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Are attitudes toward wolves changing? A case study in Utah

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ABSTRACT

A number of trends suggest public behavior and sentiment regarding wildlife, and especially charismatic mega-fauna such as wolves (*Canis lupus*), changed in the latter half of the 20th century. Declining hunter participation, support for trapping ban initiatives, changes in wildlife-related policy and the portrayal of predators in the media all point to changes in the way US residents view wildlife. Yet, while many researchers have examined attitudes toward wolves and other wildlife species, few have empirically assessed such attitudes over time. We conducted a mail survey of Utah residents in 2003, replicating the methods of a 1994 study, in order to determine if Utahns' attitudes toward wolves changed over the last decade. In addition, we compared the attitudes of relevant subgroups (i.e., big game hunters, rural residents, urban residents) across the two studies. Our results demonstrate the relative stability of attitudes toward wolves in Utah for all groups assessed, and offer important insights into questions related to the assessment of wildlife-related attitude change.

1. Introduction

Farley Mowat's (1963) novel, *Never Cry Wolf*, chronicles how one biologist's experience with a wild wolf pack dramatically alters what he knows and how he feels about wolves. Many scientists objected to *Never Cry Wolf*'s "blend of scientific argument and quixotic prose" (Jones, 2003, p. 67), and the idea that a wolf pack could sustain itself solely on small rodents was discredited (Mech, 1995). Yet, while Mowat was wrong about the science, the attitude change experienced by his central character is widely believed to be representative of a broader shift in public sentiment evident around the time of *Never Cry Wolf*'s publication. Kellert et al. (1996, pp. 977–979) argued US residents' attitudes toward wolves underwent a "significant attitudinal transformation" during the latter part of the 20th century, reflecting a "maturing of thought and an expansion of knowledge." Williams et al. (2002) provided a timeline for this shift, arguing attitudes toward wolves in the US became more positive between the 1930s and the 1970s. Evidence for this shift in public attitudes toward wolves includes changes in US policy regarding predators, shifting goals regarding carnivore management, and the depiction of wolves in the media (Messmer et al., 2001; Kellert and Westervelt, 1982). Still, scientific research on attitudes toward wolves did not begin until the 1970s. Thus, attitude shift before this time has been inferred based largely on changes in wolf management policies.

1.1. *Wolf policy in the US*

Although bounties on wolves in the US began as early as the 1600s (Mech, 1970), federally-sponsored control was not established until 1915, when the government appropriated $125,000 for controlling wolves and coyotes (Di Silvestro, 1985). Federal predator control continued for a half century and, combined with the efforts of private citizens, nearly

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succeeded in eliminating wolves from the lower 48 states (Mech, 1970; Feldman, 1996). Predator control, especially the use of poisons, became contentious during the early 1960s, prompting a federal review of the program. In its 1964 report, the Leopold committee warned changes to the program were necessary, including a reassessment of the control program goals (Feldman, 1996). Two years later Congress enacted the Endangered Species Preservation Act (1966), and a year later wolves were listed. Thus, US wolf policy transformed from a focus on eradication to a focus on conservation. US residents' attitudes toward wolves are believed to have paralleled this policy shift (Kellert et al., 1996; Treves and Karanth, 2003; Musiani and Paquet, 2004).

1.2. *Proposed causes for societal change in attitudes toward wolves*

While most researchers agree attitudes toward wolves in the US changed over the past century, there is yet no consensus regarding what caused this change. Some researchers posit increased environmental awareness regarding the importance of predators drove changes in attitudes toward wolves (Musiani and Paquet, 2004). Others suggest changes in the way wolves were portrayed in the media contributed to this shift (Messmer et al., 2001; Kellert et al., 1996). For instance, Messmer et al. (2001, p. 1256) argued, while before World War II attitudes toward wolves were shaped largely by folklore, after the war "the media's portrayal of predators progressively transformed them from ugly and ominous to playful, beautiful." However, it is unclear if the factors suggested by these authors actually *caused* a shift in attitudes, or merely reflected a shift already underway.

Only a handful of studies have examined attitudes toward wolves over time. Ericsson and Heberlein (2003) compared results from two surveys of Swedish residents conducted 25 years apart. Their findings suggest while the general public became more positive toward wolves, attitudes of hunters moved in the opposite direction. They proposed news of livestock and hunting dogs killed by wolves spread quickly and focused hunters' attention on the negative aspects of wolves. Similarly, Kellert (1999, p. 402) found evidence of increased "affection for and interest in wolves" in Minnesota between 1985 and 1999, while also noting an increase in support for control of wolf damage to livestock.

