Routledge
Taylor & Francis Group

Human Dimensions of Wildlife

An International Journal

ISSN: 1087-1209 (Print) 1533-158X (Online) Journal homepage: www.tandfonline.com/journals/uhdw20

Hunter acceptance of antlerless moose harvest in Alaska: Importance of agency trust, proximity of hunter residence to hunting area, and hunting experience

Todd J. Brinkman

To cite this article: Todd J. Brinkman (2018) Hunter acceptance of antlerless moose harvest in Alaska: Importance of agency trust, proximity of hunter residence to hunting area, and hunting experience, Human Dimensions of Wildlife, 23:2, 129-145, DOI: 10.1080/10871209.2017.1399486

To link to this article: https://doi.org/10.1080/10871209.2017.1399486

HUMAN DIMENSIONS OF WILDLIFE
2018, VOL. 23, NO. 2, 129–145
https://doi.org/10.1080/10871209.2017.1399486

Routledge
Taylor & Francis Group

Hunter acceptance of antlerless moose harvest in Alaska: Importance of agency trust, proximity of hunter residence to hunting area, and hunting experience

Todd J. Brinkman

Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, Alaska, USA

ABSTRACT

Liberalized harvest of antlerless moose (*Alces alces*) in Alaska has resulted in conflict between wildlife managers and hunters. To address this issue, I surveyed moose hunters (n = 845, 35% response rate) to quantify and characterize acceptance of antlerless moose harvest. I found that 16%, 69%, and 15% of hunters thought antlerless hunts were *always, sometimes*, or *never acceptable*, respectively. Characteristics of the *never acceptable* group frequently differed from the other two groups. Using a multinomial logistic regression, I estimated that the odds of a hunter being in the *never acceptable* group was more likely if he/she strongly distrusted agency data (odds = 4.8), resided in the area with antlerless hunts (odds = 3.5), and had >20 years of moose hunting experience (odds = 3.4). My findings imply that a relatively small proportion of hunters can disproportionately direct wildlife management attention, especially in the absence of scientifically derived information on the human dimensions.

KEYWORDS

Alaska; anterless; attitudes; moose hunters; harvest regulations

Introduction

Contrary to the early years of wildlife management, ungulate biologists in North America and Europe now spend much of their time addressing challenges related to population overabundance rather than scarcity (Bradford & Hobbs, 2008; Gortázar, Acevedo, Ruiz-Fons, & Vicente, 2006; McShea, Underwood, & Rappole, 1997). While addressing the influence that overabundant ungulates have on the health of other wildlife species and ecosystems, wildlife managers also are tasked with balancing the interests of multiple groups of people with diverse individual preferences (Côté, Rooney, Tremblay, Dussault, & Waller, 2004; D'Angelo & Grund, 2015; McLaren, Roberts, Djan-Chekar, & Lewis, 2004; Vaske & Roemer, 2013). Increased harvest of antlerless individuals (e.g., female, cow, doe, calf, fawn) through hunting is the most widespread management tool for reducing population size (McCullough, 1979; Krausman, Christensen, McDonald, & Leopold, 2014). However, liberalized antlerless harvest may generate other management challenges such as public controversy, conflict among wildlife stakeholders, and reduced hunter satisfaction (Fulton & Manfredo, 2004; Van Deelen, Dhuey, McCaffery, & Rolley, 2006; Young & Boertje, 2011). Effective population control of ungulates may be hindered if efforts are not made to assess conflict and resolve problems related to stakeholder support

CONTACT Todd J. Brinkman tjbrinkman@alaska.edu Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, Alaska, USA

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/uhdw.

of management decisions (Cornicelli, Fulton, Grund, & Fieberg, 2011; Schroeder, Cornicelli, Fulton, & Grund, 2014; Young, Boertje, Seaton, & Kellie, 2006).

Alaska Statute 16.05.255 requires the Alaska Board of Game to set big game population and harvest objectives. During the late 1990s in parts of Interior Alaska, moose (*Alces alces*) numbers exceeded population goals, and antlerless harvest was liberalized in 2004. Increasing the antlerless harvest quota was supported by Alaska Department of Fish and Game (ADF&G) data estimating that the moose population was nutritionally stressed and habitat was over-browsed (Boertje et al., 2007). Similar to many situations involving overabundant white-tailed deer (*Odocoileus virginianus*), these hunts also were intended to reduce moose–vehicle collisions (Marcoux & Riley, 2010). Conflict among different hunter groups, and between biologists and hunters followed (Young & Boertje, 2011). Dissatisfaction was expressed by vocal groups of hunters at public meetings and was well documented by the local newspaper (e.g., Fairbanks Daily News Miner 2008, 2012a, 2012b; Mowry, 2013). Although reliable data on causes of dissatisfaction were absent, hunter resistance was likely related to concerns that liberalized antlerless hunts would cause the moose population to crash, increase conflict between local and nonlocal antlerless hunters, and increase conflict between landowners and antlerless hunters (Young et al., 2006).

In addition to ADF&G recommendations for antlerless harvest, Alaska Statute 16.05.780 also requires a majority vote of approval from members of the active Local Advisory Committees (LAC) in that Game Management Unit (GMU) for antlerless harvest to occur. LACs are ADF&G-coordinated citizen groups distributed across Alaska ($N = 84$) that create a structured forum for public opinions on and recommendations for the management of fish and wildlife (ADF&G, 2017a). Thus, Alaska is unique in that an opposing vote by a citizen group can prevent the harvest of antlerless moose.

ADF&G has been collecting extensive biological data on moose populations in Interior Alaska for over 25 years, but limited information is available on hunter perceptions of moose populations and their management (Boertje, Keech, Young, Kellie, & Seaton, 2009; Boertje, Valkenburg, & McNay, 1996; Whittaker et al., 2001). Antlerless harvest plans implemented without objective data on both stakeholder perceptions (e.g., extent of approval) and ecological characteristics (e.g., habitat carrying capacity) are more vulnerable to continued contention because of lower hunter compliance and a reduced ability to justify and defend management actions. Generally, and in the moose hunting system of Alaska, wildlife managers may benefit from being aware of and responsive to a diversity of hunter attitudes, values, and concerns if they hope to optimize hunter opportunities and satisfaction, and fulfill public trust responsibilities (Decker et al., 2014; Heberlein, 2002; Vaske & Manfredo, 2012). Public stakeholders (e.g., hunters, wildlife watchers) also benefit from wildlife investigations focused on the human dimensions, because such studies are often designed to cultivate their *voice* into the game management process. Participation from diverse stakeholder groups in wildlife management can foster representation, diffuse conflict, increase acceptance of and compliance with regulations, and lead to greater support for final decisions (Lauber, Decker, Leong, Chase, & Schusler, 2012; Leong, Decker, & Lauber, 2012). Research accounting for variation in hunter cognitions (e.g., values, norms, attitudes) has been shown to facilitate predictions of human behavior, which may help wildlife managers anticipate and act on future opportunities and problems (Hrubes, Ajzen, & Daigle, 2001; Rossi & Armstrong, 2008).

