)	2 (16.7%)
	Driving	45 (46.4%)	21 (21.6%)	31 (32%)
	HomeYard	214 (72.8%)	42 (14.3%)	38 (12.9%)
	OutdoorAct	20 (76.9%)	3 (11.5%)	3 (11.5%)
	Unknown	189 (69%)	42 (15.3%)	43 (15.7%)
	Walking	248 (69.5%)	79 (22.1%)	30 (8.4%)
Vulnerable Individual	Cat	32 (78%)	2 (4.9%)	7 (17.1%)
	Child	91 (87.5%)	10 (9.6%)	3 (2.9%)
	Dog	314 (77%)	67 (16.4%)	27 (6.6%)
	Multiple	131 (92.3%)	7 (4.9%)	4 (2.8%)
	Unknown	150 (41.1%)	109 (29.9%)	106 (29%)
Dog Leash Status	Leashed	49 (75.4%)	12 (18.5%)	4 (6.2%)
	Off-Leash	43 (87.8%)	3 (6.1%)	3 (6.1%)
	Unknown	291 (79.7%)	54 (14.8%)	20 (5.5%)
Coyote Number	One	396 (60.7%)	141 (21.6%)	115 (17.6%)
	Two	138 (76.7%)	26 (14.4%)	16 (8.9%)
	Three	62 (77.5%)	9 (11.2%)	9 (11.2%)
	More	50 (80.6%)	9 (14.5%)	3 (4.8%)
	Unknown	72 (83.7%)	10 (11.6%)	4 (4.7%)
Health	Healthy	85 (38.3%)	51 (23%)	86 (38.7%)
	Unhealthy	31 (77.5%)	6 (15%)	3 (7.5%)
	Unknown	602 (75.4%)	138 (17.3%)	58 (7.3%)

Table A2.3. Pearson's χ2 test of independence results examining if land cover, coyote season, time of day, or any contextual variables affected coyote boldness or human concern of coyotes.

Variables Tested	*N*†	χ^2	df	*p*
Coyote boldness x Land cover	3540	102.9	12	1.5E-16
Coyote Boldness x Season	3540	126.3	6	7.5E-25
Coyote boldness x Time of day	3305	30.1	3	1.3E-06
Coyote boldness x Human activity	3483	452.2	12	2.7E-92
Coyote boldness x Vulnerable individual	3540	916.8	12	1.4E-188
Coyote boldness x Dog leash status	1505	67.0	6	1.7E-12
Coyote boldness x Number of coyotes	3540	109.9	12	6.3E-18
Coyote boldness x Coyote health	3540	88.4	6	6.6E-17
Human concern x Land cover	1060	13.2	8	0.11
Human concern x Season	1060	6.1	4	0.2
Human concern x Time of day	982	1.1	2	0.58
Human concern x Human activity	1022	46.6	6	2.3E-08
Human concern x Vulnerable individual	1060	209.9	8	5.20E-41
Human concern x Dog leash status	452	3.67	2	0.16
Human concern x Number of coyotes	1060	42.0	8	1.3E-06
Human concern x Coyote health	1060	164.5	4	1.6E-34
Human concern x Coyote boldness	653	56.3	6	2.5E-10

† *N* is the number of reports available for each test

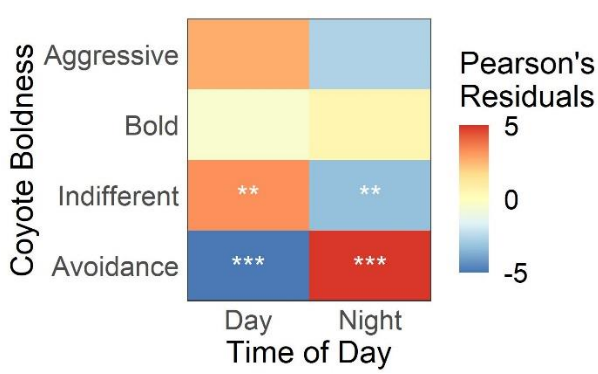


Figure A2.1. Relationship between coyote boldness and time of day. Colors represent Pearson's residual values calculated post-hoc from chi square tests, with positive values (red) indicating positive relationships and negative values (blue) indicating negative relationships. Significance is indicated by asterisks (* p < 0.05, ** p <0.01, *** p < 0.001).

