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Attitudes toward predator control in the United States: 1995 and 2014

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Predator control policies in the United States shifted in the latter half of the 20th century, largely in response to public outcry. However, few studies have assessed attitudes toward predator control at the national level. We replicated measures from a 1995 study that assessed attitudes toward predator management in the United States. We sought to determine if public support for predator management and perceptions of the humaneness of specific management practices changed over the past 2 decades. A web-based questionnaire was used to survey a representative sample of United States residents. The survey instrument contained items designed to assess attitudes toward predator management in general and the humaneness of specific predator management practices (lethal and nonlethal). We found relatively minor shifts in attitudes toward predator management, but many of the management practices assessed were rated significantly less humane than in the previous survey. Respondents were generally supportive of predator management aimed at losses of agricultural or private property; however, nonlethal methods were perceived to be far more humane than lethal methods. Our findings suggest that the public is generally supportive of predator control, but increasingly skeptical of the methods employed in control actions.

Key words: attitudes, damage management, policy, predator control, public opinion, wildlife management

The United States government first institutionalized predator control in 1915, when Congress appropriated funding for the eradication of predators (Feldman 2007); however, state and local governments had been offering bounties for predators since before the United States was formed (Mech and Boitani 2003). Members of the American Society of Mammalogists were among the 1st organized scientists to question the legitimacy of federal eradication programs and have continued to criticize predator management for over-reliance on lethal methods of controlling nuisance wildlife and negative impacts on nontarget species (Robinson 2005; Bergstrom et al. 2014). Notwithstanding efforts of the American Society of Mammalogists, the combined effect of state and federal interventions (i.e., state bounties, federal predator control, use of poisons) were so effective in eradicating predators that by the time Congress passed the National Animal Damage Control Act (in 1931), large carnivores had been mostly eradicated east of the Mississippi River (Young 1944; Mattson and Merrill 2002; McCollough 2011).

Despite successful eradication of large carnivores throughout much of the conterminous United States, federal funding for predator control actually increased between 1930 and 1950 (Feldman 2007), and with the demise of wolves (*Canis lupus*), the focus of efforts shifted to eliminating coyotes (*Canis latrans*). However, protests against predator control increased during the 1950s and 1960s (Feldman 2007), prompting then United States Secretary of the Interior, Stewart Udall, to call for a review of the predator control program and recommend changes. Five prominent wildlife biologists, led by A. Starker Leopold, were appointed to the task. Their 1964 committee report (commonly known as "The Leopold Report"—Leopold et al. 1964) "lambasted the existing federal control program" and offered a series of recommendations for improvement, including a reassessment of program goals, increased focus on research, and nonlethal methods of control (Feldman 2007:117). The lethal control of predators continues to be a lightning rod today, igniting controversy regarding the government's role

in managing livestock depredations (Bergstrom, this issue; Robinson 2005; Knudson 2012).

Public Opinion and Policy on Predators and Predator Control

Public perception of predators appears to have undergone a dramatic shift at some point in the latter half of the 20th century (Kellert et al. 1996). Where predators were once demonized and intentionally eradicated—even by conservationists (Lopez 1978; Feldman 2007)—early research during the 1930s and 1940s began to challenge long-held myths about predators (Murie 1940, 1944), ultimately prompting a variety of changes in federal policy (Feldman 2007). The Leopold Report (1964) followed closely on the heels of Rachel Carson's *Silent Spring* (1962) and Farley Mowat and Sim's *Never Cry Wolf* (1963), and itself was followed by Barry Commoner's *Science and Survival* (1966)—publications that were widely read by environmental activists whose advocacy would provoke a sea change in public policy (Kline 2000), including the passage of the 1st federal legislation designed to protect endangered species—the Endangered Species Preservation Act of 1966 (Enzler and Bruskotter 2009).

Yet even as policies changed, little was known about how the general public viewed predatory wildlife or predator control activities. Subsequent studies of attitudes toward predatory species that began in the late 1970s revealed that public attitudes toward predators were largely mixed and much less positive than for common domestic species (Kellert 1985a,b; Kellert et al. 1996). Even less is known about attitudes toward predator control. Existing research indicates that nonlethal methods of predator control are generally favored over lethal methods (Arthur 1981; Reiter et al. 1999; Bruskotter et al. 2009), though lethal methods—including regulated public hunting—tend to be viewed as acceptable under certain conditions (Messmer et al. 1999; Treves and Naughton-Treves 2005; Decker et al. 2006; Treves and Martin 2011). Research also indicates that foot- or leghold traps, neck snares, shooting animals from aircraft, foot snares, and poisons are viewed by the majority of the American public as inhumane, while the use of nonlethal control methods such as guard animals, scare devices, and fertility control are viewed as very humane (Reiter et al. 1999).