Duda et al. (1998) found Adirondack residents' support for wolf reintroduction decreased from 76% in 1996 to 46% in 1997. In a follow-up study, Enck and Brown (2002, p. 17) found only 42% of residents supported reintroductions. They suggested "extensive, mostly negative, media coverage," contributed to a shift in attitudes toward restoration. However, it is important to note these researchers were interested in support for wolf *reintroduction*, a specific management policy, rather than more general attitudes toward wolves. Still, these studies suggest public opinion regarding wolf-related issues is capable of undergoing substantial shifts over short time periods.

Changing public attitudes toward wolves could also stem from a broader shift in public values regarding wildlife. As indicated by Bright and Manfredo (1996), public sentiment regarding wolf-related issues are rooted in more fundamental value-laden beliefs. Recent research suggests certain societal-level factors (e.g., increasing urbanization, education, and economic prosperity) contributed to a shift away from traditional values emphasizing the use of wildlife for human benefit toward a more protectionist view of wildlife resources (Manfredo and Zinn, 1996; Manfredo et al., 2003). In a meta-analysis of 38 studies, Williams et al. (2002) suggested some of these same societal trends linked to value change (i.e., increasing education and urbanization and decreasing employment in agriculture) could contribute to a shift toward more positive attitudes toward wolves in the future. Further, they argued attitudes toward wolves could become more positive as a result of population replacement; that is, as a generation of people with negative attitudes toward wolves is replaced by people who view the predator more positively. Conversely, the successful reintroduction and restoration of wolves could actually promote more negative attitudes, especially when individuals are negatively impacted by wolves (Williams et al., 2002; Ericsson and Heberlein, 2003).

Williams et al. (2002) called for researchers to replicate previous cross-sectional studies in order to explore how attitudes toward wolves change over time. We contribute to this area of inquiry by reporting results from a longitudinal comparison (1994–2003) of Utah residents' attitudes toward wolves. With expanding human and wolf populations in the western US, and increasing pressure to remove wolves from endangered species protections, these results are particularly relevant for anticipating and addressing potential conflicts. Increases in direct public involvement in wildlife management decisions (e.g., ballot initiatives) suggest future efforts to conserve large carnivores in the US will be ever more dependent on the support of its citizens. Just as wolves are considered an "indicator species" when it comes to ecosystem health, the controversial nature of wolves also make them an indicator of public support for carnivore recovery and endangered species protection.

1.3. *Study context: wolves in the western US*

Gray wolves once ranged throughout the Rocky Mountain region of the western US (Mech, 1970); however, predator control programs led to the extirpation of wolves from most of this region by the 1930s (La Vine, 1995). Efforts to return wolves to the Rockies proved highly contentious. Two sites were chosen for reintroductions, Yellowstone National Park (YNP) and central Idaho—in the heart of the West's livestock industry. Subsequent research, planning, and the ensuing court battles spanned two decades, and involved over 120 public hearings (Wilson, 1997). Finally, in 1995–1996 the US Fish and Wildlife Service (USFWS) reintroduced wolves into YNP and central Idaho (Bangs and Fritts, 1996). Reintroduction efforts were highly successful; according to the USFWS, the minimum fall wolf population in greater Yellowstone and central Idaho increased from just 35 individuals in 1995 to 890 in 2005 (USFWS, 2006). Wolves continue to expand their territory in the Rockies and, though wolves have yet to establish packs in states adjacent to the original

recovery area, several wolves have been killed in surrounding states, including Utah (USFWS, 2006).

1.3.1. *Utah*

In 1994, La Vine (1995) surveyed Utah residents to discern the level of public support for wolves despite the fact there were no wolves in Utah at that time. Although Utah was not included in the initial recovery area, she surmised that if wolves were reintroduced to the northern Rockies as planned, they would eventually make their way to Utah. In November 2002, a male wolf originating from YNP was caught in a coyote (*Canis latrans*) trap in north-central Utah. This wolf was the first confirmed in the state in over 70 years. Shortly thereafter, the Utah House of Representatives passed House Joint Resolution 12, urging the USFWS to remove federal protections for wolves and instructing the Utah Division of Wildlife Resources (UDWR) to draft a wolf management plan. In February 2006, the USFWS announced its intention to remove the northern Rocky Mountain population of wolves from the endangered species list, which would turn management authority for wolves over to the states, and provide for greater flexibility in wolf management (USFWS, 2007). Habitat modeling efforts suggest Utah contains adequate habitat to support from 200 to 700 wolves (Switalski et al., 2002), but given high human densities, successful reoccupation of areas outside the core reintroduction site will depend largely on human tolerance (Carroll et al., 2002).