To provide moose managers in Alaska with human dimension information on the cause and extent of the antlerless harvest controversy, I conducted a moose hunter survey with the following objectives: (a) estimate the extent of hunter acceptance of antlerless harvest, (b) understand how hunter characteristics influence the acceptability of antlerless harvest, and (c) identify an acceptable antlerless hunt structure based on hunter responses.

Methods

Study area

My survey focused on moose hunting in ADF&G's GMU subunits 20A, 20B, and 20D in Interior Alaska (Figure 1). GMU 20 contains Fairbanks, the second largest city in Alaska. Most moose hunter activity is concentrated on a low-density network of maintained roads and navigable rivers. Off-road-vehicle trail networks and small aircraft-landing strips are sparsely scattered in remote areas in GMU 20, and large areas of moose habitat are relatively difficult for hunters to access. GMU 20 is within the boreal forest, containing the northern lowlands and the foothills and mountains of the Alaska Range. A mosaic of shrub forest, climax bogs, and black spruce (*Picea mariana*) forest dominate the lowlands. Taiga and shrub habitat transition into alpine tundra from the foothills to the mountains. In Fairbanks, the mean monthly temperatures in July and January are 17°C and −22°C, respectively.

Other publications have provided detailed information on moose habitat characteristics in the study area, and information on gender-specific moose harvest and hunting

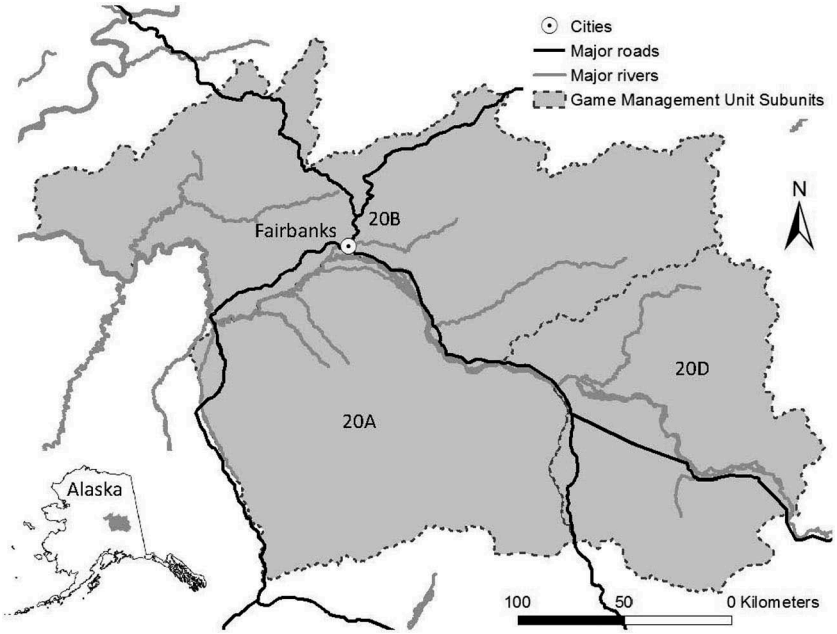

Figure 1. The hunter survey on antlerless moose hunts included resident Alaskans who hunted moose in Alaska Department of Fish and Game (ADF&G) Game Management Unit Subunits 20A, 20B, and 20C in Interior Alaska.

regulations from the 1960s to the early 2000s (Gasaway, Stephenson, Davis, Shepherd, & Burris, 1983; Seaton et al., 2011; Young & Boertje, 2011; Young et al., 2006). However, GMU subunit 20A has been the center of the current and historic conflict over antlerless harvest, and warrants discussion. Relatively low levels of antlerless harvest occurred in this subunit during the 1960s, and were liberalized between 1972 and 1975. Antlerless harvest did not occur again until the late 1990s, when relatively low harvest levels were implemented. Antlerless harvest was liberalized in 2004 for approximately four years, and then implemented at moderate levels to the present (Young & Boertje, 2011). Outside of those time periods, bull-only harvest regulations permitted moose hunting mainly during September. During liberalized hunts between 2004 and the time of this study, antlerless hunts extended beyond September into the winter months. Compared with GMU subunit 20A, hunters had relatively few antlerless harvest opportunities in 20B and 20D until the latter years of the first decade of the 2000s, when antlerless hunts were expanded in those subunits. Expanding antlerless harvest opportunities in 20B and 20D justified the inclusion of people who hunted moose from those areas as part of the survey sample.

Sampling design

Between June 2012 and January 2013, I conducted an online (SurveyMonkey©) and mail-out survey of Alaska residents at least 18 years old who hunted moose in Units 20A, 20B, or 20D during 2010 or 2011. A data-sharing agreement with ADF&G provided me access to hunter harvest records, which included information such as mailing addresses, hunter success, days hunted, and method of transportation. With these records, I mailed postcards that included a website address for the online survey. I conducted a follow-up mailing that included a hard copy of the questionnaire to those who did not complete the survey online. I mailed a second postcard and hard copy of the questionnaire to those who didn't respond after the first mailing. From the first mailing of the post card, the survey was open for seven months. I selected hunters from the 2010 and 2011 hunting seasons to focus on recent hunts and minimize potential recall bias. The transient nature of Alaskans causes mail-out surveys that use older records of hunters to be troublesome (i.e., there is a high degree of undeliverables and mailings marked "return to sender") because of people leaving the state (e.g., many residents associated with the military) or changing addresses within the state.

As part of survey development, I used focus-group discussions with local moose managers, moose hunters, and members of LACs within GMU 20 to explore the issue and facilitate the construction of a questionnaire that would address the study objectives. The final survey contained 23 questions that assessed the following: hunters' acceptability of antlerless moose hunting in general; approval of different types of antlerless hunts (e.g., timing of hunt, alternative restrictions); moose hunting motivations (e.g., for the meat, trophy opportunity); moose hunter experience (years hunting moose); hunter perceptions of the consequences of antlerless harvest; sources of information hunters used to assess moose population levels; and the extent of trust or distrust in data used by ADF&G to manage moose.

Based on ADF&G harvest records, 9,166 Alaska residents were eligible to be included in the survey. I assumed a response rate of 30%, and sought to obtain a maximum survey sampling error of ±5% with a 95% confidence level (CL) for the target population. I also

Table 1. Multivariable weighting by population proportions applied to the survey sample population (n = 854) to represent the target population (N = 9,166): people who hunted moose during 2010 or 2011 in Game Management Unit Subunits 20A, 20B, and 20D in Interior Alaska.