Subsequent research indicated attitudes toward lethal predator control are related to more basic value orientations (Zinn et al. 1998; Whittaker et al. 2006). Endorsement of a "protectionist" orientation is associated with less support for lethal control, while endorsement of a "use" or "utilitarian" orientation is associated with greater support for lethal measures. Research also revealed the importance of context for understanding people's attitudes toward lethal control of wildlife (Naughton-Treves and Treves 2005; Treves and Naughton-Treves 2005; Decker et al. 2006; Don Carlos et al. 2009; Treves and Martin 2011). For example, Alaskans' support for lethal management of wolves and grizzly bears ranged from 30% to 64% depending upon the hypothetical impact of these predatory species on ungulate game populations—as the impact to valued game increased, so did support for lethal management (Decker et al. 2006). Similarly, another study found predator control was more acceptable when justified as a method of enhancing recruitment of other species (Messmer et al. 1999). Some research suggests that public support for lethal management is greater when the animals being controlled damage private property, as opposed to other wildlife populations; for example, Bruskotter and Schmidt (pers. obs.) found that whereas 41% of Utah residents supported the use of lethal management of wolves if wolf populations negatively affected other big game populations, 75% supported lethal management in cases where wolves prey upon livestock. Still other research implicates a variety of additional contextual factors that affect approval for lethal control, including the relative abundance of the animal(s) being targeted, their appearance, and their reproductive and health status (Naughton-Treves and Treves 2005; Treves and Naughton-Treves 2005).

In a recent review of the literature, Way and Bruskotter (2012) concluded that most people will support lethal management of predators if "it is undertaken to address what they perceive to be legitimate impacts" (Way and Bruskotter 2012:456). However, their generalization was tentative, as nearly all of the existing research focuses on the management of single species in specific geographic locations (usually, within states). Variation in the species studied, study sites, methods, and questions employed confound comparison of such studies. The only national data on the subject of predator control were collected in 1976 (Arthur 1981), 1995 (Reiter et al. 1999), and 1996 (Messmer et al. 2001). Thus, little is known regarding how United States residents view predator control today, and, perhaps more importantly, if attitudes toward predator management have changed. The purpose of this study is, first, to quantify Americans' views on predator control, next, to quantify the extent to which specific damage management practices are viewed as humane, and finally, to determine if Americans' views regarding predator control have changed since 1995.

Materials and Methods

Sampling and data collection.—We collected responses from KnowledgePanel, a representative online panel of residents of the United States that is maintained by the GfK Group, a private research firm (hereafter, GfK; formerly Knowledge Networks, www.knowledgenetworks.com/ganp/, date last accessed 11 October 2015). GfK's online panel is randomly selected and maintained using both random digit dialing and address-based sampling methods identical to those employed in traditional mail survey and phone surveys (Dillman 2007). If households agree to participate in the panel but do not have access to the Internet or a computer, Internet access and a computer are provided by GfK. All members within households who agree to participate with KnowledgePanel are placed into a pool of potential respondents (the panel), and GfK uses demographic data from the United States Census Bureau to weight the data in order to account for any selection bias. Additionally, GfK applies a weight accounting for the number of times a

participant has previously been selected, and after all weights are accounted for, a sample is drawn. Only 1 member per household can be selected. Panel members that are randomly selected to this sample are then recruited to participate via email or on the recruit's member webpage. A more detailed description of the creations of the KnowledgePanel is given in Berrens et al. (2003) and GfK (2013). With appropriate sociodemographic controls, previous research found this method of sample generation to be nearly identical to data generated by robust telephone surveys (Berrens et al. 2003) and generally result in less social desirability bias than telephone surveys (Chang and Krosnick 2009). Self-administered internet surveys are also generally similar to self-administered mail surveys—both lack the intermediary required to record responses in a telephone survey (Couper 2011). The prior studies by Arthur (1981) and Reiter et al (1999) were a randomly selected telephone survey and mail survey, respectively.

