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RESEARCH ARTICLE

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The wildlife attitude-acceptability framework's potential to inform human dimensions of wildlife science and practice

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ABSTRACT

Despite years of research, concepts such as human tolerance and acceptability of wildlife remain inconsistently defined and measured, creating confusion, undermining comparative and longitudinal research, and limiting utility to practitioners. To address these shortcomings, the wildlife attitude-acceptability framework proposed intersecting attitudes toward wildlife species with acceptability of impacts from that species to reveal four archetypes of human cognitions toward wildlife. Here, we use data from western US household surveys to populate the conceptual space of the wildlife attitude-acceptability framework with human cognitions toward three carnivore species: gray wolf (*Canis lupis*), cougar (*Puma concolor*), and grizzly bear (*Ursus arctos horribilis*). This empirical application of the wildlife attitude-acceptability framework demonstrates its potential to inform management and conservation efforts, promote consistent measurement across species and studies, and extend theoretical understanding of concepts like tolerance, which are necessary for human-wildlife coexistence. We discuss these opportunities and remaining needs for improvement before wider adoption.

KEYWORDS

Carnivores; coexistence; cognitions; conservation; methods; quantitative survey; tolerance

Introduction and Literature Review

Human dimensions of wildlife researchers have increasingly sought to define and operationalize concepts relating to human-wildlife interactions, including people's cognitions toward species and their evaluations of wildlife-related costs and benefits (Carlson et al., 2023; König et al., 2020). Despite this literature, or perhaps because of it (Bruskotter et al., 2015), wildlife scientists and practitioners continue to hold shared, contested, and sometimes confused perspectives toward concepts such as tolerance, acceptability, coexistence, and other cognitions such as beliefs, attitudes, and behavioral intentions when used with regard to wildlife (Glikman et al., 2021; Hill, 2021). Universally shared definitions of these

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concepts have been and may remain elusive in the literature (Chapron & Vicente López-Bao, 2016; Frank, 2016; Morehouse & Boyce, 2017). Despite the ongoing efforts to standardize conceptual definitions (Brenner & Metcalf, 2020; Venumière-Lefebvre et al., 2022), recent insights suggest ubiquitous conceptual agreement may not be possible nor necessary for practical conservation efforts to succeed (Glikman et al., 2021). While embracing the fluidity of possible conceptual definitions, Glikman et al. (2021) emphasized the importance of at least locally specific definitions and metrics of human cognitions relevant to specific conservation efforts. Tools to facilitate specificity in conceptual definitions and the measurement of human dimension metrics may also promote consistency across contexts, time, and focal wildlife species.

The wildlife attitude-acceptability framework (Brenner & Metcalf, 2020) is one approach that could facilitate locally specific definitions and measurements while promoting consistency across species and studies where possible (Glikman et al., 2021), although opportunities to refine the framework remain. With an initial focus on tolerance, Brenner and Metcalf (2020) reviewed and discussed inconsistencies in authors' use of the concept, sometimes defined as a passive acceptance of wildlife, other times as an attitude, normative belief, or behavioral intention, and occasionally as a behavior (Bruskotter & Fulton, 2012; Ruth et al., 2016; Treves & Bruskotter, 2014; Treves et al., 2013; Zajac et al., 2012). This lack of conceptual and measurement specificity and consistency is not limited to "tolerance" (Jackie et al., 2022), but extends to other coexistence-related concepts such as "acceptance" (Whitehouse-Tedd et al., 2021), "acceptance capacity" (Riley & Decker, 2000), and behavioral intentions (Hiroyasu et al., 2019; Slagle et al., 2012). This inconsistency complicates knowledge production, comparative work, and efforts to understand the beneficial, positive, and more pragmatic aspects of human-wildlife interactions (Brenner & Metcalf, 2020; Glikman et al., 2021; Pooley et al., 2021), and in a practical sense it hinders defining or making measurable progress toward related objectives (Venumière-Lefebvre et al., 2022). Although identical measurement across all studies is not necessarily a prerequisite for knowledge production or comparative work (Ruth et al., 2014; Williams et al., 2002), conceptual clarity and measurement consistency could provide wildlife conservationists and managers with more readily usable tools for articulating what "success" might be, setting clear objectives and metrics thereof, evaluating management alternatives, and monitoring outcomes from management actions.