APPENDIX 3. ORDERED LOGISTIC REGRESSION MODELLING

Table A3.1. Pearson's chi-square test of independence outputs testing the relationship between season, time of day, and contextual variables.

Variables Tested	***N*†**	χ^2	**df**	***p***
Season x Human activity	9134	66.5	10	2.1E-10
Season x Vulnerable individual	9134	77.0	8	1.9E-13
Season x Dog leash status	2202	23.6	6	6.2E-04
Season x Number of coyotes	9134	95.5	8	3.5E-17
Season x Coyote health	9134	19.5	4	6.4E-04
Season x Time of day	8474	298.9	2	1.3E-65
Time of day x Human activity	8474	92.7	5	1.8E-18
Time of day x Vulnerable individual	8474	39.2	4	6.3E-08
Time of day x Dog leash status	2029	51.1	3	4.6E-11
Time of day x Number of coyotes	8474	240.8	4	6.3E-51
Time of day x Coyote health	8474	155.3	2	1.9E-34
Human activity x Vulnerable individual	1262	89.8	6	3.4E-17
Human activity x Dog leash status	1882	60.8	4	2.0E-12
Human activity x Number of coyotes	9059	624.4	16	1.5E-122
Human activity x Coyote health	9059	108.1	8	9.2E-20
Vulnerable individual x Dog leash status	1958	13.6	2	1.1E-03
Vulnerable individual x Number of coyotes	9134	193.5	16	1.6E-32
Vulnerable individual x Coyote health	9134	40.9	8	2.2E-06
Dog leash status x Number of coyotes	9134	193.5	16	1.6E-32
Dog leash status x Coyote health	2202	5.4	6	5.0E-01
Number of coyotes x Coyote health	9134	464.8	8	2.5E-95

† *N* is the number of reports available for each test

Table A3.2 The outputs from univariate ordinal regression models aiming to determine the best-fit scale for measuring land cover variables and building density, showing AIC values and the difference between the AIC value of each univariate model and the null model.

Coyote Boldness			**Human Concern**		
Variable (scale)†	AIC	ΔAIC_{null}	Variable (scale)†	AIC	ΔAIC_{null}
Building Density (100m)	8865.2	-52.1	Building Density (100m)	1805.2	0.7
Building Density (200m)	**8860.7**	**-56.6**	**Building Density (200m)**	**1804.5**	**0.0**
Building Density (400m)	8868.1	-49.2	Building Density (400m)	1804.8	0.3
Building Density (800m)	8885.2	-32.1	Building Density (800m)	1806.3	1.8
Building Density (1600m)	8899.3	-18.1	Building Density (1600m)	1805.6	1.0
Natural (100m)	**8911.2**	**-6.1**	Natural (100m)	1803.5	-1.0
Natural (200m)	8912.5	-4.8	Natural (200m)	1803.7	-0.8
Natural (400m)	8911.9	-5.4	Natural (400m)	1804.9	0.4
Natural (800m)	8911.4	-6.0	Natural (800m)	1804.6	0.1
Natural (1600m)	8918.0	0.6	**Natural (1600m)**	**1802.2**	**-2.3**
Modified Open (100m)	8892.7	-24.6	Modified Open (100m)	1806.5	2.0
Modified Open (200m)	8889.9	-27.4	Modified Open (200m)	1806.5	2.0
Modified Open (400m)	**8889.1**	**-28.2**	Modified Open (400m)	1806.5	2.0
Modified Open (800m)	8898.2	-19.1	Modified Open (800m)	1806.5	2.0
Modified Open (1600m)	8899.9	-17.4	**Modified Open (1600m)**	**1802.1**	**-2.4**
Mowed (100m)	**8906.5**	**-10.8**	Mowed (100m)	1805.6	1.1
Mowed (200m)	8914.2	-3.1	Mowed (200m)	1806.5	2.0
Mowed (400m)	8919.3	1.9	Mowed (400m)	1805.1	0.6
Mowed (800m)	8918.0	0.7	**Mowed (800m)**	**1801.1**	**-3.4**
Mowed (1600m)	8918.6	1.3	Mowed (1600m)	1805.3	0.8
Commercial (100m)	8916.0	-1.3	**Commercial (100m)**	**1802.3**	**-2.2**
Commercial (200m)	**8915.7**	**-1.6**	Commercial (200m)	1804.3	-0.2
Commercial (400m)	8915.8	-1.5	Commercial (400m)	1804.9	0.4
Commercial (800m)	8917.0	-0.3	Commercial (800m)	1805.5	1.0
Commercial (1600m)	8918.1	0.8	Commercial (1600m)	1804.4	-0.1
Residential (100m)	**8877.4**	**-40.0**	Residential (100m)	1803.7	-0.8
Residential (200m)	8890.8	-26.6	Residential (200m)	1801.4	-3.1
Residential (400m)	8903.4	-13.9	Residential (400m)	1798.7	-5.8
Residential (800m)	8910.3	-7.1	**Residential (800m)**	**1798.3**	**-6.2**
Residential (1600m)	8912.9	-4.4	Residential (1600m)	1801.6	-2.9