The Ohio State University's Office of Responsible Research Practices reviewed and approved the methods used in this research (protocol number 2013E0553). We administered the questionnaire using Qualtrics, an online survey software package (available from http://www.qualtrics.com, Qualtrics, Provo, Utah). We pretested the survey instrument using a small subsample of United States residents from GfK's online panel on 21–23 January 2014 to gauge time to completion and functionality errors. After trimming the survey for time and fixing any errors, we sent a recruitment email to the entire study sample on 7 February 2014, explaining the purpose of the study, and included a web link to the questionnaire. The web link remained active to respondents for 11 days. Those who did not complete the survey after 3 days were sent an email reminder asking them to participate in the research. If email reminders did not generate a response, GfK placed an automated telephone call asking panel participants to take the survey. GfK tracked sample members who responded and those who did not respond. Respondents who completed the survey were given points which could be applied toward cash, goods, or services unrelated to survey objectives as an incentive to take and complete the survey. These points are accrued over time and typically result in no more than $4–$6 per month worth of remuneration for their participation. This low-level reward, while helpful for recruiting participants, is not expected to place undue influence on survey responses, particularly given that it is unrelated to survey objectives.

The research firm, GfK, contacted 2,020 potential respondents to complete the survey, resulting in 1,287 completed surveys (Northern Rocky Mountains, n = 406; Western Great Lakes, n = 451; and the remaining areas of the contiguous United States, n = 430) for a response rate of 63.7%. Post hoc weights for the sample were created based on benchmarks from the 2009–2011 American Community Survey conducted by the United States Census Bureau (www.census.gov/acs/, date last accessed 10 December 2014) and were applied to the overall sample in all subsequent analyses in order to ensure accurate representation of the American public. For a full methodological description of weighting social data, see Vaske (2008). Specifically to this project, GfK developed post hoc weights to adjust data for national representation on 7 demographic variables: respondent age, race and/or ethnicity, level of education, household income, census region, metropolitan area residence, and whether or not respondent had household access to the Internet. Respondent demographics closely approximate nationally available demographic data (Table 1). Although direct comparisons with 1995 sociodemographic data are not always possible due to differences in measurement, for purposes of clarity, we discuss approximate comparisons and their differing measures in the results section.

Data analysis.—Whereas Reiter et al. (1999) stratified their sample by management regions of the United States Department of Agriculture Wildlife Services, our primary objective was to quantify support for recovery and management of gray wolves which required a different sampling scheme. We stratified our sample into 3 regions: 2 based on gray wolf distinct population segments defined by the United States Fish and Wildlife Service, consisting of the Northern Rocky Mountains and the Western Great Lakes, and a 3rd region made up of the remaining areas of the United States. Reiter et al. (1999) did not weight their analyses for representativeness of the United States population, and given the sampling scheme, certain regions are likely overrepresented in their results. For the present analysis, responses from all regional strata were combined and weighted post hoc to be representative of the general United States population; indeed the aim of Reiter et al. was "to obtain results reflective of the entire population of the United States…" (Reiter et al. 1999:748).

To assess public attitudes toward predator control and management practices, we replicated several survey response items used by Reiter et al. (1999) and Arthur (1981). We asked respondents to indicate their level of agreement (ranging from strongly disagree to strongly agree) with statements concerning the acceptability of predator control and wildlife damage management (Table 2). To reduce response burden (or the time and effort required for a person to respond to the survey), we randomly assigned respondents to respond to 5 of the 8 statements replicated. We followed Reiter et al. (1999) and Arthur (1981) when assessing the humaneness of predator management practices (see Table 3 for individual measures). Specifically, we asked respondents to rate the humaneness of 4 nonlethal and 5 lethal practices used to manage wildlife damage. To reduce response burden, we randomly assigned respondents to 6 of 9 management practices.