1.4. *Research objectives*

The primary objective of our research was to determine if Utah residents' attitudes toward wolves changed since La Vine's (1995) study. Because wolves were absent in Utah for more than 70 years, we presumed lack of direct experience with wolves would contribute to stability in public sentiment. In addition, the relative stability of societal-level factors proposed to affect public attitudes toward wolves (Williams et al., 2002) supported our stability hypothesis. Education and urbanization remained relatively fixed in the time period between studies. For example, the percent of Utah residents residing in urbanized counties (with more than 100,000 people) decreased only slightly from 78% to 76% (US Census Bureau, 1990, 2000).

Because previous research suggested hunters and rural residents may be more likely to perceive wolves as a threat and therefore have more negative attitudes (Ericsson and Heberlein, 2003; Williams et al., 2002), a second objective was to determine if attitude change occurred for three groups: urban residents, rural residents, and big game hunters. A final objective was to contribute to the development of solid methodology for measuring attitudes toward wolves that could be replicated over time. In reviewing the literature we discovered a lack of consistency across studies in the instruments used to measure attitudes toward wolves. This is unfortunate as it makes comparisons across studies less meaningful. Administering the same measurement instrument to the same population provided an opportunity to assess the factor structure and reliability of a multiple-item measurement instrument that could be adapted by other researchers and used in future studies.

2. Methods

We followed the data collection methods used by La Vine (1995) in order to maximize comparability with her results. The population of interest was defined as adult residents (18 years or older) of Utah, and the sampling frame consisted of private households with permanent mailing addresses. We obtained a random sample of Utah households from a private sampling firm, and data were collected via mail-back questionnaires administered during October–November 2003. The sample was disproportionately stratified into two regions, urban and rural, and 1000 households were selected from each region. We defined urban residents as those living in Davis, Salt Lake, Utah, or Weber counties, which accounted for roughly three quarters of Utah's population (US Census Bureau, 2000). Rural residents were those living in all other counties. We used the question, "have you hunted big game animals within the last 3 years" in order to identify big game hunters.

Each household received a letter explaining the study, accompanied by the questionnaire. Subsequent mailings included a postcard reminder sent 10 days after the initial mailing, and a second questionnaire sent three weeks after the initial mailing. Finally, a letter and postcard questionnaire were sent to all non-respondents in order to assess non-response bias.

2.1. *Measurement of attitudes toward wolves*

Ten items from the 1994 survey were used to assess Utah residents' attitudes toward wolves. All items were measured on an 11 point scale ranging from strongly disagree (0) to strongly agree (10), or (0) strongly dislike to (10) strongly like. The items included measures representing respondents' general beliefs about wolves, evaluative statements regarding the outcomes associated with the presence of wolves in Utah, as well as a single item asking respondents to directly indicate their attitudes toward wolves[1] (Table 1).

2.2. *Data analysis*

We conducted principle components analysis (PCA) using SPSS v.12 for Windows (2003) on 10 items from the 1994 survey believed to represent a respondent's attitude toward wolves. PCA allows researchers to explore relationships among survey response items and identify the number of latent variables (or factors) underlying the response items (DeVellis, 2003). Using the factor structure suggested by the PCA, we conducted confirmatory factor analysis (CFA) using LisRel v.8.71 for Windows (2004) on the same 10 items from the 2003 survey. In contrast to exploratory analyses such as PCA, CFA allows researchers to specify both the number of latent factors believed to underlie a set of items and which factors are associated with which items. The CFA allowed us to

[1] Strictly speaking, attitudes and beliefs are different types of cognitions. However, in using belief statements as indicators of attitudes toward wolves we draw upon more information and a long history of research that views beliefs as the immediate antecedents or determinants of attitudes (see Eagly and Chaiken, 1993; Ajzen and Fishbein, 1980 for further discussion).

