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Human Dimensions of Wildlife Management Article

Can Public Meetings Accurately Reflect Public Attitudes Toward Wildlife Management?

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ABSTRACT State wildlife agencies often use input obtained through public meetings to develop management policies. Because public meetings can be dominated by single stakeholder groups, these policies may not reflect the attitudes of new wildlife stakeholders. In 2000 the Utah Wildlife Board, after a series of public meetings, adopted a statewide policy for winter-feeding mule deer (*Odocoileus hemionus*). The policy was implemented by the Utah Division of Wildlife Resources from 2001 to 2007 in Cache County of northern Utah, USA. In 2007, we surveyed Utah households representing metropolitan, nonmetropolitan, and Cache County residents (n = 1,800) to evaluate whether the winter-feeding policy reflected the attitudes of all wildlife stakeholders. Survey respondents, regardless of residence strata, believed winter-feeding programs were essential for managing mule deer in Utah ($\chi^2_6 = 7.02$, $P = 0.32$). However, most respondents were reluctant to support feeding programs at the expense of habitat restoration projects ($\chi^2_6 = 11.64$, $P = 0.07$). Our results suggest that the winter-feeding policy represented the attitudes of the Utah residents surveyed, though few had participated in its development. Respondents' strong utilitarian attitudes toward wildlife (e.g., strong support for hunting and feeding) influenced those respondents' perceptions of the policy. Given the effects of increased urbanization on utilitarian attitudes toward wildlife in many parts of the United States, coupled with decreasing numbers of traditional wildlife stakeholders, state wildlife agencies should continually reevaluate their public involvement processes to ensure new wildlife stakeholders' attitudes and concerns are represented.

KEY WORDS attitudes, human–wildlife interactions, mule deer, *Odocoileus hemionus*, public policy, stakeholder, Utah, wildlife uses, winter-feeding.

Large-scale winter-feeding of game species such as mule deer (*Odocoileus hemionus*) by state wildlife agencies is common throughout the western United States (Leopold 1940, Trefethen 1975). Many wildlife stakeholders strongly support these programs in large part because they can 1) maintain big game herds and reduce starvation in areas where winter range is limited, 2) reduce competition on winter ranges shared by multiple species such as elk (*Cervus elaphus*) and mule deer, 3) sustain economies created by wildlife viewing opportunities associated with long-term feeding grounds, and 4) mitigate human–wildlife conflicts (e.g., big game depredations, wildlife–vehicle collisions, and disease transmission; Dean et al. 2003).

Winter-feeding programs are increasingly scrutinized by wildlife managers because of potential risks associated with spreading diseases among and within big game herds and domestic livestock (Dean et al. 2003). Managers may also be concerned that winter-feeding will disrupt seasonal migrations, reduce resources (e.g., money, staff time) available for habitat restoration projects and attenuate negative public perception that these programs could replace habitat in areas where development threatens winter range (Wallmo and Regellin 1981, Dean et al. 2003). Debate persists about the costs and benefits of winter-feeding programs (Dean et al. 2003).

State wildlife agencies in Idaho, Oregon, Washington, Colorado, Utah, and Wyoming have responded to this debate by developing policies to regulate winter-feeding of big game animals (Dean et al. 2003). These policies are typically developed using input from stakeholders obtained through public meetings (Decker and Chase 2001). Because public meetings may be dominated by traditional stakeholders such as hunters, some wildlife managers are concerned that policies developed based on input from public meetings may not reflect the attitudes of the broader public, especially new nonhunting wildlife stakeholders (Decker et al. 1996, Decker and Chase 2001). Thus, the public meeting approach may be limited in providing human dimensions insight for wildlife management policy regarding winter-feeding. If wildlife managers are interested in crafting policy that reflects public attitudes toward winter-feeding and determining factors that influence public perceptions about and participation in winter-feeding, alternative methods of seeking stakeholder input may be warranted. In addition, human dimension data from the area where a specific policy was implemented may provide a link between policy and practice and contribute vital information to future policy planning (Gore and Knuth 2009). Our primary purpose was to obtain stakeholder input about winter-feeding to gain insights on the human dimensions of winter wildlife feeding. Specifically, we evaluated whether a winter-feeding policy developed through a widely used contemporary public meeting process reflected public sentiment when compared to another method of public involvement, a survey. Published research comparing the input obtained through public meetings and surveys for application to establishing winter-feeding policies that best reflect stakeholders' attitudes is lacking (Dean et al. 2003, Wakeling and Bender 2003).