Typically, social scientists treat data measured on uni- and bipolar response scales as continuous and perform parametric tests on the data (Gardner 1975; Borgatta and Bohrnstedt 1980); however, in the interest of the readership of this journal, we include both the appropriate parametric (Student's t-test) and nonparametric (Mann–Whitney U-test) tests for both the agreement scales and the humaneness scales. We applied a Sidak–Bonferroni correction to each set of scales to account for multiple statistical tests and reduce the likelihood of type I error while preserving power (Keppel and Wickens 2004): for statements on wildlife management Sidak–Bonferroni

adjusted P-value (n = 8, P = 0.05), significant at $P < 0.007$, and humaneness ratings Sidak–Bonferroni adjusted P-value (n = 9, P = 0.05), significant at $P < 0.006$. We made direct statistical comparisons of our 2014 survey only with the 1995 data because of differences in measurement between our survey and both the 1976 (Arthur 1981) and 1996 (Messmer et al. 1999) surveys. Finally, we report effect sizes as Cohen's d for any significant differences between 1995 and 2014. Effect size can give a sense of "real world" significance, particularly in cases where large samples sizes might inflate statistical significance despite small observed differences in the data (Vaske et al. 2002). We followed Vaske's (2008) guidance for interpreting effect sizes. "Minimal" (d ~ 0.2) means the difference is small, and not very meaningful; "typical" (d ~ 0.5) indicates a commonly found difference or relationship; "substantial" (d ~ 0.8) is indicative of a relatively strong relationship. All statistical tests were performed in Microsoft Office Excel 2010.

Table 1.—Social and demographic characteristics of respondents to survey on predator control and comparison to characteristics of the population of the United States. Characteristics are weighted, as described in text.

Variable	Percentage or mean	
	2014 survey	National data[a,b]
Age[a]		
18–29	21.5%	22.1%
30–44	26.0%	26.0%
45–59	27.5%	27.5%
60+	24.9%	24.4%
Gender (% female)[a]	50.9%	50.8%
Bachelor's degree or higher[a]	26.0%	28.5%
Household income (% under $50,000)[a]	44.0%	47.0%
Household size[a]	2.7 people	2.6 people
Political ideology[b]		
Conservative	46%	38%
Moderate	32%	34%
Liberal	22%	23%
Experienced wildlife damage in past 5 years	13%	Not available
Hunted (at any time in the past)	37%	Not available
Hunted big game (in the past 3 years)	9%	Not available

[a] United States Census Bureau, 2008–2012 American Community Survey 5-Year Estimates.
[b] Gallup Politics, Liberal Self-Identification Edges Up to New High in 2013 (Gallup 2014, see http://www.gallup.com/poll/166787/liberal-self-identification-edges-new-high-2013.aspx, date last accessed 11 October 2015).

Results

Sociodemographic comparisons between the 1995 sample and our weighted (2014) sample indicate more male respondents in 1995 (68% compared to 48%), more retired respondents in 1995 (25% compared to 18%), and more educated respondents in 1995 (45% completed "college or higher" compared to 26% completed "bachelors or higher"). Comparisons also revealed more respondents experienced perceived wildlife damage in 1995 (24% compared to 13%). Respondents at both time points were on average similar in age (51 years old compared to 46 years old). In 1995, respondents were asked to characterize their current and childhood area of residence in terms of population size. Approximately 60% of their respondents

Table 2.—Agreement of survey respondents on a scale of 1 ("strongly disagree") to 5 ("strongly agree) with statements about the control of wildlife for surveys conducted in 1995 and 2014, and comparisons between responses in the 2 surveys. Significant differences are indicated by asterisks.

Survey item	Survey year	n	U-test ($d.f.$ = 1)			t-test				
			Median	U	P[a]	Mean	SD	t	$d.f.$	P[a]
It is acceptable to remove predators that prey on livestock										
	1995	594	4	216,002.8	0.966	3.68	1.19	0.85	1,386	0.394
	2014	794	4			3.73	1.05			
It is acceptable to use small and big game hunting as a tool to control wildlife that do crop damage										
	1995	600	4	230,044.7	0.286	3.61	1.29	–0.09	1,415	0.925
	2014	817	4			3.6	1.13			
Wildlife control is acceptable if there is evidence that wildlife damage is the cause of economic loss										
	1995	606	4	233,125.9	0.84	3.46	1.13	0.62	1,421	0.533
	2014	817	4			3.49	1.01			
It is unacceptable to remove native predators that prey on threatened and endangered species										
	1995	606	3	219,732.3	0.107	2.91	1.27	1.74	1,376	0.082
	2014	772	3			3.01	1.09			
Predator control is unacceptable										
	1995	606	2	218,664.1	0.051	2.41	1.22	1.14	1,371	0.256
	2014	767	2			2.47	1.02			
Wildlife populations should not be managed by humans										
	1995	600	2	202,334.4*	< 0.001	2.37	1.25	4.34*	1,316	< 0.001
	2014	718	3			2.63	1.10			
The careful use of poisons is an acceptable method to control wildlife populations										
	1995	600	2	223,023.3	0.998	2.19	1.31	–0.5	1,386	0.618
	2014	788	2			2.16	1.20			
Farmers have the right to control wildlife that are damaging their crops										
	1995	600	4	216,433.6	0.169	3.64	1.21	2.81*	1,384	0.005
	2014	909	4			3.8	0.95			

[a] Sidak–Bonferroni adjustment indicates that differences are statistically significant at $P < 0.007$.