Table 1 – Factor analyses and responses to individual item indicators in attitudes toward wolves scale[a]

Response item	1994[b]			2003[c]			t (two-tailed)
	n	Mean	Factor loading	*n*	Mean	Factor loading	
Wolves help maintain healthy populations of elk and deer	396	6.77	0.80	651	6.61	0.90	−0.883
Wolves compete with big game hunters for prime trophy animals[d]	389	3.89	0.56	646	3.23	0.81	−3.384**
Wolves are important members of the ecological world	396	7.49	0.81	649	7.37	0.95	−0.723
Utah is better off without wolves[d]	394	4.29	0.80	651	3.33	0.95	−4.402***
The wolf is a killing machine[d]	390	3.75	0.67	642	3.44	0.88	−1.578
I would like to see wolves in Utah	392	6.29	0.90	651	6.33	0.98	0.177
What best describes your attitude toward wolves	377	6.30	0.87	610	6.40	0.96	0.573
Wolves would reduce elk numbers to unacceptable levels within Utah[d]	389	3.93	0.82	649	3.62	0.89	−1.664
Putting wolves back into their former habitat will restore the balance to the deer populations in that area	393	4.94	0.79	649	5.54	0.88	3.203*
Wolves would be a significant predator on livestock in Utah[d]	391	5.27	0.81	651	5.44	0.89	0.87

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

a Cronbach's alpha for: 1994 scale = 0.93; 2003 scale = 0.94.

b Extraction method: principal components analysis.

c Fit statistics for CFA of 2003 data: chi-square to degrees of freedom ratio = 3.1/1; root mean square error of approximation = 0.07; comparative fit index = 0.99; adjusted goodness of fit index = 0.99; standardized root mean square residual = 0.13.

d Item was reverse-coded in final scale.

ensure the factor structure was consistent across studies. Cronbach's alpha was calculated for both the 1994 and 2003 attitude scales to assess internal consistency. Following these analyses, responses to the 10 items were averaged, and the resulting score used as an indicator of respondents' attitudes toward wolves. Finally, we used independent samples *t*-tests to determine if attitudes in 2003 differed from those measured in 1994.

3. Results

3.1. *Response rates*

Of the 2000 surveys mailed in 2003, 250 were undeliverable, and 17 contained too little data to be used and were treated as refusals. The adjusted response rate for our survey was 40.5%, slightly lower than the 50% obtained in 1994. The response rate for rural residents was slightly higher ($n = 373$, 43.1%) than for urban residents ($n = 334$, 37.7%), and may reflect a higher level of interest among rural residents, as evidenced by rural residents' greater likelihood to perceive the issue of wolf management as very important (rural = 33.3%, urban = 23.8%; respondents were asked "how important do you find the issue of wolf management in Utah" on a 5-point scale).

Overall, respondents to the 2003 survey were very similar to 1994 respondents on demographic measures. After weighting data from each survey by region (i.e., urban and rural) to reflect the actual population distributions of Utah residents at the time of the survey (i.e., 1994 or 2003), neither age, sex, nor education[2] differed significantly between 1994 and 2003 respondents. When compared with census data, however, respondents from both the 1994 and 2003 studies were more often male, tended to have higher levels of education, and were older. Given these findings, we weighted responses from both surveys to adjust for underrepresentation of females and younger age groups and overrepresentation of higher education levels. We obtained population estimates for weighting procedures from US Census data (US Census Bureau, 1990, 2000).

We received 110 postcard surveys allowing us to examine differences between respondents and non-respondents on key variables of interest. After applying Bonferroni's correction, there were no significant differences ($p > 0.025$) between respondents and non-respondents on either of the following variables: "what best describes your attitude toward wolves," and "Utah is better off without wolves." In addition, non-respondents did not differ significantly from respondents in terms of their hunting participation.

[2] While not the focus of this investigation, subsequent analyses indicated attitudes toward wolves in both studies were negatively associated ($p < 0.05$) with age ($r = -0.26$ in 1994, $r = -0.22$ in 2003) and gender (being male; $r = -0.17$ in 1994, $r = -0.11$ in 2003). The association between attitudes toward wolves and education ($r = 0.02$ in 1994, $r = 0.06$ in 2003) was not significant ($p > 0.05$).

