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The VIPs of Wolf Conservation: How Values, Identity, and Place Shape Attitudes Toward Wolves in the United States

Shelby C. Carlson, Alia M. Dietsch, Kristina M. Slagle and Jeremy T. Bruskotter*

School of Environment and Natural Resources, The Ohio State University, Columbus, OH, United States

Attitudes toward wildlife shape support for and opposition to myriad conservation actions worldwide. Scholars have long debated what are the most critical factors shaping these attitudes, and research on carnivores has often treated important factors such as values, identity, and place (VIPs), as independent of one another. To better integrate these factors in the context of explaining attitudes toward wolves (*Canis lupus*), we explore the effect of: (i) region of the United States [Northern Rocky Mountains (NRM), Western Great Lakes (WGL), and the remainder of the country], (ii) sociodemographic characteristics (age, gender, income, urban/rural residency, and education), (iii) indicators of one's social identity (hunter, farmer, environmentalist, and animal rights advocate), and (iv) wildlife value orientations (mutualism and domination). Using one-way analysis of variance tests and hierarchical regression analyses, we found that attitudes do not statistically differ across regions with wolves (compared to regions without wolves), yet the people who identify with interest groups most likely to directly impact or be impacted by wolf populations, such as farmers/ranchers, are less tolerant of wolves when they live closer to them (i.e., in the NRM and WGL) even when accounting for individual-level values. By examining attitudes toward wolves at a spatial scale not commonly assessed, this study seeks to enhance current understandings of the impact of VIPs, while serving as a guide to inform future research and policies regarding carnivore management.

Keywords: gray wolves, attitudes, values, social identity, carnivores, conservation, tolerance

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Krithi K. Karanth,
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Reviewed by:
Douglas William Smith,
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Paul Charles Paquet,
University of Victoria, Canada

****Correspondence:***
Shelby C. Carlson
carlson.539@buckeyemail.osu.edu

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INTRODUCTION

Efforts to recover populations of large mammalian carnivores (e.g., gray wolves, brown bear, lynx) have been remarkably successful across the United States and Europe (Enserink and Vogel, 2006; Chapron et al., 2014; Mech, 2017). These successes are both celebrated by proponents of large carnivores, and lamented by those who oppose the restoration of these species (Bruskotter et al., 2010; Krange and Skogen, 2011; Epstein, 2017). The recovery of gray wolves (*Canis lupus*), in particular has been met with open hostility among some subsets of the public, prompting the agencies charged with wolf management to find ways of increasing tolerance for this species (Treves and Bruskotter, 2014; Hogberg et al., 2016; Epstein, 2017). To that end, various agencies have liberalized killing of wolves through regulated public hunting, trapping, and lethal control,

contending that such actions are necessary to avoid erosion of public support for wolves and the laws that protect them (Mech et al., 2015).

Recently, Bruskotter et al. (2018) sought to evaluate these hypotheses by comparing broad regions of the United States that have different experiences with wolf recovery. In the western Great Lakes (WGL) region, wolves were never fully eradicated and have been recovering "naturally" (i.e., without reintroduction) since their federal protection in the early 1970s. In the Northern Rocky Mountains (NRM) region, wolves were largely eradicated by 1930, reintroduced in the mid-1990s (Smith and Bangs, 2009), then removed from Endangered Species Act (ESA) protections by Congress in 2011. Finally, wolves have generally been absent in the rest of the country over the past half century with a few exceptions (i.e., Alaska; and more recently, Washington and Oregon). Bruskotter et al. (2018) found that, despite substantial differences in both wolf presence and policy, residents of these broad regions did not differ in terms of their attitudes toward wolves, support for the ESA, or their trust of the U.S. Fish and Wildlife Service (USFWS; the federal agency charged with wolf recovery). Thus, the authors suggested that existing evidence does not support the idea that protections for wolves will lead to decreased tolerance of wolves. However, the authors conceded that the scale of their analyses may have affected their results; specifically, differences among the residents most likely to be affected by wolves (e.g., hunters and ranchers/farmers living in wolf-occupied regions) may have been 'drowned out' in their analyses by urban residents who make up ∼82% of the United States population (U.S. Census Bureau, 2016). To examine this possibility in conjunction with how values, identity, and place (VIPs) may interact, we conducted comparisons of residents from these same three regions while limiting analysis to three "affected" sub-groups: (i) rural [non-metropolitan statistical area (non-MSA)] residents, (ii) those who identified as hunters, and (iii) those who identified as ranchers/farmers. We then used a series of hierarchical regression analyses to simultaneously explore the effects of VIPs on attitudes toward wolves.