Table 3.—Respondent humaneness ratings of wildlife damage management practices from surveys administered in 1995 and 2014 on a scale of 1 ("Not at all humane") to 5 ("Very humane"), and comparisons between responses in the 2 surveys. Significant differences are indicated by asterisks.

Management practice	Survey year	*n*	*U*-test (*d.f.* = 1)			*t*-test				
			Median	*U*	*P*[a]	Mean	*SD*	*t*	*d.f.*	*P*[a]
Fertility control										
	1995	600	4	210,522.3*	< 0.001	4	1.18	10.75*	1,394	< 0.001
	2014	870	4			3.36	1.37			
Guard animals (e.g., dogs; nonlethal)										
	1995	600	4	224,003.9*	< 0.001	3.67	1.23	6.04*	1,350	< 0.001
	2014	794	3			3.3	1.36			
Chemical repellents										
	1995	600	4	240,805.9*	< 0.001	3.66	1.34	13.55*	1,315	< 0.001
	2014	853	3			2.82	1.38			
Scare devices										
	1995	600	4	227,335.7*	< 0.001	4.03	1.18	9.33*	1,357	< 0.001
	2014	805	4			3.47	1.32			
Poisons for predators										
	1995	594	2	240,493.6*	< 0.001	2.27	1.34	8.43*	1,136	< 0.001
	2014	856	1			1.77	1.12			
Leghold traps										
	1995	606	1	251,119.2*	0.002	1.73	1.14	2.57	1,227	0.01
	2014	872	1			1.59	1.10			
Fumigation or gassing of dens										
	1995	600	1.5	253,363.6*	< 0.001	2.1	1.37	7.16*	1,049	< 0.001
	2014	892	1			1.68	1.04			
Neck snares										
	1995	600	1	259,180.2	0.135	1.72	1.13	1.27	1,214	0.204
	2014	909	1			1.65	1.05			
Shooting animals from aircraft										
	1995	594	1	239,979	0.066	1.89	1.27	–0.53	1,163	0.596
	2014	855	1			1.92	1.11			

[a] Sidak–Bonferroni adjustment indicates that differences are statistically significant at $P < 0.006$.

reported that at the time of the survey, they lived in either a city of up to 200,000 people, a large metropolitan area of more than 200,000, or a suburb of a city or metropolitan area. We did not ask our respondents in 2014 about the perceived population of their childhood or current residence; however, 84% of our respondents reside in a metropolitan statistical area. The metropolitan statistical area is a standard delineation used by the Office of Management and Budget to indicate places of high population densities and their surrounding areas with strong economic ties (United States Office of Management and Budget 2010). The metropolitan statistical area is an imprecise measure of rurality, as rural communities can be included in the metropolitan statistical area if the residents tend to commute to the more populated city for work. Nevertheless, the metropolitan statistical area provides a gross measure of rurality and a standard for reporting. It is possible that our 2014 sample is more urban than the 1995 sample, but the differences in measurement (metropolitan statistical area in 2014 compared to the perceived size of town or city in 1995) prevent direct comparison. Additionally, in 1995, respondents were asked about their broader interests in wildlife-related activities. Approximately 51% of respondents indicated that they "did not enjoy hunting." In 2014, respondents were similarly asked if they had hunted at any time in their lives, and 63% responded they had never hunted. Again, while this is not a direct comparison, it would seem that the 1995 sample may have had a higher number of hunters among their respondents.

Overall, there was little to no change in agreement with statements about the appropriateness of wildlife management over the 19-year period (Table 2). Of the 8 items replicated, only 2 items exhibited an increase in agreement: "Wildlife populations should not be managed by humans" and "Farmers have the right to control wildlife that are damaging their crops." The size of the effect for both items ($d = 0.23$ and 0.15, respectively) indicates that the extent of change was minimal (Cohen 1988; Vaske 2008).