STUDY AREA

We used the case of a winter-feeding program for mule deer in Utah, an implementation of a big game feeding policy

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developed through the public meeting process, to achieve our objectives. In 2000, the Utah Wildlife Board approved a statewide Big Game Feeding Policy based on public input obtained through a public meeting process (Utah Division of Wildlife Resources [UDWR] 2003). Between 2001 and 2007, exclusive of 2 years characterized with moderate conditions, the UDWR implemented winter-feeding of mule deer in Cache County. We focused our inquiry on mule deer because the UDWR stated publicly that the winter-feeding policy was being implemented to benefit stressed mule deer populations (Peterson 2005, 2008). Publicity about UDWR mule deer feeding actions in northern Utah was prolific and featured by major news networks. In Cache County, the local media provided residents with periodic updates of the winter-feeding program.

METHODS

We stratified our sample into 3 strata. Two strata were composed of metropolitan and nonmetropolitan counties across the state where the winter-feeding program was not implemented. Using 2001 Census data, we classified counties with populations >100,000 as metropolitan (6 counties, hereafter, metro; U.S. Census Bureau 2006). We classed counties <100,000 as nonmetropolitan (23 counties, hereafter, nonmetro). The third stratum was the Cache County area where the winter-feeding program was implemented. We created this third stratum because this was the area of operation for the program and research suggests that public attitudes and perceptions about wildlife management programs may differ based on stakeholders' level of involvement (Gore and Knuth 2009). Additionally, development and urbanization in Cache County has restricted winter range in areas that historically supported high numbers of mule deer. Cache County residents also have a long tradition of winter-feeding of big game (D. Austin, UDWR [retired], personal communication). Farming and ranching once dominated retail business, government, education, and service-related industries in Cache County; the sector is now decreasing (U.S. Census Bureau 2006).

We used voluntary, 4-wave, self-administered mail-back questionnaires to collect data January–March 2007 following guidelines discussed in Dillman (2000). We distributed the questionnaire in January 2007, because winter conditions and public interest and awareness of wildlife feeding peaked at this time (Peterson 2008). We mailed questionnaires to a random sample of 600 households within each strata (N = 1,800). We instructed participants to have an adult (≥18 yr old) with the birthday nearest the time of receipt complete the questionnaire. We acquired the random sample and household addresses from Survey Sampling International, Inc. (Fairfield, CT).

To measure predictor variables, the questionnaire consisted of 8 4-point Likert-type scale statements. We asked respondents to agree or disagree with general statements regarding winter-feeding of mule deer. We asked for the relative strength of agreement or disagreement for these statements (1 = strongly disagree to 4 = strongly agree; we also provided an optional "don't know" response).

Additionally we asked questions to determine respondent participation in mule deer winter-feeding programs, who should be allowed to conduct feeding programs, and who should pay for them. Because previous experiences with wildlife can affect respondent attitudes for wildlife management programs, we also asked respondents to identify the nature of past interactions with wildlife within the past 5 years (Messmer et al. 1999). If respondents reported negative interactions we asked them to estimate damages. We measured response variables using respondent age and sex, educational background, residence history, and sportsmen or sportswomen organization affiliations.