To address these shortcomings, Brenner and Metcalf (2020) proposed the wildlife attitude-acceptability framework that delineated a more complete typology of possible wildlife-related cognitions. The framework was initially conceived by considering the more consistent definitions of tolerance found in other fields such as animal behavior and sociology; that is, "putting up with something you do not like" (Vogt, 1997). Applied to the human dimensions of wildlife, this definition became: "accepting wildlife and/or wildlife behaviors that one dislikes" (Brenner & Metcalf, 2020, p. 262), similar to other definitions like "neutral behavioural preference or behaviour from someone with a negative attitude toward that entity" (Lisa et al., 2022, p. 603). By coupling people's attitudes toward wildlife species to their willingness to accept impacts from those species, Brenner and Metcalf (2020) delineated archetypes of human cognitions toward wildlife species that expanded beyond tolerance to include more positive attitudes and capture the often-complex relationship between these two cognitions. Here, to ease interpretation and use, we propose adapting the attitude-acceptability framework quadrant labels from Brenner and Metcalf

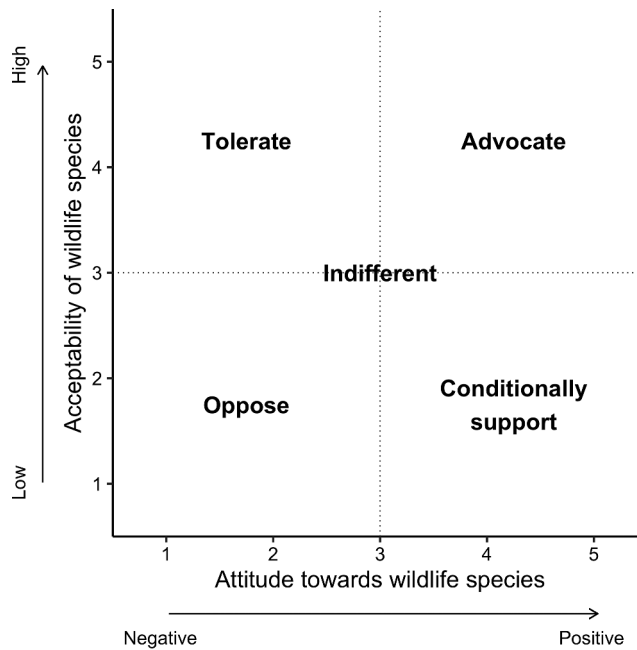


Figure 1. The attitude-acceptability wildlife framework. Intersecting attitudes toward wildlife species with acceptability of said species reveals 5 archetypes of human–wildlife cognitions: tolerate – those who are willing to accept impacts from a species they hold negative attitudes toward; advocate – those who hold positive attitudes toward a species and are willing to accept impacts from that species; conditionally support – those who are unwilling to accept impacts from a species they hold positive attitudes toward; oppose – those who hold negative attitudes toward a species and are unwilling to accept impacts from that species; and the indifferent – those holding neutral attitudes toward a species and being neither willing nor unwilling to accept impacts from that species.

(2020) to more clearly differentiate the archetypes with words more commonly used to describe people’s orientations toward wildlife. In this adaptation, the quadrant labels become: oppose, tolerate, conditionally support, and advocate (Figure 1). We also propose rotating the framework so that attitudes are represented on the x-axis and acceptability on the y-axis, acknowledging attitudes’ tendencies toward consistency and the likelihood that acceptability is at least somewhat a function of attitudes. While derived from a specific definition of tolerance, the wildlife attitude-acceptability framework goes beyond a simple tolerant/intolerant dichotomy and creates space for positive cognitions toward wildlife and more nuanced views of species and their management. See Brenner and Metcalf (2020) for a full review of related literature preceding and a complete introduction to the wildlife attitude-acceptability framework.

The theoretical space created by intersecting attitudes and acceptability reveals *possible* cognitions related to wildlife species, but *actually* populating this space with data could allow researchers and practitioners to empirically evaluate the extant social landscape for wildlife conservation, advance knowledge in new ways, inform wildlife conservation and management decisions, and help set objectives and define success for interventions or outreach programs. For example, the framework populated with data could afford the quantification of quadrant frequencies with respect

to a given species, including relative proportions of each as well as levels of agreement, general disagreement, or the presence of particular clusters or “camps” of cognitions among interested parties. Researchers and practitioners could use longitudinal data populating this conceptual space to understand how different stakeholder cognitions shift when wildlife interactions or impacts increase or decrease (Brenner, 2017). Data in the framework might also allow the evaluation of how and to what extent attitudes and acceptability relate to each other or the relative likelihood of people to shift between quadrants. For example, researchers might ask whether the relationship between attitudes and acceptability is linear, where acceptability is simply correlated with attitudes, or if they are unrelated or exponentially or logarithmically related, where acceptability changes more quickly or slowly as attitudes become more positive. Others may use the framework to understand whether opponents and advocates, for instance, are more or less likely to change than those who tolerate or conditionally support species, or whether all groups are equally plastic/rigid. Mapping data into this conceptual space could also allow comparisons among wildlife species, across study areas, or between social contexts, as well as evaluations of change over time or as a result of a particular intervention seeking to achieve a specific outcome.