3.2. Factor structure of respondent's attitudes toward wolves

PCA results from 1994 data suggested the retention of one factor that explained 62% of the variance (Table 1). Factor loadings were high (>0.5) for all items, and items displayed a high degree of internal consistency (alpha = 0.929; Nunnally and Bernstein, 1994). We imposed this single factor structure on the 2003 attitude items in a CFA. Forcing all 10 items to load on a single factor resulted in a significant chi-square, suggesting the model's covariance matrix may not be a good approximation of the observed matrix. However, large sample sizes (>500) can inflate chi-square values even when models fit well (Jöreskog and Sörbom, 1993). Other fit statistics assessed indicated a moderate to close fit to the imposed model, supporting the proposed one-factor structure (Table 1). More importantly, all items displayed significant ($p < 0.001$) factor loadings greater than 0.8 (Table 1), and Cronbach's alpha again indicated internal consistency was high (alpha = 0.941), suggesting these items reliably measured the same construct. Based on these analyses, all 10 items were averaged to create a single scale measuring respondents' attitudes toward wolves.

3.3. Attitudes toward wolves

Utah residents' mean attitude in 1994 (6.15) did not differ significantly from that measured in 2003 (6.30). Moreover, additional *t*-tests indicated mean attitude scores in 1994 did not differ significantly from 2003 scores for any of the three subgroups of interest (i.e., urban, rural, big game hunters; Table 2). In total, 74% of 2003 respondents displayed a positive attitude toward wolves (above the scale midpoint, 5), compared to 70% in 1994. Consistent with La Vine's (1995) findings, urban residents displayed the most positive attitudes toward wolves; 78% of urban respondents in 2003 scored above the midpoint on the response scale, compared to 74% in 1994. In contrast, the attitudes of rural residents and hunters were slightly more negative than urban residents. Still, more than half of rural residents (2003 = 62%; 1994 = 60%) scored above the midpoint, reflecting generally positive attitudes toward wolves. Roughly half of all big game hunters (2003 = 56%; 1994 = 47%) reported positive attitudes toward wolves.

While we demonstrated stability on the basis of the overall measure of attitudes toward wolves, slight differences were noted on individual statements comprising the measure (Table 1). After applying Bonferroni's correction for multiple comparisons, mean values for 3 of the 10 items differed significantly ($p < 0.005$) from those recorded in the 1994 survey. Specifically, 2003 respondents displayed higher levels of agreement with the item, (1) "putting wolves back into their former habitat will restore the balance to the deer populations in that area," and displayed lower levels of agreement for: (2) "wolves compete with big game hunters for prime trophy animals," and (3) "Utah is better off without wolves." However, we caution researchers against making conclusions on the basis of single-item indicators as there is no method for assessing the reliability of a single-item measure employed in a cross-sectional design (DeVellis, 2003). Additionally, the effect size, or strength of association between time (study year) and these individual items was minimal. As an illustration, the item with the greatest mean difference ("Utah is better off without wolves") differed by only 0.96 on an 11 point scale across the two studies. Correlating this indicator with a dummy-coded time variable revealed a point-biserial correlation of 0.135, indicating the effect of time was quite small (Cohen, 1988).

4. Discussion

Our results, based on a comparison of 1994 and 2003 data, indicate Utah residents' attitudes toward wolves did not change significantly over the past decade. This finding is consistent with Williams et al. (2002, p. 581), who suggested attitudes toward wolves in the US have remained relatively stable in recent decades and "positive changes in attitudes toward wolves came before social scientists began conducting scientific surveys." In addition, attitudes toward wolves were stable across specific population subgroups, including urban residents, rural residents, and big game hunters. Also consistent with previous studies, respondents to the 2003 survey generally expressed positive attitudes toward wolves. Though rural residents and big game hunters were less positive than urban residents, the majority of each of these groups indicated a positive view of wolves. Still, these differences have implications for the conservation of wolves, as hunters and rural residents may be more likely than other types of residents to actually interact with wolves, should a wolf population become established in Utah. If such interactions prove predominantly negative, opinion among hunters and rural residents could become more negative (Ericsson and Heberlein, 2003),

Table 2 – Comparison of Utah residents' attitudes toward wolves, 1994 and 2003[a]

Sample	1994				2003				Difference	
	n	Mean	95% Confidence interval		*n*	Mean	95% Confidence interval		Mean	*t*[c]
Attitudes toward wolves scale[a,b]										
Urban	270	6.40	6.13	6.66	445	6.51	6.31	6.72	0.11	0.68
Rural	78	5.29	4.70	5.87	138	5.61	5.15	6.06	0.32	0.85
Big game hunters	87	4.82	4.21	5.42	139	5.29	4.81	5.77	0.47	1.22
Combined	348	6.15	5.90	6.39	583	6.30	6.11	6.49	0.15	0.95

a Data were weighted for age, sex, education level, and sample (rural/urban).
b Attitudes ranged from 0 (negative) to 10 (positive).
c No values differed significantly at the $p < 0.05$ level.

which could lead to decreased support for wolf conservation strategies and possibly, outright opposition to wolves.