Understanding Attitudes Toward Wolves

Attitudes Over Time

Kellert et al. (1996) suggested that attitudes toward wolves in the United States transformed substantially throughout the twentieth century – with the public becoming more positive and accepting of wolves. Although this sentiment was widely accepted among researchers and wildlife professionals alike (Bruskotter et al., 2010), empirical investigations of attitudes toward wolves were inconsistent, and causes of potential attitude shifts remain contested.

In a meta-analysis of attitudes toward wolves and their reintroduction in the United States and Europe, Williams et al. (2002) found that positive attitudes did not appear to be increasing over time. More recently, Dressel et al. (2015) examination of over 100 surveys evaluating tolerance of large carnivores, including wolves, across Europe suggested that attitudes toward wolves actually became *less* favorable the longer people coexisted with them. However, the studies assessed in these meta-analyses exhibited substantial inconsistencies in the conceptualization and measurement of attitudes, which affect the comparability of their findings (Dressel et al., 2015). A lack of uniformity in measurement limits the ability to establish trends in attitudes across time and space and to understand the factors affecting those attitudes.

Tracking residents' attitudes in the same location across time can provide helpful insight into how and why attitudes toward wolves change. Over approximately a 10-year time frame, Bruskotter et al. (2014) found that attitudes toward wolves among Utah residents remained relatively stable – yet the state of Utah lacks a viable wolf population, leaving the question of what influences the attitudes of residents who live near wolf populations unanswered. In contrast, residents of rural Wisconsin have experienced numerous policy shifts and increasing wolf abundance over time. Respondents there reported decreased tolerance for the species, coupled with growing acceptance of lethal control and inclinations to poach wolves (Treves et al., 2013); however, this study targeted rural residents living within wolves' range, and the vast majority of respondents (78% in one panel, 88% in the other) were hunters. In contrast to these local-level analyses, George et al. (2016) found a substantial (>40%) increase in the proportion of United States residents who expressed positive attitudes toward wolves from 1978 to 2014. Collectively, these studies raise the question of what exactly leads to change in attitudes toward wolves over time in different places.

Factors Affecting Attitudes Toward Wolves in Cross-Sectional Studies

A range of social and demographic factors, including age, gender, and political ideology, have been correlated with attitudes toward wolves in cross-sectional studies. Williams et al. (2002) found rural residency and occupations related to farming and ranching to be among the most powerful predictors, correlating negatively with attitudes toward wolves across most studies they assessed. Generalizing across these studies, Williams et al. (2002) suggested that social groups with a greater likelihood of direct experience with wolves typically have more negative attitudes of the species. Likewise, Ericsson and Heberlein (2003) found that residents of areas where wolf populations had rebounded reported more negative attitudes toward the species than the general public. Subsequent analyses found that identification as a hunter, residence in a wolf-occupied area, and experience with wolf depredation all had independent negative effects on attitudes.

Karlsson and Sjöström (2007) countered that, given how few people directly interact with wolves, negative attitudes toward wolves may instead result from *indirect* experience with the species. Essentially, people who are directly affected share their stories and experiences with others (e.g., friends, family, neighbors) within their communities, shaping the attitudes of people who hear such stories but have not directly interacted with the species. If true, attitudes toward wolves can also be socially constructed in relation to group interests, shared values, and collective experiences (additional support for this idea can be found in: Wilson, 1997; Skogen and Thrane, 2007; Skogen et al., 2017; Slagle et al., 2018). Consistent with

this idea, Bruskotter et al. (2009) found that Utah residents' identification with a variety of relevant interest groups (e.g., farmers, hunters, environmentalists) was strongly associated with residents' beliefs about the costs and benefits of wolves, as well as their attitudes toward wolves.