Even more practically, data in the framework could inform the setting of wildlife objectives that seek to balance ecological and social considerations, help decision-makers establish reasonable goals given the extant social landscape or be used to more effectively design outreach efforts and evaluate outcomes. For example, campaigns might retool away from attempting to change attitudes about species by bolstering positive beliefs (e.g., convincing people black bears have positive traits worthy of admiration), a notoriously futile effort (Erber et al., 1995; Heberlein, 2012), toward increasing acceptability of impacts (e.g., reducing bear-induced fear) through prevention or mitigation programs or target outreach to specific audiences to reduce problematic human behavior (e.g., bear enthusiasts purposefully feeding bears, which exacerbates human–wildlife conflict). Although likely insufficient on its own, quantitative data in the framework could complement richer and more contextually grounded qualitative inquiry to inform wildlife-related decisions.

Below, we populate the attitude-acceptability framework with human dimension data from three different studies to demonstrate its theoretical and practical utility for advancing wildlife research and management. We also highlight a pressing need for field-wide agreement on consistent measurement approaches that will facilitate broader adoption of the framework and comparative work across species, space, and time. We use data from three independent surveys measuring human cognitions toward different large carnivore species: gray wolves (*Canis lupus*), grizzly bears (*Ursus arctos horribilis*), and cougars (*Puma concolor*) to show how the framework could, (i) allow managers and practitioners to quickly understand the social landscape regarding specific wildlife species as well as how the landscape differs for different species, (ii) provide consistent measurement of human cognitions toward wildlife species across study locations, focal species, and time, (iii) inform the theoretical discussion of tolerance and other concepts’ utility to the human dimensions of wildlife field, particularly by expanding the recognition of positive cognitions and orientations toward wildlife, and (iv) provide a practical

tool for the setting of wildlife conservation or management objectives and evaluating outcomes.

Methods

We collected data during three independent human dimension studies on large carnivores, including a 2017 statewide survey of Montana residents regarding gray wolves, a 2017 community-level survey of residents regarding cougars in Kalispell, MT, and a 2020 statewide survey of Montana residents regarding grizzly bears. We describe our survey methods below, but for complete methodological details see Lewis et al. (2018) for the wolf survey, Nesbitt et al. (2023) for the grizzly bear survey, and Brenner (2017) for the cougar survey. All methods were reviewed for human subjects' protections and approved by the University of Montana Institutional Review Board.

Survey Sampling and Administration

We drew samples for all three studies by purchasing independent, simple random, address-based samples of residents from Dynata (previously Survey Sampling International), a survey data company drawing from US Postal Service delivery points and commercial databases. We administered the statewide MT surveys on gray wolves (initial $n = 1,500$) and grizzly bears (initial $n = 5,350$) in partnership with the MT Department of Fish Wildlife and Parks (FWP) using a mail-back questionnaire and tailored design method (Dillman et al., 2014) including an initial mailing of the invitation and questionnaire and two replacement invitations and questionnaires mailed approximately two to four weeks later. Data entry and quality checks for both mail-back questionnaires were conducted by FWP staff. As part of a larger effort, the second and third authors independently administered the community-level survey on cougars to residents of Kalispell, MT (initial $n = 1,045$) using an online, Qualtrics questionnaire with three invitations sent via US Postal Service: a first-class letter and two reminder postcards each sent 10 days apart (Brenner, 2017).

Measures and Analysis

We measured respondents' attitudes toward wildlife species and acceptability of species-related impacts using several multi-point scalar items (Table 1). Statements differed slightly across studies/species, but each contained between six and eleven items with a mix of positive and negative attitudinal statements. We used three different measures of acceptability across the three studies/species. To measure acceptability of species-related impacts for gray wolves, we asked how strongly respondents agreed or disagreed that "wolf populations should be controlled" across a series of five, increasingly negative interactions with people. To measure the acceptability of cougars, we used a similar approach that asked how acceptable it would be to "shoot and kill" a cougar across a series of three increasingly negative interactions with people. For grizzly bears, we measured the acceptability of the species by asking respondents if there were too few, too many, or just the right number of grizzly bears. Each of these approaches was adopted by unique research teams at different moments in time and to meet specific research objectives of each, independent study.