We determined response rates by calculating the proportion of returned and completed questionnaires to the total number distributed (Dillman 2000). We sampled a stratified random sample of 6% of nonrespondents from each of the 3 strata to test for nonresponse bias (Messmer et al. 1999). We asked nonrespondents a number of questions selected from the original questionnaire, including demographics, participation in wildlife-related recreational activities, statements concerning the effectiveness of winter-feeding programs, the nature of human–wildlife interactions, and affiliation with sportsmen or sportswomen organizations (Armstrong and Overton 1977, Dillman 2000). The questionnaire and study methodology were approved by the Institutional Review Board at Utah State University (IRB no. 1716).

We analyzed responses to determine whether any differences in demographics or attitudes existed among metro, nonmetro, and Cache County respondents' response variables using chi-square tests of homogeneity of proportions, followed by pair-wise comparisons between strata when an overall test was significant to identify differences. We compared nonresponse phone survey results to mail survey results. We used chi-square homogeneity of proportions tests to evaluate nominal data with $P \leq 0.05$ (Conover 1999, SAS Institute 2001).

RESULTS

Most respondents were male, between the ages of 35–74, and were well-educated (Table 1). Cache County and nonmetro respondents reported stronger rural ties than their metro counterparts ($\chi^2_{10} = 208$, $P \leq 0.001$). More nonmetro respondents considered themselves to be a sportsman or sportswoman than did metro and Cache County respondents ($\chi^2_2 = 6.22$, $P = 0.04$).

Although respondents, regardless of residence strata, were equally concerned that winter-feeding programs could increase the spread of wildlife diseases ($\chi^2_6 = 6.91$, $P \leq 0.33$), most respondents believed winter-feeding programs were essential to management of mule deer in Utah ($\chi^2_6 = 7.02$, $P = 0.32$; Table 2). However, most respondents did not support diverting money from habitat restoration projects to feeding operations, with nonmetro respondents being most unsupportive ($\chi^2_6 = 11.64$, $P = 0.07$). Public perception that feeding mule deer increased deer numbers

Table 1. Demographic characteristics of metro, nonmetro, and Cache County respondents that participated in our Utah, USA, mule deer winter-feeding survey, 2007.

	Area		
	Nonimplementation of winter-feeding		Implementation of winter-feeding
Characteristic	Metro ($N = 146$) %	Nonmetro ($N = 197$) %	Cache County ($N = 181$) %
Sex			
M	75	70	72
F	25	30	28
Age (yr)			
18–34	9	10	16
35–54	47	38	39
55–74	36	41	34
>74	8	11	11
Education			
<12 yr	4	4	3
12 yr	15	13	16
Professional	31	44	28
4-yr college	27	24	27
Graduate degree	23	15	26
Sportsman or sportswoman*			
Yes	50	57	44
No	50	43	56
License to hunt or fish			
Yes	47	50	43
No	53	50	57
Sportsmen or sportswomen organization member			
Yes	9	11	9
No	91	89	91
Current residence**			
Rural farm	1	12	8
Nonfarm	1	23	10
Town	1	16	6
Small city	31	43	46
City	29	6	26
Metropolitan area	36	0	4
Residence during youth**			
Rural farm	21	22	27
Nonfarm	7	8	7
Town	5	12	16
Small city	19	32	29
City	20	13	13
Metropolitan area	27	13	8
Residence as adult**			
Rural farm	2	13	11
Nonfarm	1	14	8
Town	1	10	7
Small city	28	39	39
City	33	14	27
Metropolitan area	35	11	8

* P-values <0.05, ** P-values <0.01.

was greater among Cache County respondents than metro and nonmetro respondents ($\chi^2_6 = 21.24$, $P \leq 0.01$).