† Bolded values indicate the best-fit scale (lowest AIC value)

Table A3.3. Spearman's correlation coefficients between variables used for ordinal regression models of coyote boldness towards humans. For variable pairs with r > 0.6, only the variable with the lowest AIC in univariate models was retained for further analysis.

	Road Distance Decay	Modified Open (400m)	Natural (100m)	Mowed (100m)	Building Density (200m)	Commercial (200m)	Residential (100m)
Road Distance Decay	-	-0.12	-0.18	-0.13	0.50	0.14	0.58
Modified Open (400m)	-	-	0.02	-0.34	-0.14	-0.11	-0.06
Natural (100m)	-	-	-	-0.28	-0.39	-0.31	-0.23
Mowed (100m)	-	-	-	-	0.00	0.02	-0.15
Building Density (200m)	-	-	-	-	-	0.16	**0.61**
Commercial (200m)	-	-	-	-	-	-	-0.17
Residential (100m)	-	-	-	-	-	-	-

Table A3.4. Spearman's correlation coefficients between variables used for ordinal regression models of human concern of coyotes. For variable pairs with r > 0.6 (bold), only the variable with the lower AIC in univariate models was retained for further analysis.

	Modified Open (1600m)	Mowed (800m)	Natural (1600m)	Commercial (100m)	Residential (800m)
Modified Open (1600m)	-	-0.42	0.062	-0.15	0.024
Mowed (800m)	-	-	-0.03	-0.017	-0.02
Natural (1600m)	-	-	-	-0.19	-0.32
Commercial (100m)	-	-	-	-	-0.13
Residential (800m)	-	-	-	-	-

Table A3.5. The variables included in global models examining the factors affecting coyote boldness towards humans and human concern of coyotes

Global Model	**Variables**	**df**	**AIC**	**ΔAIC_{null}**
Coyote Boldness	RoadDistDecay + BuildingDensity200m + Natural100m + ModifiedOpen400m + Mowed100m + Commercial200m + Season + Natural100m*Season + ModifiedOpen*Season + Year + RoadDistDecay*Year + BuildingDensity200m *Year + Natural100m*Year + ModifiedOpen400m*Year + Mowed100m*Year + Commercial200m*Year	22	8691.3	-226.1
Human Concern	Natural1600m + Modified_Open1600m + Mowed800m + Commercial100m + Residential800m + Season + Year + Year*Natural1600m + Year*Modified_Open1600m + Year*Mowed800m + Year*Commercial100m + Year*Residential800m	15	1797.2	8.2

Table A3.6. The coefficients, confidence intervals and model parameters from the top-ranked ordinal regression models assessing coyote boldness towards humans.