Dietsch et al. (2016) offer another mechanism explaining variation in people's attitudes toward wolves and their management. The authors found substantial variation in residents' attitudes (in this case, attitudes toward lethal control of wolves) across counties independent of where wolves were located. The authors suggested that people's core beliefs about wildlife (i.e., wildlife value orientations) help explain observed differences in attitudes. As the authors describe, value orientations consist of two central and contrasting ideologies; domination, which prioritizes human needs over the perceived needs of wildlife, and mutualism, which places heightened awareness on the perceived needs of wildlife relative to human needs (Manfredo et al., 2009). Consistent with their hypothesis, they found that value orientations were strongly associated with attitudes toward lethal control at the county level (Dietsch et al., 2016), though they raise the need for future analyses to simultaneously consider values, local context, and additional factors (e.g., identity) to fully account for the range of variation in attitudes.

Collectively, these studies offer three basic insights concerning attitudes toward wolves; they suggest attitudes vary as a function of: (i) one's experience – whether one is affected by wolves; (ii) one's social (or interest) group, which is used as a reference for constructing wolves; and (iii) one's value orientations – that is, one's ideas for how we should live with respect to wildlife. Our research explores the collective effects of these different sources of variation – or VIPs – while controlling for a variety of background social and demographic variables.

Current Study

Research indicates attitudes toward wolves do not vary between large regions of the United States with different histories with wolf recovery (Bruskotter et al., 2018). However, studies also suggests that experience – whether direct or indirect – with wolves may be important in formulating attitudes toward these species (Williams et al., 2002). Moreover, at the individual level research suggests these attitudes are powerfully shaped both by one's social groups (Williams et al., 2002; Ericsson and Heberlein, 2003; Bruskotter et al., 2009; Lute et al., 2014) as well as one's values (Dietsch et al., 2016; Bruskotter et al., 2017). Herein, we examine the extent to which attitudes toward wolves can be explained by simultaneously taking account of: (i) region of the United States (NRM, WGL, and the remainder of the country), (ii) sociodemographic characteristics previously shown to correlate with wolves (i.e., age, gender, income, rural/urban residency, and education), (iii) indicators of one's social identity (hunter, farmer/rancher, environmentalist, and animal rights advocate), and (iv) wildlife value orientations (mutualism and domination).

METHODS

We conducted analyses of data obtained by Bruskotter et al. (2018), which consisted of a survey (n = 1,287) of adult residents in the United States Responses were collected using Qualtrics, a web-based survey platform, by the GfK Group in 2014. Through GfK's Knowledge Panel®, three regions with varying experiences in protecting gray wolves under the ESA were sampled, the: (i) NRM, (ii) WGL, and (iii) remainder of the United States (RUS). Participants in the Knowledge Panel were recruited via address-based sampling and recruitment methods, then maintained as a panel by GfK (currently Ipsos). Panelists were randomly selected for participation by GfK. Due to controversy regarding ESA protections of Mexican wolves (*Canis lupus baileyi*) residing in New Mexico and Arizona, as well as red wolves (*Canis rufus*) inhabiting a small portion of North Carolina, cases from these three states (n = 23) were excluded from the present analyses. Cases were also removed from Alaska (n = 4), given that this state has an unlisted population of wolves, and Hawaii (n = 4), where wolves have never existed.

In order to quantify attitudes toward wolves, we used a semantic differential scale composed of four response items, which were each measured on a seven-point scale ranging from one (negative perception of the species) to seven (most favorable perception) (see **Appendix**). Items were then averaged to reflect a participant's overall attitude toward wolves. To measure indicators of social identity, respondents were asked to report the extent to which they identified with each respective group on a five-point unipolar scale ranging from one (not at all) to five (very strongly). Finally, to capture individual beliefs about human-wildlife relationships (Teel and Manfredo, 2010), we operationalized an abbreviated form of wildlife value orientations by averaging respondents' scores to a select set of domination and mutualism-based items. The seven items used were measured on a five-point bi-polar scale ranging from one (strong disagreement) to five (strong agreement) (see **Appendix**).