Harvested a moose	Unsuccessful		Successful			
Sex of harvest	NA		Male		Female	
Residence in or out of GMU subunits 20A, 20B, and 20D	In	Out	In	Out	In	Out
Target Population (N)	4,512	1,989	1,214	636	481	334
% Target Population	0.49	0.22	0.13	0.07	0.05	0.04
Sample Population (n)	255	120	171	133	86	97
% Sample Population	0.30	0.14	0.20	0.15	0.10	0.11
Weight	1.66	1.56	0.67	0.45	0.53	0.32

was interested in exploring differences in hunter acceptance of antlerless harvest of six strata that could be quantified using ADF&G harvest records (Table 1). I sent the questionnaire to 2,500 moose hunters, randomly sampling within each stratum. I disproportionately sampled strata to obtain a relatively consistent error rate (≤7%, 95% CL) within each stratum. For example, I sent questionnaires to a higher proportion of hunters in the stratum with the smallest population (70% were sent questionnaires) than the stratum with the largest population (15% were sent questionnaires).

I assessed under- or overreporting within the target population using ADF&G harvest records for the following variables: hunter age, hunter residing in and out of the study area, hunter harvest success, and sex of moose harvested. I also assessed nonresponse error on questions investigating hunter opinions (e.g., acceptability of antlerless hunts, extent of trust) by randomly surveying (using telephone contacts) moose hunters within the sample who didn't respond by the survey deadline. If nonresponse bias or under/overreporting was detected, I weighed the survey responses across strata to represent the target population before comparisons were made among hunter groups.

Data analysis

I compared the hunter characteristics of groups of hunters with different extents of acceptance of antlerless harvest using a Kruskal–Wallis test for scale variables and a crosstabs analysis (chi-squared tests) for categorical variables. Extents of acceptance were grouped based on response to the question "Which statement best matches your thoughts about antlerless moose hunting in Alaska?" Three acceptance responses were possible: (a) antlerless hunts are always unacceptable (*never acceptable* hereafter), (b) antlerless hunts are acceptable in certain situations (*sometimes acceptable* hereafter), and (c) antlerless hunts are *always acceptable*. I tested for differences among acceptance groups, using a Phi correlation coefficient (i.e., measure of effect size) and the z-score method with adjusted p-values using the Bonferroni method, for the following variables: hunter harvest success (yes, no), sex of moose harvested (male, female), moose hunting experience (years), extent of trust in ADF&G moose data (strongly trust, trust, neither, distrust, strongly distrust), primary motivation for moose hunting (meat, trophy, etc.), frequency (every year, 2–5 years, 6–10 years, never) that a person hunts moose in a different GMU subunit (i.e., hunt location fidelity), primary mode of transportation used to access the hunting area, and whether a hunter resided in or out of the area with antlerless hunts. I used a multinomial logistic regression model to predict a moose

hunter's acceptance of antlerless hunts (response variable with three categories) based on variables that were estimated to be different among acceptance groups (predictor variables) using the z-score method. My regression analysis estimated the strength of influence that predictor variables had on moose hunter acceptance of antlerless hunts. I used the *sometimes acceptable* group as my response reference category. The exponential beta coefficient was used to assess the odds of the predictor variable affecting the response variable. I considered main effects of predictor variables. I determined whether my model reasonably approximated the behavior of my data using Pearson and Deviance goodness-of-fit statistics and likelihood ratio tests. If collinearity occurred among predictors, I selected one variable for analysis from the set of highly correlated (>0.6) variables.

Several questions in the survey addressed the extent that hunters approved or disapproved antlerless hunts based on the timing of moose hunts, locations where hunts occur, how permits are allocated, and the type of moose (e.g., calf, cow) eligible for harvest during antlerless hunts. I used descriptive response data (medians of scale response categories) to characterize the antlerless hunt design that received the greatest extent of approval and disapproval. I weighed the survey responses for all variables included in the analysis to be representative of the target population using the ADF&G harvest records (Table 1). For the analysis on the extent of approval, I focused on *sometimes* and *always acceptable* hunter groups, because the *never acceptable* group strongly disapproved of all antlerless hunt structures, regardless of when, where, or how they occurred.

Results

After accounting for undeliverable mailings, 2,447 questionnaires were sent to moose hunters. I received 854 completed questionnaires (173 completed online, 681 mailed in), which provided an overall response rate of 35% and a survey sampling error of ±3% with a 95% CL. I assessed nonresponse error by conducting phone interviews with 31 hunters who did not complete the questionnaire. I found no differences in key variables such as acceptance of antlerless hunts ($\chi^2(2) = 0.53$, $p = .77$, $n = 884$), extent of trust ($\chi^2(4) = 6.17$, $p = .20$, $n = 841$), hunting experience ($\chi^2(4) = 4.44$, $p = .35$, $n = 863$), and hunting location fidelity ($\chi^2(3) = 0.50$, $p = .92$, $n = 864$) between respondents and nonrespondents. Compared with the target population of moose hunters, my sample underrepresented unsuccessful hunters (i.e., hunters who did not kill a moose during 2010 or 2011), the proportion of hunters harvesting a male moose, and the proportion of hunters residing in the study area (GMU subunits 20A, 20B, and 20D). Therefore, I weighed data for these variables during analysis so that the sample was representative of the target population (Table 1). Mean hunter age was similar between the target population (48 years, $SD = 14.3$, $N = 9{,}166$) and the sample population (52 years, $SD = 13.7$, $n = 854$).

Similarities and differences among acceptance groups

The majority of hunters reported that antlerless moose hunts were *sometimes acceptable* (69%), and the remainder were equally split between *always* (16%) and *never acceptable* (15%). Grouping hunters based on acceptance of antlerless hunts, I determined that groups were similar with regard to hunter age ($\chi^2(2) = 0.65$, $p = .65$, $n = 829$), the only scale variable. For categorical variables, primary modes of transportation to their moose

Table 2. Categorical variable similarities and differences in survey responses among groups of moose hunters in Interior Alaska who always, sometimes, or never thought antlerless moose hunts were acceptable.[1]