Variables† ß (2.5% C.I. , 97.5% C.I.)														Model Parameters		
BUILD	**MOD**	**MOW**	**ROAD**	**SEAS(D)**	**SEAS(P)**	**YEAR**	**MOD: SEAS(D)**	**MOD: SEAS(P)**	**MOW: YEAR**	**MOD: YEAR**	**ROAD: YEAR**	**BUILD: YEAR**	**COM: YEAR**	**AIC_c**	**ΔAIC_c**	**$wgtAIC_c$**
-0.13 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.16)	-0.11 (-0.18, -0.03)	0.03 (-0.1 , 0.17)	0.03 (-0.1 , 0.17)	0.29 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.19 , 0.52)	NA	NA	NA	NA	NA	8677.6	0	0.14
-0.13 (-0.2, -0.05)	-0.02 (-0.14, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18, -0.03)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.28 (0.22 , 0.35)	0.13 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	0.04 (-0.02 , 0.1)	NA	NA	NA	NA	8677.7	0.1	0.14
-0.13 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.1 , 0.17)	0.03 (-0.1 , 0.17)	0.29 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	NA	-0.04 (-0.1 , 0.02)	NA	NA	NA	8677.7	0.13	0.13
-0.13 (-0.2, -0.05)	-0.02 (-0.14, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.29 (0.22 , 0.35)	0.13 (-0.02 , 0.27)	0.36 (0.2 , 0.53)	0.04 (-0.03 , 0.1)	-0.03 (-0.09 , 0.03)	NA	NA	NA	8678.5	0.92	0.09
-0.13 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.08 (0.02, 0.15)	-0.11 (-0.18 , -0.04)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.28 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	0.05 (-0.01 , 0.11)	NA	0.04 (-0.03 , 0.1)	NA	NA	8678.5	0.93	0.09
-0.12 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.04 (-0.1 , 0.17)	0.04 (-0.1 , 0.17)	0.28 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.35 (0.19 , 0.52)	NA	NA	0.02 (-0.04 , 0.08)	NA	NA	8679.1	1.51	0.07
-0.13 (-0.2, -0.05)	-0.03 (-0.14, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.28 (0.22 , 0.35)	0.13 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	0.05 (-0.01 , 0.11)	NA	NA	0.02 (-0.04 , 0.09)	NA	8679.1	1.54	0.07
-0.13 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.04 (-0.1 , 0.17)	0.04 (-0.1 , 0.17)	0.29 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.19 , 0.52)	NA	NA	NA	0.01 (-0.05 , 0.08)	NA	8679.4	1.78	0.06

-0.12 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.1 , 0.17)	0.03 (-0.1 , 0.17)	0.28 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.19 , 0.52)	NA	NA	NA	NA	-0.01 (-0.07 , 0.05)	8679.4	1.84	0.06
-0.12 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.29 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	NA	-0.04 (-0.1 , 0.02)	NA	NA	-0.01 (-0.07 , 0.05)	8679.5	1.95	0.05
-0.12 (-0.2, -0.05)	-0.02 (-0.14, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18 , -0.03)	0.03 (-0.11 , 0.17)	0.03 (-0.11 , 0.17)	0.28 (0.22 , 0.35)	0.13 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	0.04 (-0.02 , 0.1)	NA	NA	NA	-0.01 (-0.07 , 0.05)	8679.5	1.96	0.05
-0.13 (-0.2, -0.05)	-0.02 (-0.13, 0.09)	0.09 (0.02, 0.15)	-0.11 (-0.18, -0.03)	0.03 (-0.1 , 0.17)	0.03 (-0.1 , 0.17)	0.29 (0.22 , 0.35)	0.12 (-0.02 , 0.27)	0.36 (0.2 , 0.52)	NA	-0.04 (-0.1 , 0.02)	0.01 (-0.05 , 0.08)	NA	NA	8679.5	1.99	0.05

† BUILD = Building Density (200m), MOD = Modified Open (400m), MOW = Mowed (100m), ROAD = Road Distance Decay, SEAS(D) = Season (Dispersal), SEAS(P) = Season (Pup rearing), YEAR = Year, COM = Commercial (200m)

Table A3.7. The coefficients, confidence intervals and model parameters from the top-ranked ordinal regression models assessing human concern of coyotes.