Table 1. Individual item and composite variable means, standard deviations, and sample sizes for attitudes toward and acceptability of wolves, grizzly bears, and cougars.

Species-Cognition Grouping	Item	n	Mean	SD
Attitudes toward gray wolves**	Composite Wolf Attitude (Cronbach alpha = .894)	406	2.91	1.21
	Wolves help maintain the balance of nature	405	3.39	1.52
	Wolves threaten things I care about*	405	3.32	1.50
	I like knowing wolves are out there, even if I never see one	401	3.28	1.55
	Wolves should be considered a nuisance animal*	404	2.67	1.59
	Humans should manage wolf populations so humans benefit*	400	3.24	1.49
	The rights of wolves are more important than human interests	401	1.99	1.26
	Composite Wolf Acceptability (Cronbach alpha = .900)	406	1.97	1.08
	... threaten big game populations**	403	1.19	1.41
	... are sighted near human development**	403	1.24	1.32
Acceptability of gray wolves**	... threaten livestock**	402	0.74	1.09
	... threaten pets**	402	0.94	1.23
	... threaten people**	400	0.72	1.21
	Composite Grizzly Attitude (Cronbach alpha = .930)	1,744	3.82	0.87
	I think grizzly bears are beautiful animals	1,693	4.34	0.85
	I think grizzly bears are important for ecosystem health	1,703	4.16	0.99
	I enjoy knowing that grizzly bears exist in Montana, even if I never see one	1,706	4.15	1.01
	I think grizzly bears can positively contribute to the outdoor economy in Montana	1,699	3.82	1.08
	I think grizzly bears have a right to exist in Montana	1,730	4.47	0.83
	Grizzly bears limit my recreational opportunities*	1,693	2.44	1.23
Attitudes toward grizzly bears**	Grizzly bears are a burden I'd rather not deal with*	1,688	2.20	1.21
	I think grizzly bears pose a safety risk to people I care about*	1,729	2.61	1.28
	I feel that my personal safety is threatened by grizzly bears*	1,728	2.31	1.20
	I am concerned about grizzly bears damaging things that I care about*	1,728	2.28	1.22
	Grizzly bears negatively affect my economic well-being*	1,728	1.89	1.04
	I think grizzly bear populations in Montana are ... [Much too low/high]*	1,204	3.31	1.06
	Composite Cougar Attitude (Cronbach alpha = .777)	528	3.51	0.94
	Cougars should be treated as nuisance animals in my area*	527	2.16	1.23
	Cougars are an important part of the ecosystem	527	4.29	0.81
	Cougars have the right to exist wherever they are found	526	3.33	1.33
Acceptability of cougars*****	It is unethical to kill a cougar	526	2.89	1.44
	Composite Cougar Acceptability (Cronbach alpha = .860)	516	3.11	1.19
	How acceptable would it be to "shoot and kill the cougar" when "residents of your community report sightings of a cougar"*	512	2.14	1.21
	How acceptable would it be to "shoot and kill the cougar" when "a cougar has killed several pets in your community"	513	2.80	1.40
	How acceptable would it be to "shoot and kill the cougar" when "a cougar has attacked and injured someone in your community"	512	3.71	1.38

*Reverse Coded.

**Scale = 1 to 5, Strongly Disagree to Strongly Agree.

***Scale = 1 to 5, Very Dissatisfied to Very Satisfied.

****Scale = 1 to 5, Much too low to Much too high.

*****Scale = 1 to 5, Highly unacceptable to High acceptable.

+Question stem: "wolf populations should be controlled when they"

To confirm the scale reliability across each of the multi-item attitude and acceptability batteries, we calculated Cronbach's alpha for each scale using 0.65 as a cutoff (Vaske, 2019). We computed composite attitude scores and separate composite acceptability scores by calculating the mean across all species-specific attitude items and acceptability items, excluding missing data. We plotted composite attitude scores against acceptability scores (composite or single-item) to visualize each respondent's location in the wildlife attitude-acceptability framework conceptual space. We rescaled the attitude scale for cougars from 1–7 to 1–5 to facilitate comparison with the grizzly and wolf attitude scales. To assign each respondent to a quadrant in the wildlife attitude-acceptability framework, we categorized their attitude score as either below or above the scale mid-point (3.0); we repeated the same process for their acceptability score. We randomly forced individual scores falling exactly on the midpoint into either the higher or lower categories, leaving exploration of the “indifferent” category for later work.