Variable	Category	Never acceptable (n = 126)	Sometimes acceptable (n = 594)	Always acceptable (n = 134)
Proportion of hunters harvesting a moose ($\chi^2(2) = 4.67$, $\varphi = .07$, $p = .10$, $n = 854$)	Successful	22%[a]	31%[a]	26%[a]
	Unsuccessful	78%[a]	69%[a]	74%[a]
Sex proportions of harvest ($\chi^2(2) = 2.57$, $\varphi = .10$, $p = .28$, $n = 248$)	Female moose	21%[a]	30%[a]	40%[a]
	Male moose	79%[a]	70%[a]	60%[a]
Primary modes of transportation to moose hunting area ($\chi^2(4) = 8.08$, $\varphi = .11$, $p = .09$, $n = 689$)	ATV (four-wheeler)	44%[a]	34%[a]	41%[a]
	Car/Truck	17%[a]	22%[a]	21%[a]
	Boat	15%[a]	23%[a]	25%[a]
Frequency that hunters hunt in different GMU subunits ($\chi^2(6) = 18.78$, $\varphi = .15$, $p < .01$, $n = 832$)	Every year	16%[a]	19%[a]	23%[a]
	Every 2–5 years	23%[a]	38%[b]	35%[a,b]
	Every 6–10 years	8%[a]	9%[a]	11%[a]
	Same every year	53%[a]	34%[b]	32%[b]
Residence ($\chi^2(2) = 36.80$, $\varphi = .21$, $p < .01$, $n = 854$)	In study area	91%[a]	63%[b]	68%[b]
	Out of study area	10%[a]	37%[b]	32%[b]
Moose hunting experience (proportion by category) ($\chi^2(8) = 44.43$, $\varphi = .23$, $p < .01$, $n = 824$)	<5 years	7%[a,b]	15%[b]	6%[a]
	5–9 years	4%[a]	17%[b]	20%[b]
	10–14 years	11%[a]	13%[a]	18%[a]
	15–20 years	7%[a]	13%[a]	10%[a]
	>20 years	71%[a]	43%[b]	46%[b]
Extent of trust in agency data used to manage moose population size ($\chi^2(8) = 240.80$, $\varphi = .55$, $p < .01$, $n = 809$)	Strongly trust	3%[a]	16%[b]	24%[b]
	Trust	8%[a]	51%[b]	52%[b]
	Neither	22%[a]	19%[a]	18%[a]
	Distrust	26%[a]	11%[b]	5%[b]
	Strongly Distrust	42%[a]	5%[b]	1%[b]

Note. Column proportions with different superscripts ([a,b]) denote significant differences (α = .05) from each other.
Chi-squared (χ^2) statistics (df), phi (φ) correlation coefficients (measure of effect size), significance values (p), and sample sizes (n) are provided for each variable. Columns percentages represent the proportion of hunters in each category for each acceptance group. For example, 22% (n = 28) of hunters in the *never acceptable* group (n = 126) successfully harvest a moose.

hunting area, harvest success, and sex of moose harvested were similar among groups (Table 2). On a 5-point scale (1 = strongly agree, 5 = strongly disagree), hunting moose for the meat was the top-ranked motivation (median = 1, SD = 0.45, n = 845) among all groups as to why they hunt moose. Pooling all responses, 99% of the moose hunters agreed or strongly agreed that they hunted for the meat. Median ratings were similar among acceptance groups for all other motivation options: to interact with nature (median = 2, SD = 0.94, n = 825), recreation (median = 2, SD = 1.04, n = 823), spend time with family and friends (median = 2, SD = 0.97, n = 826), traditional reasons (median = 2, SD = 1.17, n = 824), challenge (median = 2, SD = 1.14, n = 817), to help manage moose (median = 3, SD = 1.12, n = 824), and for the trophy opportunity (median = 4, SD = 1.21, n = 824). Among all acceptance groups, hunting moose for the trophy opportunity was the lowest rated motivation. Pooling all hunters, 55% disagreed or strongly disagreed that they hunted moose for the trophy opportunity. Pooling all hunters,

ATV (all-terrain vehicles, i.e., four-wheeler, 37%) was the most commonly used mode of transportation to access hunting areas, followed by boat (23%) and car/truck (21%). The proportion of hunters who harvested a moose during 2010 or 2011 was the lowest (22%) among the *never acceptable* group, but not significantly different from the other two acceptance groups (Table 2). The proportion of hunters harvesting a female moose was the lowest in the *never acceptable* group and the highest in the *always acceptable* group, but no statistical differences among groups existed (Table 2).

Acceptance groups were different with regard to four variables: hunt location fidelity, whether the hunter resided in or out of the antlerless hunt area, moose hunting experience, and extent of trust or distrust in ADF&G data used to manage moose. Overall, the *never acceptable* group was the most frequently different from the other two groups (Table 2). Compared with the *sometimes* and *always* groups, a greater proportion of hunters in the *never acceptable* group hunted in the same area every year (Table 2). Compared with both other groups, a greater proportion of hunters in the *never acceptable* group resided in the area with antlerless hunts (GMU subunits 20A, 20B, or 20D), and a greater proportion had >20 years of moose hunting experience (Table 2). The *never acceptable* group had a much greater proportion of hunters who distrusted or strongly distrusted (68%) ADF&G data used to manage moose, and a much lower proportion who trusted or strongly trusted (11%). This finding on trust was supplemented by a question that asked hunters to rank different sources of information (ADF&G data, number of moose seen, harvest success, habitat condition, conversations with fellow hunters, moose sign, predator sign) that informed their opinion on moose population size. The *never acceptable* group ranked ADF&G data as the least commonly used source. The other two acceptance groups ranked ADF&G data as their first (*always*) or second (*sometimes*) source of information.

Predictors of acceptance of antlerless hunts

According to the goodness-of-fit tests (Pearson chi-square = 19.1, p = .64; Deviance chi-square = 21.801, p = .47), data were consistent with model assumptions. Hunter residence in or out of antlerless hunt area, moose hunting experience, and extent of trust or distrust in agency data contributed significantly to the model, but hunt location fidelity did not contribute to the model. Hunter trust in data used by ADF&G to manage moose was the strongest predictor of a moose hunter's acceptance of antlerless hunts (Table 3). Hunters who strongly distrusted data used by ADF&G were 4.8 times more likely to be in the *never acceptable* group than in the *sometimes acceptable* group (reference category used hereafter). Hunters strongly trusting and trusting data used by ADF&G were 8.3 and 8.0 times, respectively, less likely to be in the *never acceptable* group. Residing within GMU where antlerless hunts occurred also increased the odds of being in the *never acceptable* group by 3.5. Hunters with >20 years of experience hunting moose in Alaska were 3.4 times more likely to be in the *never acceptable* group. Other categories of moose hunting experience did not have a significant effect on the odds of being in the *never acceptable* group (Table 3).

Hunters who distrusted data used by ADF&G were slightly (p = .04) less likely (2.8 times) to be in the *always acceptable* group than in the *sometimes acceptable* group (Table 3). Hunting experience also affected the odds of being in the *always acceptable*

Table 3. Multinomial logistic regression model estimates of strength of influence (exponential beta coefficient, *Exp(B)*) of predictor variables on moose hunter attitudes (*always, sometimes, never acceptable*) toward antlerless hunts in Interior Alaska from survey responses (n = 854). Moose hunters who *sometimes* (n = 594) thought antlerless hunts were acceptable were used as the reference category.