Variables† ß (2.5% C.I. , 97.5 C.I.)										Model Parameters		
RES	**YEAR**	**RES: YEAR**	**MOD**	**SEAS(D)**	**SEAS(P)**	**MOD: YEAR**	**NAT**	**MOW**	**COM**	**AIC_c**	**ΔAIC_c**	**$wgtAIC_c$**
0.17 (0.04 , 0.3)	0.14 (0.01 , 0.27)	-0.12 (-0.25 , 0)	0.16 (0.03 , 0.3)	0.33 (0.04 , 0.62)	0.18 (-0.16 , 0.52)	NA	NA	NA	NA	1788.9	0.00	0.10
0.17 (0.04 , 0.29)	0.13 (0 , 0.26)	-0.13 (-0.25 , 0)	0.16 (0.03 , 0.3)	0.32 (0.03 , 0.61)	0.17 (-0.17 , 0.51)	-0.09 (-0.23 , 0.04)	NA	NA	NA	1789.1	0.30	0.08
0.17 (0.04 , 0.29)	0.13 (0 , 0.26)	-0.13 (-0.26 , -0.01)	0.15 (0.02 , 0.29)	NA	NA	-0.1 (-0.24 , 0.03)	NA	NA	NA	1789.7	0.84	0.06
0.14 (0 , 0.28)	0.13 (0 , 0.26)	-0.13 (-0.25 , 0)	0.16 (0.03 , 0.3)	0.33 (0.04 , 0.62)	0.18 (-0.16 , 0.52)	NA	-0.07 (-0.21 , 0.06)	NA	NA	1789.8	0.94	0.06
0.17 (0.04 , 0.3)	0.14 (0.01 , 0.26)	-0.13 (-0.25 , 0)	0.15 (0.02 , 0.28)	NA	NA	NA	NA	NA	NA	1789.9	0.95	0.06
0.16 (0.03 , 0.29)	0.14 (0.01 , 0.26)	-0.12 (-0.25 , 0.01)	0.13 (-0.02 , 0.28)	0.33 (0.04 , 0.62)	0.18 (-0.16 , 0.52)	NA	NA	-0.07 (-0.21 , 0.07)	NA	1789.9	1.05	0.06
0.14 (0 , 0.28)	0.13 (0 , 0.26)	-0.13 (-0.26 , -0.01)	0.16 (0.03 , 0.3)	0.32 (0.03 , 0.61)	0.17 (-0.17 , 0.51)	-0.09 (-0.22 , 0.05)	-0.07 (-0.2 , 0.07)	NA	NA	1790.2	1.38	0.05
0.15 (0.01 , 0.29)	0.14 (0.01 , 0.27)	-0.13 (-0.25 , 0)	0.15 (0.01 , 0.29)	0.33 (0.04 , 0.62)	0.17 (-0.16 , 0.51)	NA	NA	NA	-0.05 (-0.19 , 0.08)	1790.3	1.45	0.05
0.16 (0.03 , 0.29)	0.13 (0 , 0.26)	-0.12 (-0.25 , 0)	0.13 (-0.01 , 0.28)	0.32 (0.03 , 0.61)	0.17 (-0.16 , 0.51)	-0.09 (-0.22 , 0.05)	NA	-0.07 (-0.2 , 0.07)	NA	1790.3	1.48	0.05
0.09 (-0.06 , 0.25)	0.13 (0.01 , 0.26)	-0.13 (-0.26 , -0.01)	0.15 (0.01 , 0.29)	0.33 (0.04 , 0.62)	0.17 (-0.16 , 0.52)	NA	-0.1 (-0.25 , 0.04)	NA	-0.09 (-0.23 , 0.06)	1790.4	1.57	0.04

0.14 (0.01 , 0.28)	0.13 (0.01 , 0.26)	-0.13 (-0.26 , -0.01)	0.15 (0.02 , 0.29)	0.31 (0.02 , 0.61)	0.17 (-0.17 , 0.51)	-0.09 (-0.23 , 0.04)	NA	NA	-0.06 (-0.19 , 0.08)	1790.5	1.67	0.04
0.18 (0.06 , 0.31)	0.15 (0.02 , 0.28)	NA	0.16 (0.03 , 0.3)	0.34 (0.05 , 0.63)	0.19 (-0.15 , 0.53)	NA	NA	NA	NA	1790.6	1.69	0.04
0.06 (-0.1 , 0.21)	0.13 (0 , 0.26)	-0.13 (-0.26 , 0)	NA	0.31 (0.02 , 0.6)	0.17 (-0.16 , 0.52)	NA	-0.12 (-0.26 , 0.03)	-0.13 (-0.26 , -0.01)	-0.12 (-0.26 , 0.02)	1790.6	1.84	0.04
0.13 (-0.01 , 0.27)	0.13 (0 , 0.26)	-0.12 (-0.25 , 0)	0.13 (-0.02 , 0.28)	0.33 (0.04 , 0.62)	0.18 (-0.16 , 0.52)	NA	-0.08 (-0.21 , 0.06)	-0.07 (-0.21 , 0.07)	NA	1790.7	1.88	0.04
0.15 (0.02 , 0.28)	0.14 (0.01 , 0.26)	-0.12 (-0.25 , 0.01)	NA	0.31 (0.02 , 0.6)	0.18 (-0.16 , 0.52)	NA	NA	-0.12 (-0.25 , 0)	NA	1790.8	1.91	0.04
0.16 (0.03 , 0.29)	0.13 (0.01 , 0.26)	-0.12 (-0.25 , 0)	0.12 (-0.03 , 0.27)	NA	NA	NA	NA	-0.07 (-0.21 , 0.07)	NA	1790.8	1.94	0.04
0.09 (-0.06 , 0.25)	0.13 (0 , 0.26)	-0.14 (-0.26 , -0.01)	0.15 (0.01 , 0.29)	0.32 (0.03 , 0.61)	0.17 (-0.17 , 0.51)	-0.09 (-0.23 , 0.05)	-0.1 (-0.24 , 0.05)	NA	-0.09 (-0.23 , 0.06)	1790.7	1.95	0.04
0.14 (0.01 , 0.28)	0.13 (0 , 0.26)	-0.13 (-0.26 , 0)	0.15 (0.02 , 0.29)	NA	NA	NA	-0.07 (-0.2 , 0.07)	NA	NA	1790.9	1.97	0.04
0.16 (0.03 , 0.29)	0.13 (0 , 0.26)	-0.13 (-0.26 , 0)	0.12 (-0.03 , 0.27)	NA	NA	-0.1 (-0.23 , 0.04)	NA	-0.07 (-0.21 , 0.07)	NA	1790.8	1.98	0.04
0.14 (0.01 , 0.28)	0.13 (0 , 0.25)	-0.13 (-0.26 , -0.01)	0.15 (0.02 , 0.29)	NA	NA	-0.1 (-0.23 , 0.04)	-0.06 (-0.2 , 0.07)	NA	NA	1790.9	2.00	0.04