Results

Response rates to the surveys varied, with 34.0% responding to the wolf survey, 37.7% responding to the grizzly survey, and 20.8% responding to the cougar survey. All results presented below are descriptive of the respondents to each survey to demonstrate the potential for the wildlife attitude-acceptability framework, not to provide inference for any populations of interest. Sampling errors at the 95% confidence interval were 4.3% for the wolf survey, 3.5% for the grizzly survey, and 5.0% for the cougar survey.

Overall respondents' attitudes were slightly negative toward wolves ($m = 2.91$, $SD = 1.21$), positive toward grizzlies ($m = 3.82$, $SD = 0.87$), and slightly positive toward cougars ($m = 3.51$, $SD = 0.94$; Table 1). Acceptability among respondents was low for wolves ($m = 0.97$, $SD = 1.08$), and slightly positive for grizzlies ($m = 3.31$, $SD = 1.06$) and cougars ($m = 3.11$, $SD = 1.19$). Frequencies of responses within each attitude-acceptability framework quadrants were as follows: For wolves, we found 1% of respondents tolerate, 14% advocate, 32% conditionally support, and 53% oppose (Figure 2(C)); for grizzlies, we found <1% of respondents tolerate, 24% advocate, 55% conditionally support, and 22% oppose (Figure 2(B)); for cougars, we found 1% of respondents tolerate, 13% advocate, 59% conditionally support, and 27% oppose (Figure 2(A)).

Discussion

Populating the attitude-acceptability framework with empirical data can inform human dimensions of wildlife management and research in myriad ways. The visual representation of species-specific cognitions and relationships between attitudes and acceptability allows practitioners and researchers to quickly assess the social landscape for a particular focal species. For example, in MT with respect to gray wolves, the populated framework (Figure 2) reveals a social landscape of opposition mixed with conditional support, limited advocates, and very few who tolerate. In this case, the extent of opposition is clear (i.e., the density of respondents clustered in the bottom left corner of the “oppose” quadrant in Figure 2(C)), as is the potential for conflict between these opponents and those categorized as “advocate.” In contrast, the populated framework quickly reveals uniquely different social landscapes for grizzlies, where more responses centered on advocate (Figure 2(B)), and