To determine if differences regarding attitudes toward wolves between the groups of interest in the three study regions existed, we conducted one-way analysis of variance (ANOVA) tests. For these comparisons, data were weighted *post hoc* on regional sociodemographic characteristics using benchmarks from the United States Census Bureau's 2009–2011 American Community Survey. We further explored the data, unweighted, through hierarchical regression analyses to assess potential interaction effects among variables. By organizing our regressions into three distinct blocks (based on sociodemographic, interpersonal, and cognitive factors, respectively) we were able to examine the additive effect of these variables in conjunction with regional differences. The same sociodemographic, identity, and WVO measures were used in these analyses as described above.

RESULTS

We found significant differences between attitudes of people living in the three geographic units in relation to identity

TABLE 1 | One-way ANOVA results depicting differences in attitudes toward wolves by region among United States residents who identify with particular groups (2014).

Grouping variable	NRM residents			WGL residents			RUS residents		
	n	Mean[2]	*SD*	*n*	Mean[2]	*SD*	*n*	Mean[2]	*SD*
Hunters[1]	150	3.91[a]	1.86	143	4.48[b]	1.41	148	4.54[b]	1.41
Farmers/Ranchers[1]	178	4.15	1.84	193	4.55	1.42	196	4.61	1.52
Environmentalists[1]	185	5.10	1.64	234	4.87	1.39	228	4.88	1.41
Animal Rights Advocates[1]	149	4.86	1.86	203	4.99	1.33	179	5.08	1.33
All Respondents	401	4.48	1.66	442	4.60	1.41	414	4.69	1.41

Superscripts "a" and "b" indicate significant differences between regions at the $p < 0.001$ level. In other words, superscript "a" demonstrates that Hunters in the NRM region have a significantly different mean in attitudes toward wolves than Hunters in both the WGL region and the RUS region (each of which are noted as "b"). [1]Respondents were asked "To what extent do you identify with each of the following groups." Response categories were measured on a uni-polar scale ranging from one (not at all) to five (very strongly). Individuals were classified as belonging to a group if they selected 3–5. Respondents could identify with multiple groups; thus, group response categories are not discrete. [2]Attitudes toward wolves were measured on a seven-point bi-polar scale ranging from one (negative perception of the species) to seven (most favorable perception). Items were then averaged to reflect a participant's overall attitude toward wolves.

(**Table 1**). Specifically, hunters in the NRMs expressed more negative attitudes toward wolves relative to hunters in the WGLs and the RUS ($F = 7.156$, df = 2, $p = 0.001$). Respondents who identified at least moderately as a farmer/rancher in the NRMs also reported more negative attitudes toward wolves than those in the WGLs and the RUS ($F = 4.580$, df = 2, $p = 0.011$). Results indicated that regional differences in attitude may depend upon identity; thus, we next controlled for the potential interaction between region and identity in subsequent regression analyses.

Our initial regression model (**Table 2**) indicated that sociodemographic factors typically found to be associated with attitudes toward wolves appear less influential in our population. In fact, no significant associations were found between attitude and age, gender, income, residency in a metropolitan statistical area (MSA), or education. Furthermore, we found no significant relationship between respondents' attitudes toward wolves and residency in the NRMs or the WGLs. To determine if rural (or non-MSA) residents living in areas with wolves (i.e., the NRM and WGL regions) differ from rural residents living in areas without wolves (i.e., the RUS region) in their attitudes, we included an interaction term controlling for MSA residency and region. Despite patterns found in previous research (Treves et al., 2013; Bruskotter et al., 2014), our analysis revealed no significant effect among our population.