More respondents believed feeding mule deer in the winter did not increase property damage ($\chi^2_6 = 6.66$, $P = 0.35$), but rather increased wildlife viewing opportunities ($\chi^2_6 = 9.16$, $P \leq 0.17$). More nonmetro respondents participated in wildlife viewing than Cache County and metro respondents ($\chi^2_2 = 10.3$, $P < 0.01$; Table 3). Average annual hours and expenses for watching wildlife was similar for all groups, with ≥80% devoting ≤50 hours/year ($\chi^2_6 = 6.03$, $P = 0.42$), and 7–9% spending >US$500/year, respectively (Table 3). Most respondents spent ≤US$100.00/year to feed wildlife. The percentage of respondents that reported feeding wildlife in general over the past 5 years also did not differ by residence strata ($\chi^2_2 = 0.72$, $P = 0.70$).

Most respondents believed UDWR should be allowed to feed deer ($\chi^2_4 = 9.51$, $P = 0.05$). However, many also supported feeding programs conducted by sportsmen or sportswomen, as long as those programs were supervised by the state wildlife agency ($\chi^2_4 = 12.86$, $P = 0.01$). Although support for feeding deer by residents operating independently was low; Cache County and nonmetro were more supportive than metro respondents ($\chi^2_4 = 18.65$, $P < 0.01$).

Regardless of residence strata, many respondents believed the state wildlife agency better represented their views than did sportsmens' or sportswomens' organizations ($\chi^2_{12} = 95$, $P < 0.01$; Table 3). Metro respondents were most likely to agree that sportsmens' or sportswomens' organizations represented their views ($\chi^2_8 = 22$, $P < 0.01$). Respondents who participated in wildlife-related recreation (e.g., wildlife viewing) also believed UDWR represented them better than did sportsmens' or sportswomens' organizations ($\chi^2_4 = 37$, $P < 0.01$).

Respondents reported both positive and negative interactions with wildlife (Table 4). Positive interactions included wildlife viewing, photography, and hunting. Few respondents reported receiving financial benefits from wildlife (e.g., sale of wildlife photographs). More Cache County respondents than nonmetro and metro respondents reported they received no benefit from wildlife in the past 5 years ($\chi^2_2 = 6.78$, $P = 0.03$).

Respondents also reported negative interactions with wildlife (Table 4), including landscape damage, wildlife–vehicle collisions, and agricultural damage. Few respondents reported an incident of wildlife-related disease (e.g., rabies, hanta virus) or a loss of personal or family safety due to wildlife. More negative interactions were reported by nonmetro and Cache County respondents ($\chi^2_2 = 16.83$, $P = 0.01$). For example, 50% of wildlife–vehicle collisions were reported by nonmetro and 33% by Cache County respondents ($\chi^2_2 = 9$, $P = 0.01$). Additionally, nonmetro residents reported experiencing more landscape and agricultural damage than did Cache County respondents ($\chi^2_2 = 17$, $P = 0.01$). Generally the estimated costs of these negative interactions were <US$1,000.00 with few reporting damages between US$1,000 and US$10,000 and only one estimated damage >US$10,000 ($\chi^2_4 = 6$, $P = 0.46$).

Table 2. Attitudes of metro, nonmetro, and Cache County survey respondents regarding winter-feeding of mule deer, Utah, USA, 2007.

	Area					
	Nonimplementation of winter-feeding				Implementation of winter-feeding	
	Metro ($N = 146$) %		Nonmetro ($N = 197$) %		Cache County ($N = 181$) %	
Attitude	Agree	Disagree	Agree	Disagree	Agree	Disagree
Feeding is:						
Essential	65	35	63	37	78	22
More efficient	31	69	22	78	35	65
Increases disease risk*	41	59	50	50	54	46
Increases deer no.*	80	20	78	22	95	5
Increases property damage*	38	62	39	61	39	61
Increases viewing opportunity	89	11	92	8	95	5

* P-values <0.05.