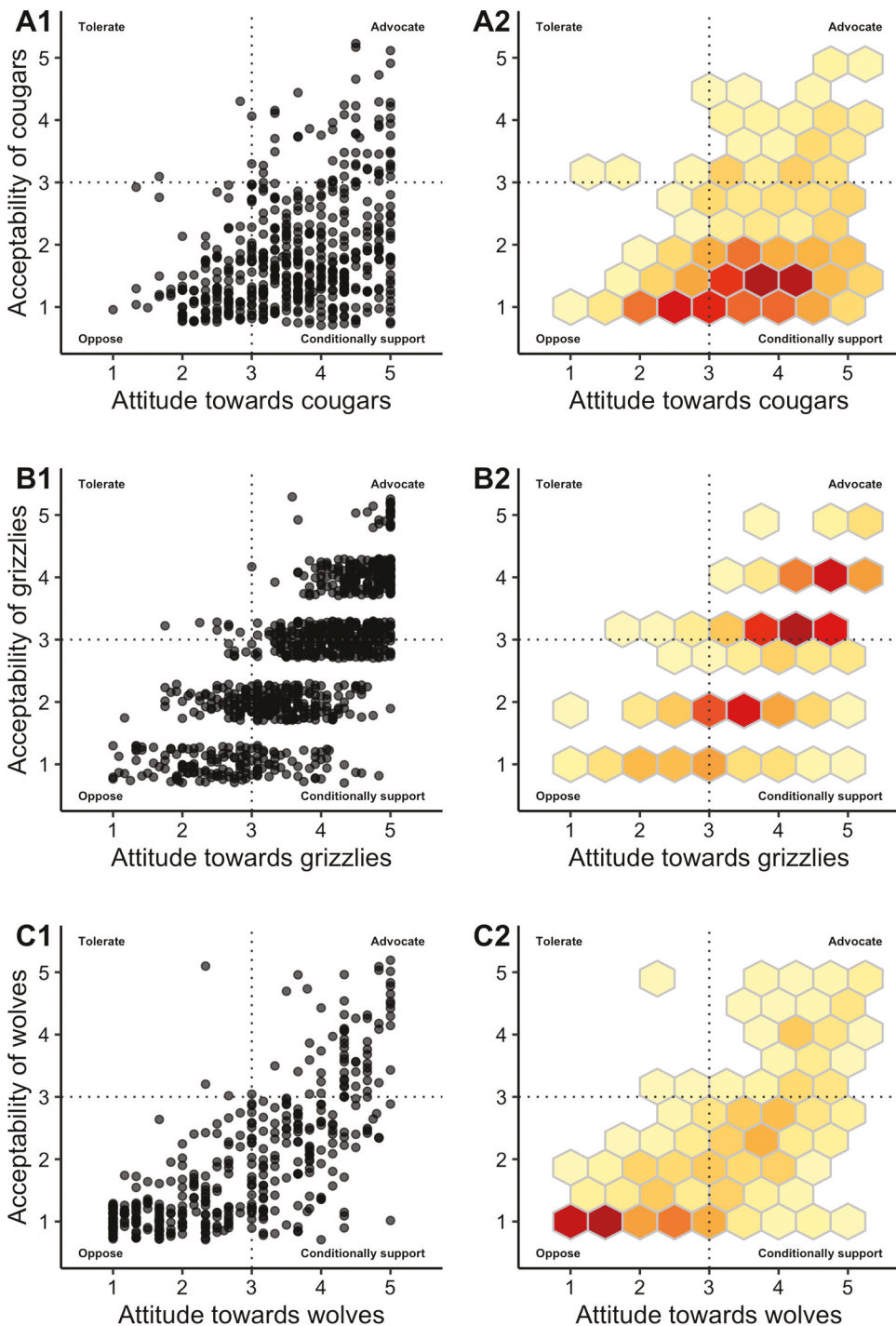


Figure 2. The wildlife attitude-acceptability framework, populated examples; jittered scatter plots (A1, B1, C1; jitter of $y \pm 0.3$ to aid interpretation) and density plots (A2, B2, C2) of attitudes (x-axes) by acceptability (y-axes) for cougars (A), grizzly bears (B), and gray wolves (C). Points in plots A1, B1, and C2 are translucent gray such that darker areas indicate overlapping points. Colored hexagons in plots A2, B2, and C2 represent varying densities of respondents at that location in the conceptual space, where low density is shown in light yellow and higher density is shown in red; missing hexagons indicate no respondents in that region of the graph.

cougars, where more responses centered on conditionally support (Figure 2(A)). In this way, the attitude-acceptability framework extends efforts to visualize wildlife-related cognitions, like the Potential for Conflict Index (Vaske et al., 2010), to inform decisions and inspire future research.

With the social landscape mapped into the attitude-acceptability conceptual space, specific research and management questions arise as do opportunities for monitoring changes over time, due to actions/interventions, or when human–wildlife conflict changes. For example, Brenner (2017) discussed how this framework can be used to map changes in social acceptability based on different management response options across increasingly severe wildlife interactions (e.g., Figure 3(A)). The framework can also be used to quantify and visualize how cognitions differ situationally or among stakeholder groups (e.g., Figure 3). This approach also has utility for wildlife managers and species advocates seeking to define “success” or set objectives by providing empirical information about extant cognitions among the public or specific stakeholder groups and the likelihood of future shifts. For instance, one could imagine a scenario where widespread advocacy for a species might be a reasonable goal, whereas elsewhere managers or species advocates might seek to move the public from largely opposing to tolerating or conditionally supporting a species, depending on the relative flexibility of attitudes versus acceptability. Additionally, managers and conservationists could use this information to compare and contrast the social landscape at different scales (e.g., national vs state) or across cultures to anticipate and potentially preempt potential conflict (Glikman et al., 2022).

A Call for Measurement Consistency

More work is needed to standardize item measurements used to populate the wildlife attitude-acceptability framework and fully realize its benefits. Wildlife attitude and acceptability measures differ widely across the human dimensions of wildlife research, including even here with three studies sharing common investigators. Some variation is likely inevitable, as it was for us, based on funders, partners, research needs, management context, and other study-specific idiosyncrasies; however, the field would benefit from increased consistency. We hope the utility of the wildlife attitude-acceptability framework demonstrated here may inspire human dimensions of wildlife researchers and practitioners to collaboratively develop a universal battery (i.e., series of survey items designed to collectively measure a latent construct) of wildlife attitude questions that could facilitate better monitoring over space and time, allow reliable comparisons among all types of species (not just large carnivores), and provide more meaningful evaluation of policy or management interventions. There is even more diversity in the literature when it comes to species acceptability scales, with some studies measuring normative beliefs about population sizes (Metcalf et al., 2017; Zinn et al., 1998), others evaluating the acceptability of general management options for a species (Jaebker et al., 2022), and still others assessing dynamic species acceptability over a range of encounter scenarios (Heneghan & Morse, 2019; Morzillo & Needham, 2015; Sponarski et al., 2015). To optimize utility and adoption of the wildlife attitude-acceptability framework, standardized attitude and acceptability batteries should be collaboratively developed by human dimensions researchers and practitioners from a variety of backgrounds and with expertise across a range of species and human–wildlife interactions. Such collaboration could take place at academic conferences,