Our second regression model incorporated measures of respondents' identification with various interest groups. Results showed that when these identities and sociodemographic factors were simultaneously accounted for, residency in the NRMs and WGLs had independent negative associations with attitudes toward wolves (**Figure 1**). Moreover, the identity-by-region interaction terms were significant for three identity groups (NRM by environmentalist [+], NRM by farmer/rancher [−], WGL by farmer/rancher [−], and WGL by animal rights [+]. Additionally, identification as an animal rights advocate was significantly and positively associated with attitudes. Collectively, these factors explained roughly 16 percent of the variance in attitudes toward wolves.

In our final regression model, we added abbreviated measures of wildlife value orientations – mutualism and domination – to factors examined in Model 2. Incorporation of wildlife value orientations increased the explained variance of our model from 16 to 21 percent. Here, we found that mutualism was significantly and positively correlated with attitude toward wolves, whereas domination was significantly and negatively correlated with attitude. Contrasting with Model 2, residency in the NRMs was not significantly associated with attitude when wildlife value orientations were controlled. Rather, its effect was entirely dependent on living in the region *and* identifying as a farmer/rancher [−] or an environmentalist [+]. Similarly, residency in the WGLs was no longer significantly associated with attitude; instead, its effect on respondents' attitude toward wolves was now dependent upon living in this region *and* identifying as a farmer/rancher [−] or an animal rights advocate [+].

DISCUSSION

Conservation agencies face a common dilemma concerning wolf management as the species recolonizes parts of Europe and the United States Agencies can retain protective policies that have allowed wolves to reclaim lost range, or they can "liberalize" harvest so that locals can exert some control over wolf populations. Such decisions are often framed as pitting the interests of local, affected peoples against broader social interests backed by federal or international policy. Some scientists implicitly legitimize this framing when they warn that continued protection of large carnivores could result in local backlash against these animals and, more ominously, generally erode support for protective legislation (Mech et al., 2015). Yet, in the United States, George et al. (2016) found a >40% increase in positive attitudes toward wolves among United States residents during a period in which wolf populations and range occupancy grew. Further, Bruskotter et al. (2018) found no differences in attitudes among residents of United States regions that have varying experiences with wolf recovery. These studies suggest that rebounds of wolf populations do not necessarily lead to negative attitudes toward the species.

Here we examined the effects of VIPs on attitudes toward wolves. Our initial results support findings of prior studies (e.g., Ericsson and Heberlein, 2003; Karlsson and Sjöström, 2007) suggesting that living in wolf-occupied regions leads to more negative attitudes. However, the effect of place was dampened when values and identity were included in our models. Specifically, the effect associated with region was moderated by identification with related interest groups. That is, people who lived in wolf-occupied regions *and* identified

TABLE 2 | Standardized coefficients for hierarchical regression analyses predicting attitudes toward wolves in the United States (2014).

	Model 1		Model 2		Model 3	
Sociodemographic factors						
Age	−0.006	(0.003)	−0.029	(0.002)	−0.027	(0.002)
Gender	0.011	(0.089)	−0.003	(0.082)	−0.010	(0.080)
Income	−0.013	(0.012)	−0.028	(0.011)	−0.023	(0.010)
Education	−0.016	(0.026)	−0.011	(0.024)	−0.019	(0.024)
MSA Resident	0.066	(0.259)	0.092	(0.241)	0.060	(0.234)
NRM Resident	−0.068	(0.228)	−0.133*	(0.332)	−0.066	(0.323)
WGL Resident	−0.047	(0.156)	−0.179*	(0.271)	−0.120	(0.264)
MSA and Region	−0.071	(0.131)	−0.092	(0.121)	−0.063	(0.118)
Interpersonal factors						
Hunter			−0.057	(0.143)	−0.038	(0.139)
Farmer/Rancher			0.020	(0.136)	0.030	(0.132)
Environmentalist			0.072	(0.133)	0.055	(0.129)
Animal Rights Advocate			0.116**	(0.137)	0.057	(0.134)
NRM Resident and Hunter			−0.095	(0.076)	−0.075	(0.074)
NRM Resident and Farmer/Rancher			−0.213**	(0.078)	−0.211**	(0.075)
NRM Resident and Environmentalist			0.342***	(0.089)	0.329***	(0.086)
NRM Resident and Animal Rights Advocate			0.024	(0.092)	−0.037	(0.090)
WGL Resident and Hunter			−0.014	(0.075)	−0.005	(0.073)
WGL Resident and Farmer/Rancher			−0.144**	(0.074)	−0.127**	(0.072)
WGL Resident and Environmentalist			0.101	(0.083)	0.072	(0.081)
WGL Resident and Animal Rights Advocate			0.198**	(0.087)	0.143**	(0.085)
Cognitive factors						
Domination Wildlife Value Orientation					−0.105***	(0.038)
Mutualism Wildlife Value Orientation					0.211***	(0.044)
R^2	0.002		0.161		0.213	
F-statistic	0.318		11.339		14.514	
p-value	0.960		<0.001		<0.001	