We received 181 usable questionnaires from Cache County (112 undeliverable and 3 unusable) resulting in a 37% response rate. Metropolitan residents returned 146 questionnaires (72 undeliverable and 3 unusable) yielding a 28% response rate. Nonmetro residents returned 197 questionnaires (103 undeliverable and 5 unusable) for a 40% response rate. Responses received from mail-back questionnaires and nonresponse bias phone contacts did not differ ($P \leq 0.50$). Mail-back questionnaire respondents expressed stronger levels of disagreement and agreement with statements than nonresponse bias test respondents.

DISCUSSION

Survey respondents, regardless of residence strata, nature of human–wildlife interactions, and type of wildlife uses they participated in, generally believed the winter-feeding policy was beneficial to mule deer. Thus, our data reinforced that the input received through the public input process did reflect wildlife attitudes of Utah wildlife stakeholders. However, stakeholders also perceived some risks associated with feeding (i.e., disease, short-term benefits vs. long-term benefits) and, thus, were hesitant to support state-sponsored feeding programs at the expense of habitat restoration projects.

Table 3. Participation of metro, nonmetro, and Cache County survey respondents in wildlife-related recreation activities within the past 5 years, Utah, USA, 2007.

	Area		
	Nonimplementation of winter-feeding		Implementation of winter-feeding
Activity	Metro ($N = 146$) %	Nonmetro ($N = 197$) %	Cache County ($N = 181$) %
Hunting or fishing	27	38	31
Wildlife viewing	77	90	80
Wildlife feeding	40	44	41
Who should conduct winter-feeding			
State wildlife agency	85	84	83
State wildlife agency and sportsmen and sportswomen	74	74	80
Sportsmen and sportswomen	18	24	28
State wildlife agency and residents	66	67	74
Residents	13	23	23
Public money for feeding	70	66	71
Buy feed	38	34	34
Buy equipment	14	17	15
Fed deer	3	12	11
Fed songbirds	36	38	37
Fed game birds	3	8	14
Annual hr spent feeding			
≤10	33	26	35
11–50	36	44	33
51–100	5	13	7
>100	7	8	6
Annual expense to feed			
≤US$20.00	35	32	40
US$21.00–$100.00	21	31	21
US$101.00–$500.00	18	21	13
>US$500.00	5	7	7
Represented by sportsmen or sportswomen organization	84	62	76
Represented by Utah Division of Wildlife Resources	84	76	80

Table 4. Human–wildlife interactions reported by metro, nonmetro, and Cache County survey respondents, Utah, USA, 2007.

	Area		
	Nonimplementation of winter-feeding		Implementation of winter-feeding
Human–wildlife interaction	Metro ($N = 146$) %	Nonmetro ($N = 197$) %	Cache County ($N = 181$) %
Positive			
Business revenue	3	4	3
Activity such as photography	57	54	52
Activity such as hunting	27	38	31
Wildlife viewing**	77	90	80
Other (i.e., sense of well-being)	15	13	12
None*	23	19	31
Negative			
Wildlife–vehicle collision*	10	21	15
Disease	0	1	1
Loss of personal or familial safety or health	0	2	1
Agricultural economic loss***	1	14	7
Landscape damage***	12	29	20
Other	1	3	4

* P-values <0.05, ** P-values <0.01, *** P-values <0.001.

Cache County respondents and nonmetro respondents were generally more supportive of winter-feeding programs than were metro respondents, and they also were more likely to believe feeding programs benefited mule deer even though those respondents also reported more damage. Many Cache County and nonmetro respondents, particularly those in Cache County, had increased opportunity and access to participate in and observe the effects of winter-feeding programs and, thus, view wildlife, than did their metro counterparts (Musclow 1984, Peterson 2008). Thus, Cache County and nonmetro respondents may have been more willing to overlook the increased wildlife damage and favor allowing anyone to feed deer. Many respondents also reported that observing mule deer in the wild was a preferred activity. Winter-feeding enhanced the perception of opportunity for Cache County and nonmetro respondents to observe mule deer during migration or when concentrated on winter ranges near urban centers. Some respondents reported they fed deer supplemental feed rations to not only help deer survive winter, but also to increase viewing opportunities. These findings suggest that with increasing interest nationally in viewing wildlife, more people might become involved in feeding wildlife. State wildlife agencies should be proactive in considering these wildlife stakeholders' interests and needs as decision-makers create policy concerning feeding wildlife in their states, at the same time mitigating the deleterious effects associated with feeding.