Although we caution researchers against making conclusions on the basis of single-item indicators, a closer look at the individual response items revealed 2 of the 3 items that differed between the 1994 and 2003 studies dealt with wolves' relationships with prey species. Specifically, 2003 respondents displayed slightly lower levels of agreement with the idea that wolves compete with big game hunters for trophy animals, and slightly higher levels of agreement with the idea that putting wolves into an area could help restore balance to deer populations. This trend could indicate Utah residents are coming to view the wolf less as a competitor, and more a natural part of the ecosystem. Interestingly, these changes occurred despite a severe winter kill in the early 1990s and prolonged drought that led to restrictions on mule deer permits and substantial decreases in mule deer harvests (C. McLaughlin, Utah Division of Wildlife Resources, personal communication; DeBloois, 2001).

Williams et al. (2002) suggest public sentiment regarding wolves is driven by broad social forces, including urbanization, education, and population replacement, that are unlikely to change overnight. An examination of a sample of these demographic trends in Utah (e.g., education, urbanization; US Census Bureau, 2000) suggests the factors previously identified as correlates of societal attitudes toward wolves might not be changing at a rate sufficient to have affected attitudes over the time elapsed between the two studies.[3]

The stable nature of attitudes in Utah may also reflect residents' lack of direct experience with wolves. Attitudes toward wolves could change if pet and livestock depredations increase or if big game populations decrease as dispersing wolves reoccupy Utah. Such negative interactions could influence public perception, resulting in decreases in positive attitudes and decreases in tolerance for the presence of wolves (Ericsson and Heberlein, 2003; Enck and Brown, 2002). Consequently, despite finding little evidence of change in Utah residents' attitudes toward wolves in this study, we caution managers against assuming attitudes will remain stable or that if change occurs it will only be toward more *positive* attitudes.

The unique cultural characteristics of Utah could also have played a role in the stability of attitudes witnessed in this study. Inglehart (1995) argued intergenerational value shift occurs as a result of increased levels of economic prosperity, making traditional religious values less widely accepted in advanced, industrialized societies. Yet, in Utah, which has relatively high levels of income and education (indicators of economic prosperity) compared with other states, religious influences remain strong. It is conceivable that the pervasiveness of The Church of Jesus Christ of Latter-day Saints (LDS; Mormon) religion and resulting religious homogeneity could be acting to reinforce a more traditional, conservative ideology that is reflected in positions on natural resource issues. However, further research is needed to examine how religion affects wildlife-related values and attitudes.

While our findings indicate relative stability in public attitudes toward wolves in Utah, it is important to consider the role contextual factors could play in shaping attitudes in the future. We suggest the stability we found is likely a function of (1) a relatively short time frame during which social forces that may affect societal attitudes toward wolves (e.g., education levels) have remained relatively stable, (2) Utah residents' lack of direct experience with wolves, and (3) Utah's unique cultural influences that may serve to reinforce public values and attitudes. With rapid changes in broad sociodemographic factors and/or residents' interactions with wolves, we might expect a shift in public attitudes in the future. Further, an influx of new residents with different values could affect public attitudes toward environmental issues, such as attitudes toward wolves.

5. Conclusions and implications

Results contribute to informing questions about the time frame and factors affecting changes in wildlife-related attitudes, and have important implications for wildlife managers and policy-makers. Specifically, our results indicate attitudes toward wolves in Utah are very positive. Nearly three quarters (74%) of Utah residents expressed a positive attitude toward wolves in 2003, which speaks well for wolf conservation in this region in the future. Moreover, the stability of attitudes witnessed in our study suggests these positive attitudes are likely to persist, at least in the absence of significant livestock losses or declines in big game populations. However, our results also suggest any proposal for wolf reintroduction could result in divisions among members of the public, as indicated by lower levels of support for wolves among certain subgroups (i.e., rural residents and hunters).