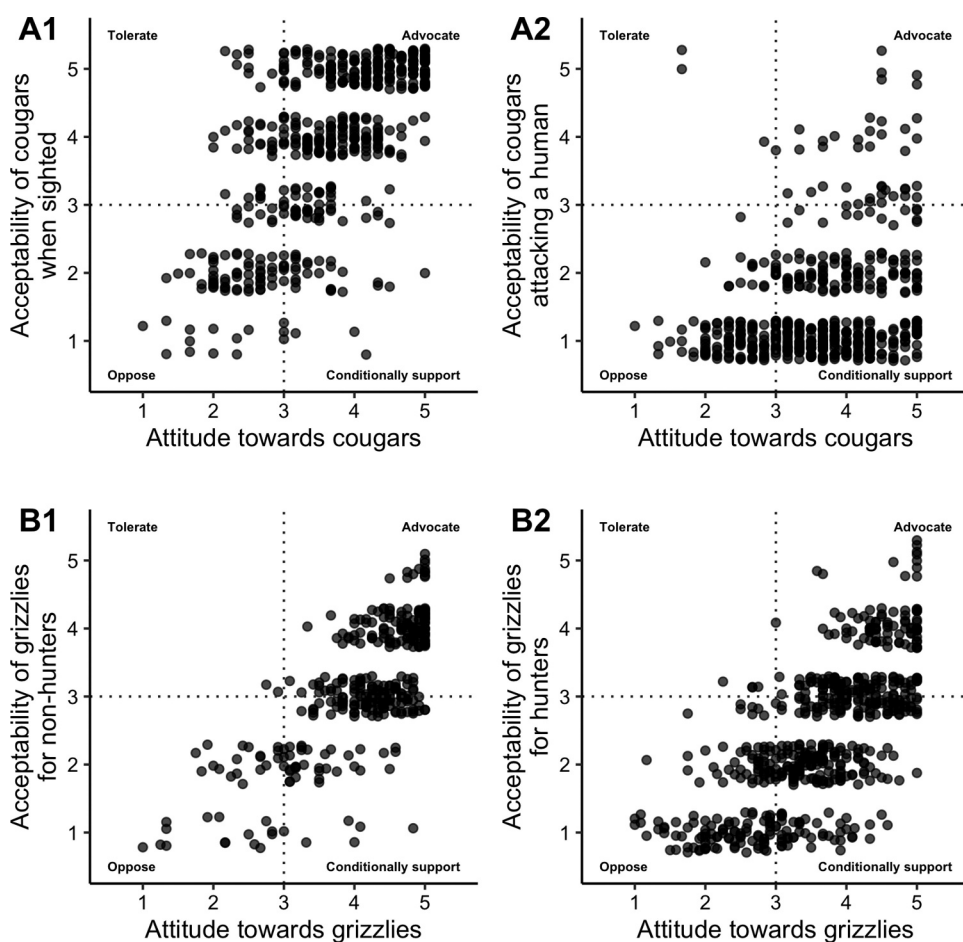


Figure 3. The wildlife attitude-acceptability framework can be used to map how social acceptability differs across increasingly severe wildlife scenarios (panels A1 and A2) and between different stakeholder groups (panels B1 and B2). Jittered scatter plots ($y \pm \leq 0.3$) in the A panels show how attitude-acceptability shifts for residents of Kalispell, MT when interactions with cougars shift from merely being sighted near human development (A1) to attacking and injuring a person (A2). Jittered scatter plots ($y \pm \leq 0.3$) in the B panels demonstrate how attitude-acceptability differs between non-hunters (B1) and hunters (B2) with respect to grizzly bears in Montana.

particularly ones inclusive of practitioners, or through organizations like the International Union for the Conservation of Nature who has recently gathered scientists and practitioners from around the world to develop metrics to evaluate progress toward human–wildlife conflict reduction. As always, researchers should carefully align sampling frames and use probability-based samples if they seek inference of wildlife-related cognitions to a specific population of interest.