					95% Confidence Interval for *Exp(B)*	
Response variable group	Predictor variable		*p*	*Exp(B)*	Lower Bound	Upper Bound
Never acceptable (n = 126)	Intercept		<.01			
	Extent of trust or distrust in data used to manage moose	Strongly trust	<.01	0.12	0.03	0.44
		Trust	<.01	0.13	0.06	0.28
		Neither	0[a]			
		Distrust	.09	1.77	0.92	3.40
		Strongly distrust	<.01	4.80	2.40	9.59
	Residence proximity to antlerless hunt area	Out	0[a]			
		In	<.01	3.52	1.79	6.92
	Years of experience hunting moose	<5	0[a]			
		5–9	.21	0.47	0.15	1.54
		10–14	.13	2.04	0.80	5.20
		15–20	.85	1.10	0.40	3.04
		>20	<.01	3.40	1.58	7.30
Always acceptable (n = 134)	Intercept		<.01			
	Extent of trust or distrust in data used to manage moose	Strongly trust	.17	1.56	0.83	2.91
		Trust	.78	0.93	0.54	1.59
		Neither	0[a]			
		Distrust	.04	0.36	0.14	0.96
		Strongly distrust	.06	0.09	0.01	1.12
	Residence	Outside antlerless hunt unit	0[a]			
		Inside antlerless hunt unit	.38	1.21	0.79	1.84
	Years of experience hunting moose	<5	0[a]			
		5–9	.03	2.59	1.13	5.97
		10–14	<.01	3.18	1.36	7.45
		15–20	.25	1.73	0.69	4.34
		>20	.03	2.30	1.07	4.95

[a]This parameter is set to zero because it is redundant.

group. However, the lower bounds of the confidence intervals of the exponential beta coefficients for each significant hunter experience category were close to 1 (i.e., equal odds) (Table 3), and proportional differences in responses between *always* and *sometimes acceptable* were only significant for hunters with < 5 years of moose hunting experience (Table 2). For all other variable categories in the model, the *always* and *sometimes acceptable* were statistically similar.

Approval toward antlerless regulation characteristics

Hunter approval of the design of the antlerless moose hunt was influenced by timing, location, and type of hunt. Hunters who felt antlerless hunts were *never acceptable* were less likely to complete this section of the questionnaire because they strongly disapproved of all antlerless hunt types, regardless of design. Therefore, I based estimates of the extent of approval on hunters who reported that that antlerless hunts were *always* or *sometimes* acceptable. Hunters expressed the strongest approval for resident-only drawing and registration hunts limited to antlerless females without calves that occurred during August through November (Table 4). Hunters expressed the strongest disapproval for

Table 4. Interior Alaska moose hunter survey responses to questions on the extent of approval or disapproval of antlerless hunts based on timing of moose hunts, locations where hunts occur, how permits are allocated, and the type of moose allowed for harvest, and hunter eligibility.

Category	Characteristic	*n*	Median	*SD*
Timing	August	682	4	1.4
	September	692	4	1.3
	October	689	4	1.3
	November	681	4	1.3
	December	681	3	1.3
	January	680	3	1.3
	February	681	2	1.2
	March	678	2	1.1
	April	665	2	1.0
Location	Everywhere	686	4	1.3
	Areas difficult to access	678	4	1.1
	Areas easy to access	682	4	1.2
	Away from communities	680	4	1.1
	Near communities	678	3	1.2
	High-moose-density areas	694	4	0.9
Permit type	General	686	2	1.3
	Drawing	704	4	1.1
	Registration	691	4	1.3
Moose type	Any antlerless	692	3	1.4
	Cow without calf	701	4	1.0
	Cow with calf	688	1	1.1
	Calf	681	2	1.3
Hunter eligibility	Resident only	708	5	0.9
	Resident & nonresident	698	2	1.0
	Youth hunt	705	4	1.2
	Senior hunt	707	4	1.1

Note. Median response scaled from 1 = strongly disapprove to 5 = strongly approve.

general permit hunts for cows with calves that occurred during February through April, and that allowed both residents and nonresidents to participate (Table 4).

Discussion

Despite demonstrating that the vast majority of moose hunters (85%) approved of antlerless hunts *always* or *sometimes* (study objective 1), the voice of the minority of hunters (15%) who reported antlerless hunts as *never acceptable* received a relatively high amount of wildlife management and public media attention in Interior Alaska for nearly a decade preceding this study (Boertje et al., 2007, 2012b; Fairbanks Daily News Miner, 2008, 2012a; Young & Boertje, 2011; Young et al., 2006). Perhaps this group has been the most vocal during LAC meetings, which serve as the forum for public comment on wildlife issues such as antlerless hunts. A strong voice in opposition to antlerless hunts by a small but organized group of hunters may influence LAC member perceptions of overall public opinion, especially if hunters in favor of antlerless hunts do not attend meetings to express their opinion. Decisions made by LACs inform Board of Game proceedings and may function as a legal tool to block antlerless hunts if the majority of active members in LACs vote against them (Alaska Statute 16.05.780). LAC meetings also are one of the primary ways that ADF&G obtains feedback from hunters, which makes it critical to assess who attends these meetings. In Fairbanks, the second largest city in Alaska, the 15-member advisory committee conducts meetings that are typically attended

by 20–50 residents of the community (~0.005% of hunters in the area). Based on comments submitted by the public to the LAC and posted as meeting minutes online, dissatisfied hunters are more likely to voice their opinion than those satisfied with the current management and hunting conditions (ADF&G 2017a). How well the values and attitudes of the LAC and of the public attendees represent the local hunter population is unknown, suggesting a greater need to ensure the voice of all hunter groups is represented.

Similarities and differences among acceptance groups (study objective 2)

Regardless of acceptance of antlerless hunts, 99% of the hunters were strongly motivated to hunt moose for the meat. This finding separates Alaska moose hunters from research on deer hunters in other parts of North America where studies have shown that "putting meat in the freezer" typically receives a middle to lower motivation ranking (Decker & Connelly, 1989; Gigliotti, 2000). Differences in satisfaction or acceptance of antlerless hunts have been attributed to both hunter age and harvest success (Gigliotti, 2000; Heberlein, 2002; Schroeder et al., 2014), but moose hunters in the *never acceptable* group were of the same age and equally as likely as those in the *sometimes* and *always* groups to both harvest a moose and harvest a female moose. The reason why hunters who found antlerless hunts *never acceptable* also harvested female moose may be related to the concept of "tragedy of the commons" (Hardin, 1968). Specifically, some hunters may think that an antlerless moose harvest is contrary to the long-term common good of the shared resource, but the individual actions of those same hunters will optimize their own interests over the short term. I surmise that hunters in the *never acceptable* group likely adopted the mentality that if they don't shoot the cow, someone else will. In addition, "filling the freezer" (top hunter motivation) may suppress other common-good motivations, such as maintaining moose population health (second lowest hunter motivation).