The importance Utahns place on wildlife, including mule deer, was reflected in our survey respondents (Krannich and Teel 1999). Many of our respondents reported they participate in wildlife uses such as hunting, wildlife viewing, and feeding. Respondents believed winter-feeding programs were essential to mule deer management. However, they also supported long-term approaches to management, such as habitat restoration, and were hesitant to implement feeding programs at the expense of habitat improvement.

We were not able to determine whether feeding increased damage or was a mitigating factor. People who live in areas with high winter concentration of deer have few cost-effective options for preventing damage (Hygnstrom et al. 1994). Haystacks, fences, crops, orchards, and yards in rural areas may be susceptible to increased damage in winter from high deer densities (Swihart et al. 1995, Conover 2002). Thus, rural residents may attempt to reduce damage by feeding in other areas to draw the animals away from high-value crops and yards, which can be an expensive proposition and, thus, may increase individual support for using public money for winter-feeding programs.

The question our survey could not answer is why our respondents' support for Utah's policy did not differ by residence strata given the rapid urbanization the state is experiencing (U.S. Census Bureau 2006). Even though Utah, like many other states in the United States, is experiencing increased urbanization, our respondents' attitudes toward wildlife still reflected those of rural communities in Utah (Toney et al. 1997).

Manfredo and Teel (2008) hypothesized that domination and mutualism value orientations most influence contemporary human relationships with wildlife in North America. Teel et al. (2005) reported public attitudes toward wildlife in the western United States are shifting from domination to mutualism and this shift appeared to be related to increased urbanization and changing economics. However, of the 19 western states surveyed by Teel et al. (2005), Utah least fit regional shifts in public attitudes toward wildlife in response to changing economics.

One possible reason for this divergence may be explained by a strong sense of community attachment. Brehm et al. (2006) in their study on the influence of community attachment on individual attitudes about environmental issues in the Mormon Culture Region of the Intermountain West suggested that culture strongly influenced urban attitudes. This strong community attachment may have mitigated the effect of urbanization on our respondents' attitudes regarding Utah's winter-feeding policy (Toney et al. 1997). However, as Utah's population, like other states,

increases and changes, it will also become more diverse. This diversity may dilute the strength of rural community attachments as new generations become more removed from rural roots (Toney et al. 1997). As such, Utah public attitudes toward wildlife may shift from utilitarian to mutualistic. Therefore, UDWR and other state wildlife agencies faced with similar changing demographics will need to expand their public policy input repertory to include regular public surveys as mechanisms of engaging all stakeholders in the state's wildlife management policy development process (Teel et al. 2005).

MANAGEMENT IMPLICATIONS

Our results confirmed that Utah's 2001 winter-feeding policy for mule deer reflected public attitudes, even though it was based on stakeholder input generated by public meetings, which are often thought to be limited in their ability to capture broad public attitudes about wildlife management. These attitudes were generally utilitarian and doministic. Our results should be interpreted with caution because with increased urbanization and changing economics, utilitarian wildlife management policies may increasingly be questioned if the public perceives those policies have been enacted to primarily benefit one stakeholder group. State wildlife agencies experiencing similar trends may be encouraged to implement adaptive management strategies that create additional opportunities for increased public input and involvement at local and regional levels. Additionally, state wildlife agencies may consider engaging human dimension scientists to re-evaluate the input received through their public processes to ensure all wildlife stakeholders understand the process. Enhanced public understanding of agency public input processes can translate into increased involvement, greater public satisfaction with methods employed, and policies and decisions that reflect the dynamics of the changing landscape.

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