Consistent measurement of attitudes, acceptability, and their intersections across people would allow for contrasts and comparisons among species, either as a research endeavor or to alert managers and practitioners to divergent social landscapes they'll encounter in their work. For example, the populated framework for respondents'

cognitions toward wolves (Figure 2(C)) demonstrates a stark contrast with those toward grizzly bears (Figure 2(B)). As they are, these results indicate the possibility that, among respondents, more are advocates for grizzly bears than for wolves, conditional support for bears is somewhat more common than it is for wolves, and opposition is far lower for grizzlies than it is for wolves. However, more consistent measurement and inferential statistics – as the field has worked toward and benefited from with respect to Wildlife Value Orientations (Teel et al., 2007) – are needed to further investigate these apparently divergent perspectives. Once measurement is made consistent, contrasting visualizations between species could provide stark signals to managers and practitioners when the public or specific stakeholder groups view species differently, indicating a likely demand for unique management responses to changes in each species' population size, conflicts, and associated mitigation efforts.

Future Research Questions Arise

Populating the wildlife attitude-acceptability with empirical data also raises important research questions such as why cognitions differ across species, what changes in cognitions (if any) are possible, or what the implications may be for understanding, predicting, or changing human behavior or policy support, among myriad other questions grounded in the extant social context and relevant to managers and practitioners. For example, one question raised by the data presented here is how the relationship between attitudes and acceptability may differ among species, across study sites or nested spatial scales, between cultures, or following management or policy interventions. In these three independent examples that had different sampling frames and question batteries, we see a rather consistent exponential relationship between attitude and acceptability such that acceptability is low among those with negative attitudes toward wildlife species, remains somewhat low for those with neutral attitudes, but is high and higher for those with positive or very positive attitudes (Figure 2). If cognitions tend toward consistency, as social-psychological theory and research on wildlife value orientations suggests (Heberlein, 2012; Manfredo et al., 2021), but acceptability can vary based on context (Metcalf et al., 2017), some goals for outreach seem more fruitful than others. Thus, it may be easier to inspire tolerance among opponents than conditional supporters; advocacy may be more likely to develop among conditional supporters than among the tolerant; opposition is more likely to grow among the tolerant rather than among conditional supporters or advocates. However, attitudes do sometimes change, so the degree of malleability in individual attitudes and acceptability and the effect of management programs and decisions on attitudes and acceptability could be inferred with repeated measurements in time or space.

Another question raised by the data we present here is whether, when, and where tolerance (as defined by Brenner & Metcalf, 2020) actually exists in any meaningful quantity and how, if at all, it might be elevated (e.g., through compensation, conflict prevention, or conflict response programs). Perhaps discouragingly, the almost complete absence of people from the “tolerate” quadrants for these large carnivore species (Figure 2) mirrors evidence from sociology literature that human tolerance of disliked social groups is rarely practiced, although ascribed as a virtue (Peffley et al., 2001; Sullivan et al., 1979; van Doorn, 2014). However, these are data from a few carnivore species collected with varying sampling and measurement strategies –

perhaps there are other species or scenarios for which tolerance does exist, where people are willing to accept impacts from species they do not like. For example, it seems entirely plausible that people may tolerate species despite negative attitudes because of the positive role the species plays in an ecosystem (e.g., beavers, which are disliked when property is flooded, but also celebrated for bolstering water storage and climate resilience), or because the services a species provides offset disservices (e.g., elk, which provide wildlife viewing opportunities, but also cause crop damage), or because the species provides value to friends/family or other important people despite no direct benefit to the individual (e.g., white-tailed deer, that limit forest regeneration, but family members may like to hunt). In still other instances, some people may have other overriding beliefs/motivations that promote acceptance of disliked species (e.g., more tolerance of grizzly bears because of spiritual and cultural value; or more tolerance of snails in a garden because removing them would require pesticides). Wider application of the wildlife attitude-acceptability framework could help answer these and many other human dimensions of wildlife questions.

Conclusion

Although work remains toward refinement and adoption, the wildlife attitude-acceptability framework provides opportunities for consistent measurement and monitoring of human dimensions of wildlife data, comparing those data across species and over time, and understanding dynamism of the social landscape for wildlife conservation and management whether organically over time or in response to policy and management changes. In our own work, we have found that the framework facilitates understanding and curiosity among researchers and practitioners alike. We see potential for the framework to help improve wildlife management, especially in a public trust setting, by helping decision-makers set and measure realistic social objectives and targets with respect to wildlife species management and governance. For example, the framework could provide a rigorous, empirical, and replicable measure of social variables to be included in a structured decision-making rubric (Lyons et al., 2008; Martin et al., 2009), while helping ground-specific fundamental objective targets to the social reality. Applying this concept in a public wildlife management setting requires thoughtful consideration of target populations, sampling frames and protocols, and specific question batteries. We look forward to continued dialogue, refinement, and adoption of the framework by researchers and practitioners alike toward improved understanding of the nuances of humans' wildlife related cognitions and their role in promoting human-wildlife coexistence.

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