In contrast to these general statements about the appropriateness of wildlife damage management, responses to the items designed to assess the humaneness of predator management practices indicated that most practices were deemed significantly less humane in 2014 than in 1995 (Table 3). The few exceptions were practices that were already rated very low on humaneness in 1995 (i.e., shooting animals from aircraft [no significant differences in ratings according to either the Mann–Whitney *U*-test or *t*-test], neck snares [no difference according to either test], and leghold traps [no difference according to *t*-test]). Effect sizes for items that differed significantly ranged from $d = 0.13$ (leghold traps) to $d = 0.62$ (chemical repellants); and 4 of the 9 exhibited effect sizes with $d > 0.4$, indicating a "typical" relationship (Cohen 1988; Vaske 2008).

Discussion

The similarity of social and demographic characteristics of 2014 respondents relative to national benchmarks (Table 1), as well as the high response rate, provides confidence that our results reflect the American adult population. This conclusion is further supported by research indicating that probability-based Internet samples provide results that are more accurate than nonprobability samples and that are comparable with other forms of survey data collection (Yeager et al. 2011). The extent to which the 1995 data reflected the national population is questionable, something Reiter et al. (1999:749) specifically acknowledge. Compared to our 2014 sample, the 1995 sample included more males, more educated respondents, more retirees, more people having experienced wildlife damage, and likely more hunters. It is also possible a greater proportion of the 1995 sample lived in rural areas, though due to differences in methods used to assess place of residence this cannot be stated for certain. In light of these differences, it is remarkable that so few of the statements designed to assess the acceptability of damage management differed significantly (Fig. 1). The extent to which demographic differences in the sample account for the change in humaneness ratings is uncertain and is discussed in greater detail below. In any case, the present study provides a reliable baseline for any future work hoping to track longitudinal changes in attitudes toward predator management.

Our data suggest that United Sates residents are both aspirational and pragmatic when it comes to the management of mammalian carnivores and other wildlife. We found no differences over the past 2 decades in public support for predator control to mitigate agricultural and economic damages. Specifically, respondents in 1995 and 2014 reported statistically identical responses to the items, "It is acceptable to remove predators that prey on livestock," "It is acceptable to use small and big game hunting as a tool to control wildlife that do crop damage," and "Wildlife control is acceptable if there is evidence that wildlife damage is the cause of economic loss." More than one-half of respondents agreed with these items in 1995 and in 2014; in contrast, only 11% of the 2014 sample opposed predator control unconditionally by agreeing with the statement, "Predator control is unacceptable." In addition, significantly more respondents in 2014 agreed with the statement, "Farmers have the right to control wildlife that are damaging their crops." These data show relatively unambiguous public support for managing wildlife that damage private property, including predators, and echo findings from 1996 study that show relatively strong support for predator management (Messmer et al. 1999).

The support for predator control represents a pragmatic side of the public; there is general agreement that wildlife causing damage to livestock or crops, or causing economic loss generally, may be subjected to actions designed to prevent or eliminate the problem. Currently, support for predator control is substantial despite the fact that only a small percentage of respondents reported experiencing wildlife damage in the past 5 years (13%), and only a little more than one-third (37%) reported having ever hunted (Table 1). These data support the conclusions of Treves and Martin (2011) and Way and Bruskotter (2012) who contend that individuals will generally support lethal management of predators if such actions are undertaken to address what individuals perceive as legitimate impacts (see also Naughton-Treves et al. 2003; Treves et al. 2009).

The aspirational aspect of the public's response is reflected not in whether wildlife damage should be managed, but rather in which management tools are considered permissible. All of the techniques noted in the survey have been used with large and medium-bodied, mammalian carnivores (Knowlton et al. 1999). However, though hunting is deemed a humane tool for controlling wildlife causing crop damage, toxicants or poisons