† MOD = Modified Open (1600m), RES = Residential (800m), SEAS(D) = Season (dispersal), SEAS(P) = Season (pup rearing), YEAR = Year, NAT = Natural (1600m), MOW = Mowed (800m), COM = Commercial

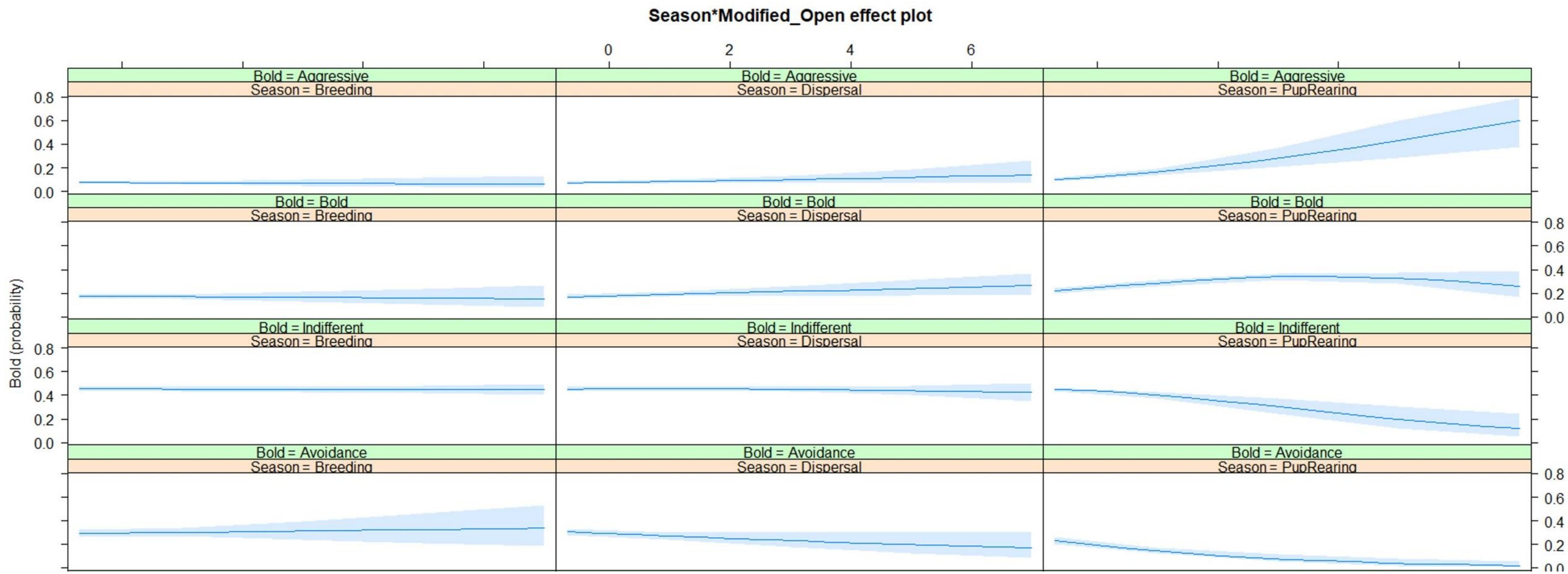


Figure A3.1. Interaction plot between season and modified open land cover (within 400m) for models of coyote boldness. The plot was generated using the *Effect* function from the package effects (Fox and Hong 2009) on an ordered logistic