*n = 1256. Standard errors appear in parentheses. ***p < 0.001; **p < 0.01; *p < 0.05.*

with groups likely to perceive or experience negative impacts of wolves (i.e., farmers/ranchers) expressed more negative attitudes toward wolves; in contrast, those living in the same regions who simultaneously identified with groups likely to perceive or experience positive impacts of wolves (i.e., environmentalists, animal rights advocates) expressed more positive attitudes. We further found that positive attitudes toward wolves were associated with different groups depending on which region (e.g., animal rights activist in the WGL and environmentalists in the NRM). These regional variations in the role of identity in shaping attitudes may further translate to regional differences in which social groups engage in conservation efforts.

The idea that human experiences with any phenomenon are, at least in part, mediated by social groups is consistent with the perspective of symbolic interactionists who suggest that knowledge is socially constructed (Blumer, 1969). Likewise, the idea that the effect of the group on any given individual is mediated through their social identity is supported by psychological research on social identity (for review see Hornsey, 2008), as well as conservation-related research that suggests social identity directly impacts how we think about wildlife and their management (Bruskotter et al., 2009; Lute et al., 2014, Bruskotter et al., 2019; van Eeden et al., 2019). Other research suggests that social groups often reinforce values and group-based norms depicting right and wrong behavior (Dandaneau, 2007), which can by amplified when groups are isolated by geography or choice (i.e., highlighting differences between groups by purposefully acting in opposition).

Despite claims (Mech et al., 2015) that long-term listings of controversial carnivores, like the gray wolf, under the ESA creates resentment toward the species being protected, Bruskotter et al. (2018) analyses suggested that removing wolves from such protections does not create tolerance – at least not immediately. Importantly, our results raise the question of whether removing ESA protections for wolves *decreases* tolerance of them among certain groups of people. For example, we found that farmers/ranchers in the NRM held the most negative attitudes toward wolves despite that wolves are no longer listed there. However, NRM farmers/ranchers may have always held negative attitudes toward wolves irrespective of ESA decisions. To be clear, our data are cross-sectional and do not track changes over time; thus, a definitive conclusion regarding potential impacts on attitudes following the delisting of this species is ultimately beyond the capabilities of the present study.