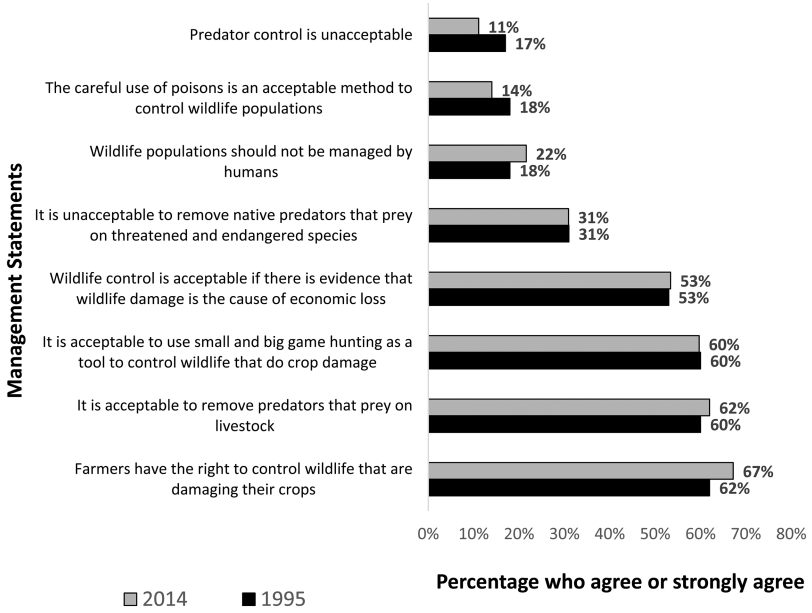

Fig. 1.—Percentage of respondents who "Agree" or "Strongly agree" with statements about the control of wildlife in a 1995 survey and a 2014 survey.

are not (Table 3; Fig. 2). Because both hunting and the use of toxicants result in the same outcome (i.e., dead animals), the acceptability of lethal control (killing) appears technique dependent. Importantly, across all measures, respondents unfailingly rated nonlethal techniques as more humane than lethal techniques (Table 3; Fig. 2). This finding is consistent with prior literature, which shows a relatively strong preference for nonlethal over lethal forms of predator management (Arthur 1981; Bruskotter et al. 2009; Way and Bruskotter 2012).

Responses to items used to assess the perceived humaneness of predator control show that techniques were generally rated as less humane in 2014 than in 1995, with differences observed for all techniques except for shooting animals from aircraft. Decreased humaneness ratings could be related to the idea that the public may be increasingly skeptical about the techniques used to manage wildlife that cause agricultural or economic damage. Coupling these changes with those observed on the broader measures of acceptability suggest growing distrust with the institution of wildlife management generally. Although people in 2014 were more supportive than people in 1995 of the notion that farmers "have the right" to take action to control nuisance wildlife, at the same time there was less support for wildlife management on the whole—nearly a quarter (22%) agreed that wildlife should not be managed at all. The observed decline could represent skepticism with the institution of wildlife management or simply reflect the broader decline in trust in government witnessed in recent decades (Dalton 2005). Opposition to wildlife management generally could also reflect changes in wildlife-related values that emphasize caring and stewardship over domination and control (Manfredo et al. 2003, 2009).

Alternatively, the overall drop in humaneness ratings from 1995 to 2014 could relate to the sociodemographic differences between the 2 surveys. Indeed, prior studies show that women tend to be less supportive of lethal control (Dougherty et al. 2003; Agee and Miller 2009), whereas participation in hunting (Naughton-Treves et al. 2003; Bruskotter et al. 2009) and rural residency are associated with greater acceptance of lethal control (Sijtsma et al. 2012). Though the 2 measures (support for lethal control and perceived humaneness) should not be confused, we anticipate that to some degree, people's support for wildlife control methods is likely predicated on the perceived humaneness of management actions. Indeed, Arthur (1981) found that when respondents are forced to tradeoff between the specificity of the control technique, its cost, and its perceived humaneness, they indicated that humaneness was most important factor in choosing an appropriate coyote control method. Consequently, we anticipate control techniques to be rated more humanely by a sample with greater proportions of male respondents, hunters, and (likely) rural residents (those groups that made up a greater proportion of the 1995 sample). What is curious, however, is that while humaneness scores exhibited substantial shifts from 1995 to 2014, general support for predator control remained relatively consistent.

Even as far back as 1976, leghold traps and aerial gunning were ranked very low in terms of acceptability, and trapping in general was perceived to cause relatively more suffering than any other method of lethal control listed in a national survey (Arthur 1981). Such skepticism could pose problems for governance of wildlife in the future. For example, increasing distrust in wildlife management could lead to rejection of the authority of decision-making bodies (i.e., state boards and commissions) and an increase in the use of direct democracy (e.g., ballot measures—Minnis 1998). A deeper concern may arise when considering the large (and mostly unaccounted for) impact of poaching on wolf populations (Treves et al., this issue). Should a better accounting of poaching reveal a great number of illegal but protective actions, wildlife management bodies may find public support for the easing of regulations surrounding carnivore take.