regression model created using the function *polr* from the package MASS (Venables and Ripley 2002).

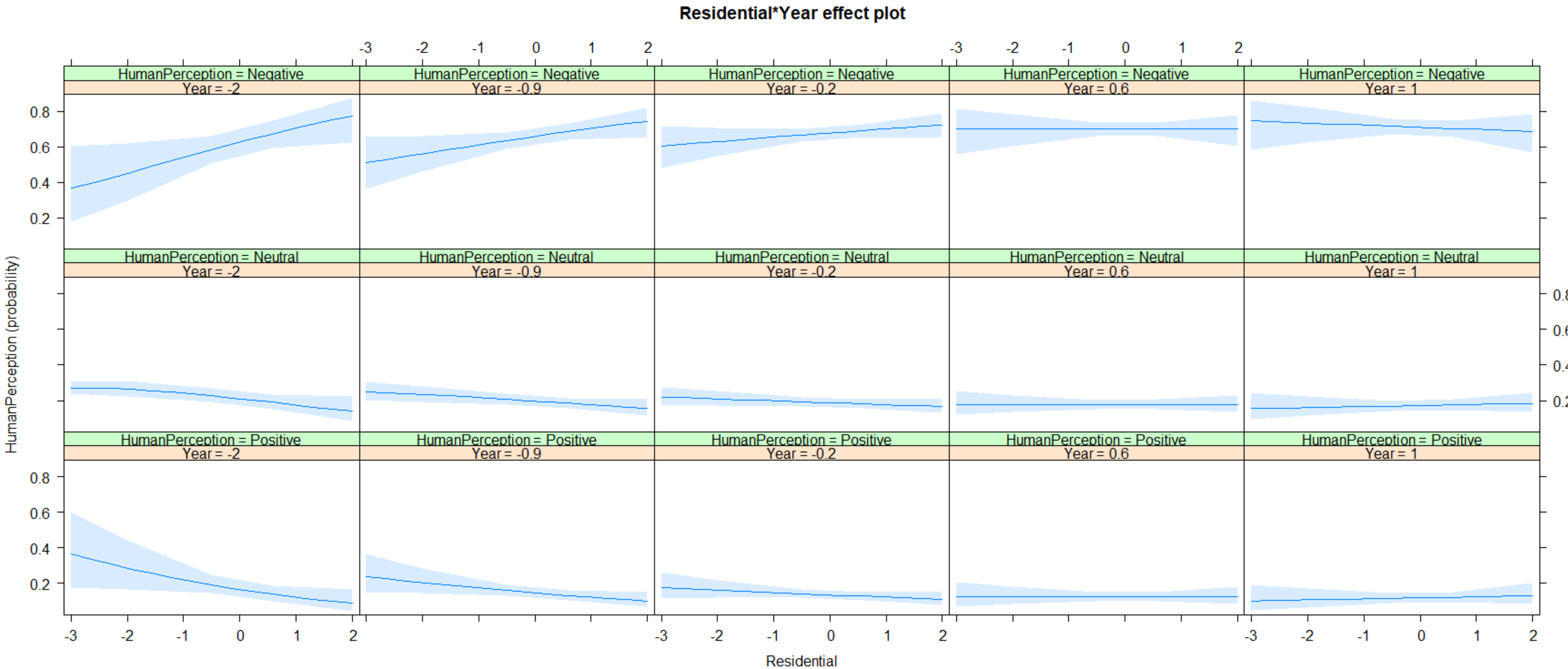


Figure A3.2. Interaction plot between year and the proportion of residential area within 800 m for human concern models. The plot was generated using the *Effect* function from the package effects (Fox and Hong 2009) on an ordered logistic regression model created using the function *polr* from the package MASS (Venables and Ripley 2002).