Differences in acceptance of antlerless hunts between people who resided in and out of the GMU might have been related to crowding, competition, and territoriality. Liberalizing antlerless hunts allowed more moose to be eligible for harvest, and extended the hunting season. More hunters were on the landscape in general and during times they weren't normally present before antlerless hunts (ADF&G, 2017b). With relatively few roads and navigable rivers in the hunting area, higher hunter densities would create more competition and crowding in easily accessible areas. These factors have been shown to reduce hunter satisfaction (Heberlein, 2002). People (particularly local residents) who hunted in the area before antlerless hunts were liberalized may be more aware of the influx of hunters or the negative consequences of increased hunter numbers. Based on a moose hunter survey in Sweden, local hunters believed that policy changes that bring additional hunters into their area would reduce hunt quality, and increase social tension and conflict (Willebrand, 2009). This may explain why people residing in the GMU where antlerless hunts occurred were more likely to find them *never acceptable*. Similarly, people with well-established moose hunting camps or cabins that had high fidelity to a particular hunting area may also have found antlerless hunts *never acceptable* because they perceive ownership of these territories through informal rules, similar to fisherman who defend "their" lobster (*Homarus spp.*) fishery from "outsiders" (Turner, Gray, Polunin, & Stead, 2013).

My finding that extent of hunter trust or distrust was the best predictor of hunter acceptance of antlerless hunts aligns with a rapidly growing body of literature on the association between agency trust and support of wildlife management regulations (Cvetkovich & Winter, 2003; Rudolph & Riley, 2014; Schroeder et al., 2014; Sponarski, Vaske, Bath, & Musiani, 2014; Vaske, Timmons, Beaman, & Petchenik, 2004). In Interior Alaska, moose hunter distrust may be an artifact of problematic management decisions of the past that led to undesirable outcomes. Poorly timed liberalized antlerless hunts were implemented in GMU 20A in the early 1970s following consecutive harsh winters. These factors contributed to a dramatic decline in the GMU 20A moose population (from ~20,000 in the mid-1960s to ~2,800 in the mid-1970s), which is well below the management objective (~10,000–12,000 moose; Young & Boertje, 2011). Managers suggested that the multiyear stretch of below-average moose harvest in the past created concern among members of the LACs that antlerless hunts were inappropriate and increased vulnerability of the moose population to unintended declines (Young et al., 2006). Hunter discontent in the early 1970s led to the passage of AS 16.05.780, which prohibited the harvest of antlerless moose unless recommended by ADF&G and approved by a majority vote of the LAC in that GMU. Hunter distrust in agency data is likely due to these negative past experiences, particularly among older hunters who resided in the area during the 1970s. Slovic (1993) contends that trust declines more following negative experiences than it increases following positive experiences. If this "asymmetry principle" is true, then trust will be hard to regain once lost.

Another explanation for the strong distrust of agency moose data in the *never acceptable* group may be related to a disagreement between hunters and the management agency on the estimates of the moose population size (Freddy et al., 2004). For example, the majority of hunters in the *never acceptable* group felt that the moose population should be increased (40%) or greatly increased (30%). The moose managers estimating too many moose and the *never acceptable* hunters perceiving too few moose may both be correct because of differences in approaches to determining moose numbers. ADF&G estimates moose numbers over a large area (100s km^2) after Fall moose migration during the winter months when snow cover facilitates detectability during aerial surveys. Hunters usually interact with moose in relatively smaller areas (few km^2) during September before snow accumulation and Fall migration. Moose distributions also are different pre and post migration (Boertje et al., 2009). Hunters are usually clumped in easily accessible areas where hunting pressure reduces moose densities or temporarily pushes moose into inaccessible sanctuaries. Mismatches in the timing when people hunt and when ADF&G moose surveys occur, along with mismatches in the spatial scale of the landscape with which hunters interact and ADF&G surveys may create equally accurate, but different assessments of moose population levels. It is not uncommon for divergence to occur between local knowledge and scientific data because of differences in the methods and assumptions during information collection and interpretation (Brinkman et al., 2016). I suggest incorporating spatially and temporally specific data on hunter access when calculating game available to hunters – such an approach may help highlight situations where conflict may arise from differences in the interpretation of moose densities between hunters and biologists (Brinkman, Chapin, Kofinas, & Person, 2009; Brinkman, Kofinas, Hansen, Chapin, & Rupp, 2013).

Approval toward antlerless regulation characteristics (study objective 3)

Hunter disapproval of late-season antlerless hunts (Table 4) may be related to three issues. First, moose bulls begin to shed their antlers in January. Therefore, hunters may be concerned that late-season antlerless hunts are more likely to harvest mature male moose, which may reduce opportunities to harvest moose the following year in areas with antler restrictions (e.g., some hunting areas in Interior Alaska restrict harvest to males with antlers that are > 127 cm). The second reason for disapproval of late-season antlerless hunts could be related to potential conflict with trappers. Snowmobiles and trapline trails are commonly used for moose hunts extending past November. Increased traffic on and disturbance to personal trapline trails can be frustrating for trappers in the area and may lead to human conflict (Dorendorf, Fix, & Prugh, 2016). Lastly, hunters did not approve of regulations that allow the harvesting of calves or a cow with a calf (Table 4), and may be concerned about harvesting of a pregnant moose. With the breeding season peaking in late September, the fetus or fetuses are easily identified when field dressing adult female moose in winter.

Based on changes in regulations of antlerless moose hunts over the last decade, ADF&G moose management has been moving in a direction that aligns with the ideal structure of antlerless hunts according to survey results (Table 4). For example, the proportion of late season (after November) antlerless hunts has been reduced or discontinued. There has also been a trend toward a greater proportion of drawing hunts, which exerts more control over harvest and reduces opportunities for overshooting harvest objectives. Furthermore, antlerless hunts have been driven by moose population size, productivity, and habitat condition, so they generally focus on areas in which ADF&G estimates relatively high moose numbers (Boertje et al., 2007). With antlerless hunts not presenting a trophy opportunity, there has been and may be little reason to open the hunt to nonresidents who are often more motivated to shoot an antlered animal (Eliason, 2008). Therefore, ADF&G's continued regulation that limits antlerless hunt opportunities to Alaska residents aligns with hunter approval and may be unlikely to cause conflict with nonresident hunters.

Management implications

Trust in agency data appears to be a fundamental factor among the relatively small group of hunters finding antlerless hunts *never acceptable*. Despite distrust being an important factor among this group, a relatively high proportion of Alaska moose hunters (61%) trusted their state agency's management of the resource compared with other states. Rudolph and Riley (2014) reported that 31% of Michigan deer hunters trusted in their state agency to establish appropriate regulations. Greater communication among wildlife managers and hunters dissatisfied with antlerless hunts and special attention to the process of establishing antlerless hunts may help reduce future conflict (Rudolph & Riley, 2014; Triezenberg, Riley, & Gore, 2016). Although ADF&G places considerable effort into outreach and education, the transmission of information is mainly from the agency to the hunter. Involving skeptical hunters in conversations about the design and implementation of ADF&G moose management may not be enough to increase acceptance of agency data, if ample time isn't allocated to gaining trust (Freddy et al., 2004).