Manfredo et al. (2003, 2009) suggested that the ways in which Americans value wildlife are shifting away from "utilitarian"

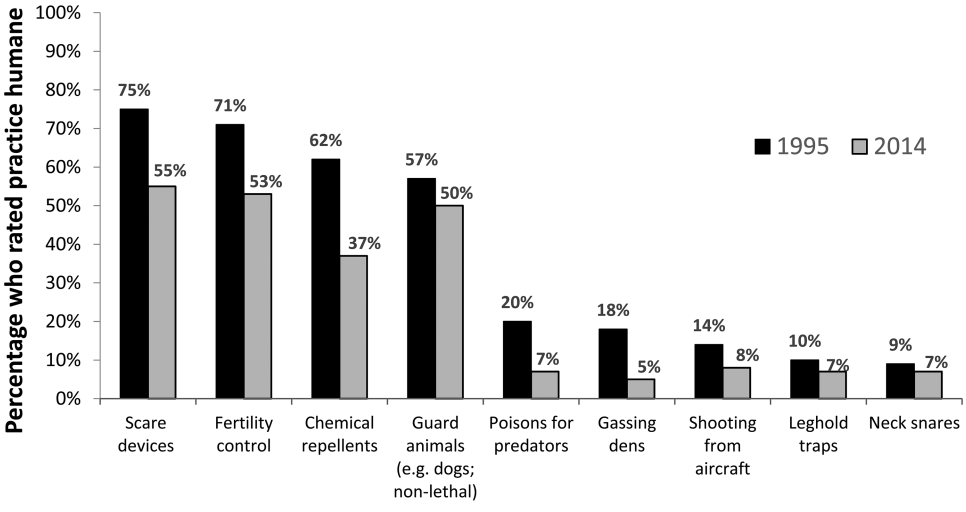

Fig. 2.—Humaneness ratings of wildlife damage management practices, as indicated by percentage of respondents who indicated "very" (4) or "completely" (5) humane, in surveys administered in 1995 and 2014.

(or use) orientations toward "mutualistic" orientations, where wildlife are viewed "as part of an extended family, and deserving of caring and compassion" (Manfredo et al. 2009:412). Although our data are silent on value change, Manfredo's work provides a potential mechanism for explaining why our 2014 respondents consistently rated various wildlife control methods as less humane than 1995 respondents. If social forces indeed have fundamentally changed the way in which people value wildlife (Manfredo et al. 2003, 2009), then we should expect changing values to reflect social change such as urban populations growing faster than overall growth in the United States (12.1% compared to 9.7% from 2000 to 2010—United States Census Bureau 2014). Thus, we should expect changing values of wildlife to be subsequently reflected in attitudes toward wildlife species and specific wildlife management policies and techniques.

For the most part, we did not uncover differences over time in respondents' support for predator control activities generally. However, we did uncover significant differences between 1995 and 2014 in how respondents viewed the relative humaneness of wildlife management techniques used to manage predators: humaneness ratings declined for all techniques except for shooting animals from aircraft (which already ranked very low on our humaneness scale). Nevertheless, we caution against overinterpretation of these results with data from just 2 points in time. For example, it is possible that attitudes toward predator control became more positive after 1995 but have more recently become negative; that is, the similarity between 1995 and 2014 data may mask shifts that occurred during the intervening period. Such ambiguity could be reduced by more frequent data collection.

Does the reduction in humaneness ratings reflect a future trend? It may be that a technologically sophisticated society views existing predator management as antiquated and expects real innovation and improvement in predator management techniques and programs. Dissatisfaction with existing techniques and programs may have political ramifications that affect use of existing techniques and spur work on novel ways in which to manage predator populations. Our 2014 respondents continued to demonstrate sensitivity to economic loss caused by wildlife (compared to 1995) even though they also expressed a belief that nonlethal techniques were more humane than lethal techniques. We believe the public in general would be responsive to additional information on several points, including the economic and ecological effects of predators, humane alternatives to current technologies, the noneconomic value of predators (e.g., ecological, cultural, etc.), and the costs and effectiveness of predator control techniques. However, we anticipate the effects of such information will be largely limited to those who do not feel strongly or have not made up their minds about predator control (Pomerantz et al. 1995; Teel et al. 2006). The development and dissemination of this information has the potential to influence the political climate regarding predator control, and the future of predator management.

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