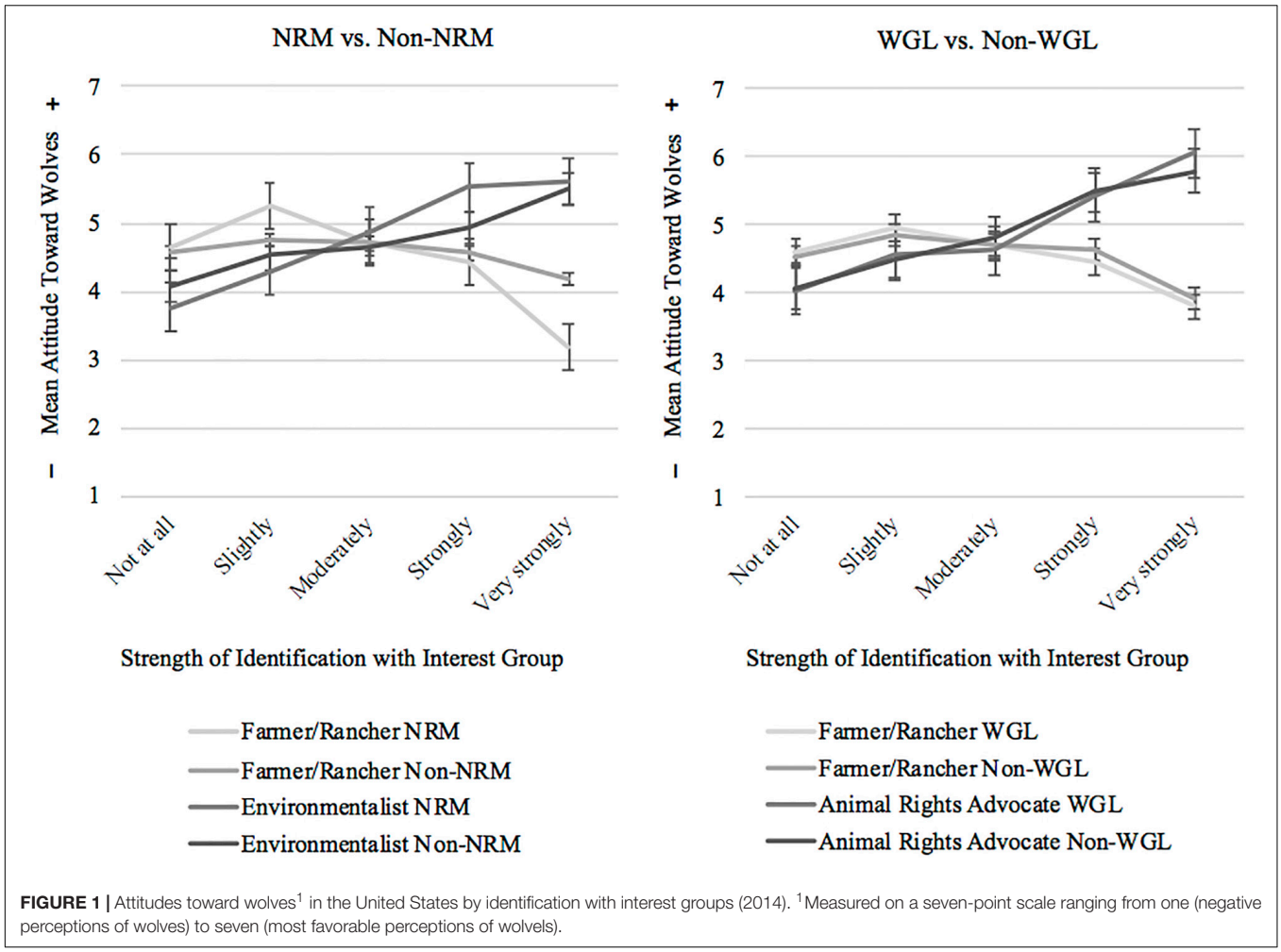

FIGURE 1 | Attitudes toward wolves[1] in the United States by identification with interest groups (2014). [1]Measured on a seven-point scale ranging from one (negative perceptions of wolves) to seven (most favorable perceptions of wolvels).

Our findings also warrant further discussion of the impact, or apparent lack thereof, of identification with other potentially influential interest groups, such as hunters. When examining tolerance for wolves in Sweden, Ericsson and Heberlein (2003) found that hunters residing in areas populated by wolves expressed the most negative attitudes toward them. Our findings, however, did not reveal identity as a hunter to be a significant predictor of attitudes in the United States when other factors were controlled. The difference could signal that United States hunters are more tolerant of wolves or less geographically proximate to wolves than are Scandinavian hunters; however, this difference might also be attributed to differences in the way we measured attitudes. For example, Ericsson and Heberlein (2003) used nine response items to construct their attitude scale, whereas we used four. As a result, cross-national investigations of attitudes toward wolves could clarify this ambiguity.