Creation of new streams of communication from hunters to the agency may help identify misunderstandings, and result in greater trust and participation in the management process by diverse groups of hunters. For example, periodic surveys of a representative cross-section of the entire hunter population will enhance engagement by hunters who do not prefer traditional channels of communication (e.g., LACs, Board of Game Meetings). Some of these traditional channels may get disproportionate feedback mainly from hunters dissatisfied with the current management process, but it is impossible to determine without scientific surveys whether their attitudes represent the minority or majority of hunters. Ultimately, effective management of a public resource requires balance in game management influence and the acknowledgment of decision responsibility among hunters with different views, and between hunters and wildlife managers.

Acknowledgment

I thank all the hunters who participated in this survey for sharing their time and thoughts. I thank the Alaska Department of Fish and Game for providing access to their hunter record database. Lastly, I thank the hunters, biologists, and local advisory committee members for providing comments on earlier drafts of the survey questionnaire. C. Brown, B. Crevensten, B. Melegari, and P. Fix provided insights on project design, online survey implementation, and data entry.

Funding

Funding for this study was provided by a grant from the National Science Foundation (0732758, 1208927).

References

ADF&G [Alaska Department of Fish and Game]. (2017a). *Advisory Committees*. Alaska Department of Fish & Game. Retrieved from http://www.ADF&G.alaska.gov/index.cfm?ADF&G=process.acoverview

ADF&G [Alaska Department of Fish and Game]. (2017b). *Harvest Lookup*. Alaska Department of Fish & Game. Retrieved from https://secure.wildlife.alaska.gov/index.cfm?fuseaction=harvest.lookup

Boertje, R. D., Keech, M. A., Young, D. D., Kellie, K. A., & Seaton, C. (2009). Managing for elevated yield of moose in interior Alaska. *Journal of Wildlife Management*, *73*(3), 314–327. doi:10.2193/2007-591

Boertje, R. D., Kellie, K. A., Seaton, C., Keech, M. A., Young, D. D., Dale, B. W., … Aderman, A. R. (2007). Ranking Alaska moose nutrition: Signals to begin liberal antlerless harvests. *Journal of Wildlife Management*, *71*(5), 1494–1506. doi:10.2193/2006-159

Boertje, R. D., Valkenburg, P., & McNay, M. (1996). Increases in moose, caribou, and wolves following wolf control in Alaska. *Journal of Wildlife Management*, *60*, 474–489. doi:10.2307/3802065

Bradford, J. B., & Hobbs, N. T. (2008). Regulating overabundant ungulate populations: An example for elk in Rocky Mountain National Park, Colorado. *Journal of Environmental Management*, *86*(3), 520–528. doi:10.1016/j.jenvman.2006.12.005

Brinkman, T. J., Chapin, T., Kofinas, G., & Person, D. K. (2009). Linking hunter knowledge with forest change to understand changing deer harvest opportunities in intensively logged landscapes. *Ecology and Society*, *14*(1), 36. doi:10.5751/ES-02805-140136

Brinkman, T. J., Hansen, W. D., Chapin, F. S. III,, Kofinas, G., BurnSilver, S., & Rupp, T. S. (2016). Arctic communities perceive climate impacts on access as a critical challenge to availability of subsistence resources. *Climatic Change*, *139*, 413–427. doi:10.1007/s10584-016-1819-6

Brinkman, T. J., Kofinas, G., Hansen, W. D., Chapin, F. S. III,, & Rupp, S. (2013). A new framework to manage hunting: Why we should shift focus from abundance to availability. *Wildlife Professional*, *7*(3), 38–43.

Cornicelli, L., Fulton, D. C., Grund, M. D., & Fieberg, J. (2011). Hunter perceptions and acceptance of alternative deer management regulations. *Wildlife Society Bulletin*, *35*, 323–329. doi:10.1002/wsb.v35.3

Côté, S. D., Rooney, T. P., Tremblay, J. P., Dussault, C., & Waller, D. M. (2004). Ecological impacts of deer overabundance. *Annual Review of Ecology, Evolution, and Systematics*, *35*, 113–147. doi:10.1146/annurev.ecolsys.35.021103.105725

Cvetkovich, G. T., & Winter, P. L. (2003). Trust and social representations of the management of threatened and endangered species. *Environment and Behavior*, *35*, 286–307. doi:10.1177/0013916502250139

D'Angelo, G. J., & Grund, M. D. (2015). Evaluating competing preferences of hunter and landowners for management of deer populations. *Human-Wildlife Interactions*, *9*(2), 236–247.

Decker, D. J., & Connelly, N. A. (1989). Motivations for deer hunting: Implications for antlerless deer harvest as a management tool. *Wildlife Society Bulletin*, *17*, 455–463.

Decker, D. J., Forstchen, A. B., Organ, J. F., Smith, C. A., Riley, S. J., Jacobson, C. A., … Siemer, W. F. (2014). Impacts management: An approach to fulfilling public trust responsibilities of wildlife agencies. *Wildlife Society Bulletin*, *38*(1), 2–8. doi:10.1002/wsb.380

Dorendorf, R. R., Fix, P. J., & Prugh, L. R. (2016). Motivations of fur trappers in Interior Alaska. *Human Dimensions of Wildlife*, *21*, 522–537. doi:10.1080/10871209.2016.1193922

Eliason, S. L. (2008). A statewide examination of hunting and trophy nonhuman animals: Perspectives of Montana hunters. *Society & Animals*, *16*(3), 256–278. doi:10.1163/156853008X323402

Fairbanks Daily News Miner. Jan 20. (2012b). *Hunters, biologists take sides on antlerless moose hunts around Fairbanks*. Retrieved from http://nl.newsbank.com/nl-search/we/Archives

Fairbanks Daily News Miner. Jan. 15. (2012a). *Antlerless moose debate divides hunters*. Retrieved from http://nl.newsbank.com/nl-search/we/Archives

Fairbanks Daily News Miner. Jan. 6. (2008). *Growing number of hunters want antlerless moose hunts stopped*. Retrieved from http://nl.newsbank.com/nl-search/we/Archives

Freddy, D. J., White, G. C., Kneeland, M. C., Kahn, R. H., Unsworth, J. W., deVergie, W. J., … Wagner, C. H. (2004). How many mule deer are there? Challenges of credibility in Colorado. *Wildlife Society Bulletin*, *32*(3), 916–927. doi:10.2193/0091-7648(2004)032[0916:HMMDAT]2.0.CO;2

Fulton, D. C., & Manfredo, M. J. (2004). A panel design to assess the effects of regulatory induced reductions in opportunity on deer hunters' satisfaction. *Human Dimensions of Wildlife*, *9*, 35–55. doi:10.1080/10871200490272160

Gasaway, W. C., Stephenson, R. O., Davis, J. L., Shepherd, P. E. K., & Burris, O. E. (1983). Interrelationships of wolves, prey, and man in Interior Alaska. *Wildlife Monographs*, *84*, 55pp.