These results are particularly relevant at a time when the USFWS is attempting to remove wolves in the northern Rocky Mountains from endangered species protection. Findings suggest as wolves recolonize Utah, residents should generally be supportive of wolf recovery. However, positive attitudes could lead to less support for certain management practices, such as lethal controls (Bruskotter et al., unpublished data), which could significantly handicap managers' ability to deal with problem wolves and possibly result in greater conflicts surrounding wolf management.

Our research provides empirical evidence indicating, at least in the absence of wolves and over a roughly 10-year time frame, attitudes toward the predator remained stable. Social science information of this nature is critical to informing decisions where public opinion plays a major role, as with predator policy in the US. To illustrate, we offer an anecdote: while we collected data for this study the UDWR conducted a series of scoping meetings in order to involve Utah residents in the management process. They found 719 of 897 attendees (80%) identified "do not allow wolves in Utah" as one of their top 3 management priorities (Utah Division of Wildlife Resources Publication #:05-17). However, our survey, which used

[3] It is important to recognize that the focus of this examination is on societal-level change (i.e., the public at large) as opposed to attitude change within individuals. While shifts in societal thinking occur at a very slow pace (e.g., through intergenerational replacement), a person's attitudes are highly changeable, particularly if they are not strongly held or deeply embedded in the individual's cognitive structure (Eagly and Chaiken, 1993).

probabilistic sampling and weighted data to accurately reflect regional population distributions, found over half of respondents agreed with the item "I would like to see wolves in Utah." Moreover, results from the 1994 survey were statistically identical, suggesting public opinion on this issue has not wavered. The lesson is that managers often hear from their most vocal critics or those most involved in particular wildlife issues. It is easy to see how such experiences can color managers' perspectives, resulting in a skewed perception of public opinion. Most wildlife professionals would object to relying on guesswork for complex, biological decisions regarding species conservation. Yet, when managers rely on anecdotal evidence or convenience samples to gauge public opinion, guesswork will result. Similarly, the notion that attitudes toward wolves and other predators are changing seems reasonable given the apparent rise of interest groups advocating animal welfare, changes in public policy, and the prominence of such charismatic predators in the media. However, rather than making assumptions regarding the extent to which attitudes toward predators have changed, it is important to collect scientific information based upon established methodologies. In this way, social science provides researchers with a way of circumventing the guesswork; allowing for decisions based on sound biological principles *and* accurate perceptions of public opinion.

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REFERENCES

Ajzen, I., Fishbein, M., 1980. Understanding Attitudes and Predicting Social Behavior. Prentice Hall, Englewood Cliffs, NJ.

Bangs, E.E., Fritts, S.H., 1996. Reintroducing the gray wolf to central Idaho and Yellowstone National Park. Wildlife Society Bulletin 24, 402–413.

Bright, A.D., Manfredo, M.J., 1996. A conceptual model of attitudes toward natural resource issues: a case study of wolf reintroduction. Human Dimensions of Wildlife 1 (1), 1–21.

Carroll, C., Phillips, M.K., Schumaker, N.H., Smith, D.W., 2002. Impacts of landscape change on wolf restoration success: planning a reintroduction program based on static and dynamic spatial models. Conservation Biology 17 (2), 536–548.

Cohen, J., 1988. Statistical Power Analysis for the Behavioral Sciences, second ed. Lawrence Earlbaum Associates, Hillsdale.

DeBloois, D.L., 2001. Utah big game annual report 2001 (No. 01-30). Utah Division of Wildlife Resources, Salt Lake City, UT.

DeVellis, R.F., 2003. Scale Development: Theory and Applications, second ed. Sage, Thousand Oaks.

Di Silvestro, R.L., 1985. The federal animal damage control program. In: Di Silvestro, R.L. (Ed.), Audubon Wildlife Report. National Audubon Society, New York, pp. 130–158.

Duda, M.D., Bissell, S.J., Young, K.C., 1998. Wildlife and the American Mind. Responsive Management Unit, Harrisonburg.

Eagly, A.H., Chaiken, S., 1993. The Psychology of Attitudes. Wadsworth, Belmont.

Enck, J.W., Brown, T.L., 2002. New Yorkers' attitudes toward restoring wolves to the Adirondack Park. Wildlife Society Bulletin 30, 16–28.

Ericsson, G., Heberlein, T.A., 2003. Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back. Biological Conservation 111, 149–159.