Efforts seeking to gauge attitudes toward wolves have been limited both temporally and spatially; and interpretation of these studies is limited by historically inconsistent measures of attitudes (Bruskotter et al., 2015). Although the present study does not explore a longitudinal perspective, our work does provide a baseline for future regional comparisons and distinctively contributes to an area of inquiry regarding the social construction of space – namely, how do different groups of people think about and engage with the landscape, as well as its wildlife and other resources. We recommend researchers investigate attitudes toward wolves at different spatial scales, as done here, particularly with an eye for longitudinal comparisons. In order to further disentangle the complexity and intersectionality of VIPs as it applies here, we additionally advocate for future analyses to employ multilevel modeling that can address impacts of group level characteristics above and beyond individual level characteristics (as done by Dietsch et al., 2016).

Our findings have direct implications for wolf management in the United States, especially given current efforts by the USFWS to delist all gray wolves from the ESA. Despite recent attempts to eliminate use of the social sciences in natural resource decision-making processes, as demonstrated by the highly contested Montana House Bill No. 161, these perceptions, and the systematic study of them, remain paramount to effective conservation efforts (Manfredo et al., 2019). Humans are the primary source of mortality for wolves practically everywhere they occur, and improving our understanding of

the policies, social conditions, and management actions that affect tolerance is crucial to efforts to conserve and coexist with this species. Collectively, our results show little support for the idea that continued protections for wolves negatively impacts tolerance for the species. Instead, United States attitudes toward wolves have become substantially more positive at the nation level (George et al., 2016), did not vary across hunters from different regions, and remained negative among a particular identity group despite wolves being removed already from the ESA. Consequently, we do not expect that removing federal protections will increase tolerance for wolves; rather, such decisions are likely to result in greater levels of harvest and lethal control (as witnessed in the NRMs), which could significantly impede wolf recovery efforts.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Office of Responsible Research Practices (Study ID2013E0553). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JB, AD, KS, and SC conceptualized the study. SC and KS performed the analyses with guidance from JB and AD. SC prepared the manuscript with critical feedback and input from JB, AD, and KS.

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APPENDIX

TABLE A1 | Descriptive statistics of indices and items used to measure model variables by region in the United States (2014).

Items and description	NRM residents			WGL residents			RUS residents		
	n	Mean	*SD*	*n*	Mean	*SD*	*n*	Mean	*SD*
Attitudes toward wolves[1]									
Generally speaking, I think wolves are. . .									
Harmful:Beneficial	396	4.45	1.85	437	4.50	1.71	379	4.63	1.68
Unpleasant:Pleasant	390	4.27	1.73	432	4.40	1.51	377	4.38	1.46
Worthless:Valuable	391	4.89	1.73	432	4.94	1.51	379	5.07	1.48
Bad:Good	388	4.46	1.77	431	4.57	1.53	378	4.71	1.49
Average	398	4.49	1.66	438	4.61	1.40	382	4.70	1.37
Abbreviated wildlife value orientations[2]									
Domination									
Fish and wildlife are on earth primarily for people to use	305	2.58	1.39	318	2.42	1.25	309	2.48	1.29
Humans should manage fish and wildlife populations so that humans benefit	272	3.16	1.20	313	3.19	1.23	294	3.25	1.23
The needs of humans should take priority over fish and wildlife protection	294	2.87	1.34	305	2.94	1.30	279	2.84	1.31
Average	402	2.87	1.14	443	2.85	1.09	394	2.84	1.12
Mutualism									
I feel a strong emotional bond with animals	299	3.63	1.14	317	3.72	1.18	270	3.70	1.10
I value the sense of companionship I receive from animals	277	4.17	1.03	315	4.18	0.98	256	4.09	1.08
I take great comfort in the relationships I have with animals	279	4.07	1.01	319	4.04	1.03	291	3.95	1.09
Animals should have rights similar to the rights of humans	280	2.91	1.43	326	3.07	1.33	263	2.89	1.26
Average	401	3.70	0.96	443	3.74	0.97	394	3.65	1.00

[1]Items were measured on a seven-point bi-polar scale ranging from one (negative perception of the species) to seven (most favorable perception). [2]Items were measured on a five-point bi-polar scale ranging from one (strong disagreement) to five (strong agreement).