Gigliotti, L. M. (2000). A classification scheme to better understand satisfaction of Black Hills deer hunters: The role of harvest success. *Human Dimensions of Wildlife*, *5*, 32–51. doi:10.1080/10871200009359171

Gortázar, C., Acevedo, P., Ruiz-Fons, F., & Vicente, J. (2006). Disease risks and overabundance of game species. *European Journal of Wildlife Research*, *52*(2), 81–87. doi:10.1007/s10344-005-0022-2

Hardin, G. (1968). The tradegy of the commons. *Science*, *162*, 1243–1248. doi:10.1126/science.162.3859.1243

Heberlein, T. A. (2002). Too many hunters or not enough deer? Human and biological determinants of hunter satisfaction and quality. *Human Dimensions of Wildlife*, *7*, 229–250. doi:10.1080/10871200214753

Hrubes, D., Ajzen, I., & Daigle, J. (2001). Predicting hunting intentions and behavior: An application of the theory of planned behavior. *Leisure Sciences*, *23*(3), 165–178. doi:10.1080/014904001316896855

Krausman, P. R., Christensen, S. A., McDonald, J. E., & Leopold, B. D. (2014). Dynamics and social issues of overpopulated deer ranges in the United States: A long term assessment. *California Fish and Game*, *100*(3), 436–450.

Lauber, T. B., Decker, D. J., Leong, K. M., Chase, L. C., & Schusler, T. M. (2012). Stakeholder engagement in wildlife management. In D. Decker, S. Riley, & W. Siemer (Eds), *Human dimensions of wildlife management* (pp. 139–156). Baltimore, Maryland: The Johns Hopkins University Press.

Leong, K. M., Decker, D. J., & Lauber, T. B. (2012). Stakeholders as beneficiaries of wildlife management. In D. Decker, S. Riley, & W. Siemer (Eds), *Human dimensions of wildlife management* (pp. 26–40). Baltimore, Maryland: The Johns Hopkins University Press.

Marcoux, A., & Riley, S. J. (2010). Driver knowledge, beliefs, and attitudes about deer-vehicle collisions in southern Michigan. *Human-Wildlife Interactions*, *4*, 47–55.

McCullough, D. R. (1979). *The George Reserve deer herd*. Ann Arbor, Michigan: Univ. Michigan Press.

McLaren, B. E., Roberts, B. A., Djan-Chekar, N., & Lewis, K. P. (2004). Effects of overabundant moose on the Newfoundland landscape. *Alces*, *40*, 45–59.

McShea, W. J., Underwood, H. B., & Rappole, J. H. (1997). *The science of overabundance: Deer ecology and population management*. Washington, D.C.: Smithsonian Institution Press.

Mowry, T. (2013). *Alaska legislators hunting for feedback on cow moose hunts*. Fairbanks Daily News Miner. Retrieved from http://www.newsminer.com/features/outdoors/alaska-legislators-hunting-for-feedback-on-cow-moose-hunts/article_94d1dd30-63d4-11e3-bab3-001a4bcf6878.html

Rossi, A. N., & Armstrong, J. B. (2008). Theory of reasoned action vs. theory of planned behavior: Testing the suitability and sufficiency of a popular behavior model using hunting intentions. *Human Dimensions of Wildlife*, *4*, 40–56. doi:10.1080/10871209909359156

Rudolph, B. A., & Riley, S. J. (2014). Factors affecting Hunters' trust and cooperation. *Human Dimensions of Wildlife*, *19*, 469–479. doi:10.1080/10871209.2014.939314

Schroeder, S. A., Cornicelli, L., Fulton, D. C., & Grund, M. D. (2014). What predicts support for antler point restrictions? *Human Dimensions of Wildlife*, *19*, 301–318. doi:10.1080/10871209.2014.915598

Seaton, C. T., Paragi, T. F., Boertje, R. D., Kielland, K., DuBois, S., & Fleener, C. L. (2011). Browse biomass removal and nutritional condition of moose, Alces alces. *Wildlife Biology*, *17*, 55–66. doi:10.2981/10-010.

Slovic, P. (1993). Perceived risk, trust, and democracy. *Risk Analysis*, *13*(6), 675–682. doi:10.1111/risk.1993.13.issue-6

Sponarski, C. C., Vaske, J. J., Bath, A. J., & Musiani, M. M. (2014). Salient values, social trust, and attitudes toward wolf management in south-western Alberta, Canada. *Environmental Conservation*, *41*(4), 303–310. doi:10.1017/S0376892913000593

Triezenberg, H. A., Riley, S. J., & Gore, M. L. (2016). A test of communication in changing harvest behaviors of deer hunters. *The Journal of Wildlife Management*, *80*(5), 941–946. doi:10.1002/jwmg.v80.5

Turner, R. A., Gray, T., Polunin, N. V. C., & Stead, S. M. (2013). Territoriality as a driver of fisher's spatial behavior in the Northumberland lobster fishery. *Society and Natural Resources*, *26*, 491–505. doi:10.1080/08941920.2012.709313

Van Deelen, T. R., Dhuey, B., McCaffery, K. R., & Rolley, R. E. (2006). Relative effects of baiting and supplemental antlerless seasons on Wisconsin's 2003 deer harvest. *Wildlife Society Bulletin*, *34*, 322–328. doi:10.2193/0091-7648(2006)34[322:REOBAS]2.0.CO;2

Vaske, J. J., & Mandfredo, M. J. (2012). Social and psychological considerations in wildlife management. In D. Decker, S. Riley, & W. Siemer (Eds), *Human dimensions of wildlife management* (pp. 43–57). Baltimore, Maryland: The Johns Hopkins University Press.

Vaske, J. J., & Roemer, J. M. (2013). Differences in overall satisfaction by consumptive and nonconsumptive recreationists: A comparative analysis of three decades of research. *Human Dimensions of Wildlife*, *18*, 159–180. doi:10.1080/10871209.2013.777819

Vaske, J. J., Timmons, N. R., Beaman, J., & Petchenik, J. (2004). Chronic wasting disease in wisconsin: Hunter behavior, perceived risk, and agency trust. *Human Dimensions of Wildlife*, *9*, 193–209. doi:10.1080/10871200490479981

Whittaker, D., Manfredo, M. J., Fix, P. J., Sinnott, R., Miller, S., & Vaske, J. J. (2001). Understanding beliefs and attitudes about an urban wildlife hunt near Anchorage, Alaska. *Wildlife Society Bulletin*, *29*, 1114–1124.

Willebrand, T. (2009). Promoting hunting tourism in north Sweden: Opinions of local hunters. *European Journal of Wildlife Research*, *55*, 209–216. doi:10.1007/s10344-008-0235-2

Young, D. D. Jr,, & Boertje, R. D. (2011). Prudent and imprudent use of antlerless moose harvests in interior Alaska. *Alces*, *47*, 91–100.

Young, D. D., Boertje, R. D., Seaton, C. T., & Kellie, K. A. (2006). Intensive management of moose at high density: Impediments, achievements, and recommendations. *Alces*, *42*, 41–48.