Feldman, J.W., 1996. The politics of predator control, 1964–1985. Thesis, Utah State University, Logan.

Inglehart, R., 1995. Public support for environmental protection: objective problems and subjective values in 43 societies. Political Science and Politics 28, 57–72.

Jones, K., 2003. Never cry wolf: science, sentiment, and the literary rehabilitation of *Canis lupus*. Canadian Historical Review 84 (1), 64–94.

Jöreskog, K.G., Sörbom, D., 1993. Lisrel 8: Structural Equation Modeling with the Simplis Command Language. Scientific Software International, Lincolnwood.

Kellert, S.R., 1999. The public and the wolf in Minnesota, 1999. A report for the International Wolf Center, Ely.

Kellert, S.R., Westervelt, M.O., 1982. Historical trends in American animal use and perception. In: Proceedings of the North American Wildlife and Natural Resources Conference.

Kellert, S.R., Black, M., Rush, C.R., Bath, A.J., 1996. Human culture and large carnivore conservation in North America. Conservation Biology 10, 977–990.

La Vine, K.P., 1995. The attitudes of Utah residents toward gray wolves. Thesis, Utah State University, Logan.

LisRel for Windows, Rel. 8.71, 2004. Scientific Software International Inc., Lincolnwood.

Manfredo, M.J., Teel, T.L., Bright, A.D., 2003. Why are public values toward wildlife changing? Human Dimensions of Wildlife 8, 287–306.

Manfredo, M.J., Zinn, H.C., 1996. Population change and its implications for wildlife management in the new West: a case study of Colorado. Human Dimensions of Wildlife 1 (3), 62–74.

Mech, L.D., 1970. The Wolf: The Ecology and Behavior of an Endangered Species. University of Minnesota Press, Minneapolis.

Mech, L.D., 1995. The challenge and opportunity of recovering wolf populations. Conservation Biology 9 (2), 270–278.

Messmer, T.A., Reiter, D., West, B.C., 2001. Enhancing wildlife sciences' linkage to public policy: lessons from the predator-control pendulum. Wildlife Society Bulletin 29, 1253–1259.

Mowat, F., 1963. Never Cry Wolf. Dell Publishing Company, New York.

Musiani, M., Paquet, P.C., 2004. The practices of wolf persecution, protection, and restoration in Canada and the United States. Bioscience 54 (1), 50–61.

Nunnally, J.C., Bernstein, I.H., 1994. Psychometric Theory, third ed. McGraw-Hill, New York.

SPSS for Windows, Rel. 12.0.0, 2003. SPSS Inc., Chicago.

Switalski, T.A., Simmons, T., Duncan, S.L., Chavez, A.S., Schmidt, R.H., 2002. Wolves in Utah: An Analysis of Potential Impacts and Recommendations for Management. Natural Resources and Environmental Issues 10, 1–54.

Treves, A., Karanth, K.U., 2003. Human-carnivore conflict and perspectives on carnivore management worldwide. Conservation Biology 17 (6), 1491–1499.

US Census Bureau, 1990. Census 1990, Summary File 1, generated by American FactFinder. <http://factfinder.census.gov> (14 February 2006).

US Census Bureau, 2000. Census 2000, Summary File 1, generated by American FactFinder. <http://factfinder.census.gov> (14 February 2006).

US Fish and Wildlife Service, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife & Parks, Idaho Fish and Game, and USDA Wildlife Services, 2006. In: Sime, C.A., Bangs, E.E., (Eds.), Rocky Mountain Wolf Recovery 2005 Annual Report. Ecological Services, Helena.

US Fish and Wildlife Service, 2007. Proposed rule designating the northern Rocky Mountain population of gray wolf as a distinct population segment and removing this distinct population segment from the federal list of endangered and threatened species, 50 CFR, part 17, pp. 6106–6139.

Utah Division of Wildlife Resources Publication #:05-17. 2005. Utah Wolf Management Plan. Salt Lake City, UT.

Williams, C.K., Ericsson, G., Heberlein, T.A., 2002. A quantitative summary of attitudes toward wolves and their reintroduction (1972–2000). Wildlife Society Bulletin 30, 575–584.

Wilson, M.A., 1997. The wolf in Yellowstone: science, symbol, or politics? Deconstructing the conflict between environmentalism and wise use. Society & Natural Resources 10, 453–468.