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## Motivations of Fur Trappers in Interior Alaska

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### ABSTRACT

Understanding how and why trapping effort varies among fur trappers is necessary to accurately interpret trends in fur harvest for wildlife management. We mailed questionnaires to 1,760 fur trappers in interior Alaska to characterize motivations for trapping and primary factors affecting trapping effort. A cluster analysis revealed four groups with distinct motivations for trapping: wildlife management (17% of trappers), recreation (39%), subsistence (18%), and solitude (26%) trappers. Perceived furbearer abundance had the greatest effect on trapping effort, while access to land and human conflicts were the most important social issues to trappers. Economic gain was the least important motivation for trapping among respondents. Because trapping effort mirrored furbearer abundance, harvest-based abundance indices may amplify true changes in population sizes. Our findings also suggested that managers seeking to maintain or increase satisfaction among trappers should focus on reducing human conflicts and maximizing the non-monetary benefits of trapping.

### KEYWORDS

Alaska; furbearer management; motivations; trapping; trapping effort

## Introduction

Monitoring changes in furbearer population and harvest levels, as well as factors contributing to these changes, is necessary to make sound management decisions. Fur harvest records are commonly used as indices of furbearer population trends, but wildlife managers currently lack information about how external factors (e.g., weather, fur value, gas prices), social issues (e.g., human conflict), and motivations (e.g., nature appreciation, fitness, escape, relaxation) affect trapping effort. A better understanding of the relationship between motivations, external factors, social issues, and trapping effort may improve the accuracy of harvest-based abundance indices.

Because furbearers occur at low densities, obtaining accurate estimates of their populations is difficult (Becker, 1991; Skalski et al., 2011). Most wildlife management agencies use fur harvest trends as indices of abundance (Gese, 2001; Hiller, Etter, Belant, & Tyre, 2011; Royama, 1992). This method, however, has been criticized for not including a measure of effort invested in trapping (DeVink, Berezanski, & Imrie, 2011; Smith, Brisbin, & White, 1984; Winterhalder, 1980). Variables such as fuel and fur prices, access to land, and social conflict may be important in determining how much effort trappers invest in trapping,

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which in turn could influence harvest levels. Understanding the various forces that change effort is necessary for managers to accurately interpret changes in harvest patterns.

A combination of motivations likely plays into the decision to trap (Todd & Boggess, 1987). These motivations are complex, numerous (Manfredo, Driver, & Tarrant, 1996), and vary by trapper. Motivations were used to describe how managers could increase the satisfactions of hunters using a multiple-satisfaction approach to wildlife management (Hendee, 1974; Hendee & Potter, 1971). Instead of managing wildlife with one goal in mind (e.g., consumptive use), the multiple-satisfaction framework brought to light the various reasons people engaged in outdoor activities. For example, hunters may participate in white-tailed deer (*Odocoileus virginianus*) hunting to enjoy the natural environment, put meat in the freezer, and be with hunting companions (Decker & Connelly, 1989). Varying motivational characteristics have been demonstrated between hunters belonging to different hunting groups (e.g., casual, intermediate, focused, veteran; Needham, Vaske, Donnelly, & Manfredo, 2007). This multiple-satisfaction framework was used to characterize motivations of trappers as well (Daigle, Muth, Zwick, & Glass, 1998; Peek, 2000; Siemer, Batcheller, Glass, & Brown, 1994). Bailey (1981) conducted a study of trapping motivations in Alaska and found outdoor experience to be the most important motivation for trapping. Trapping effort may vary among trappers with different motivations, and external factors and social issues may also differentially affect trappers in different motivational groups. Determining the strongest motivations for trapping and how motivations influence trapping effort may allow furbearer managers to increase satisfaction for trappers, and accurately target management actions with an increased knowledge of trapper groups.

Alaska's diverse trapping culture merits an investigation into how trapping motivations, external factors, and social issues influence trapping effort among trapping groups. Social issues and external factors may influence trapping effort of all trappers in a similar way. Alternatively, trappers may respond to these factors differentially based on their motivations to trap. Trappers from urban areas could have different motivations for trapping compared to members of rural fly-in-only communities (bush communities). Given the lack of economic opportunities in bush communities (Brinkman et al., 2014), money made from trapping could be more important compared to urban trappers, leading to greater trapping effort in bush communities. If trapping effort differs between motivational groups, its likely that harvest differs as well (DeVink et al., 2011). Clustering trappers by their motivations may allow Alaskan wildlife managers to better understand different groups of the trapping population (Schroeder & Fulton, 2015), and how their effort differs in relation to their motivations. Clustering groups of consumptive and non-consumptive users of wildlife provided key information for regulatory decision-making by land managers (Hautaluoma & Brown, 1978; Manfredo & Larson, 1993; Martín-López, Montes, & Benayas, 2007), and has the potential to do so for trappers across North America.

Trapping effort may be influenced not only by motivations, but also by external factors that must be taken into account in the decision to trap. These include fur prices (Daigle et al., 1998; Gosselink, Van Deelen, Warner, & Joselyn, 2003; McDonald & Harris, 1999), fuel prices (Brinkman et al., 2014; Schumacher, 2013), furbearer abundances (DeVink et al., 2011), and weather conditions (Yom-Tov, Yom-Tov, MacDonald, & Yom-Tov, 2007). Fur trapping was lucrative during the 1920s (Andersen, 1993), but fur prices have

since declined. Yet a resilient group of trappers continues to participate today. Previous studies have found that fur values play a key role in trapper participation (Siemer et al., 1994), but more recent evidence shows that this motivation has become weaker (e.g., Fortin & Cantin, 2005; Hiller et al., 2011; Kapfer & Potts, 2012). Trappers may also adjust their effort according to perceived furbearer abundance by increasing effort when animals are abundant with the goal of animal control (Daigle et al., 1998) or wildlife management (Siemer et al., 1994) through reduced effort when animals are scarce. There is evidence that these external factors influence trapping effort (Banci & Proulx, 1999; Gese, 2001; Landriault, Naylor, Mills, & Baker, 2012), but we do not know which has the greatest influence.

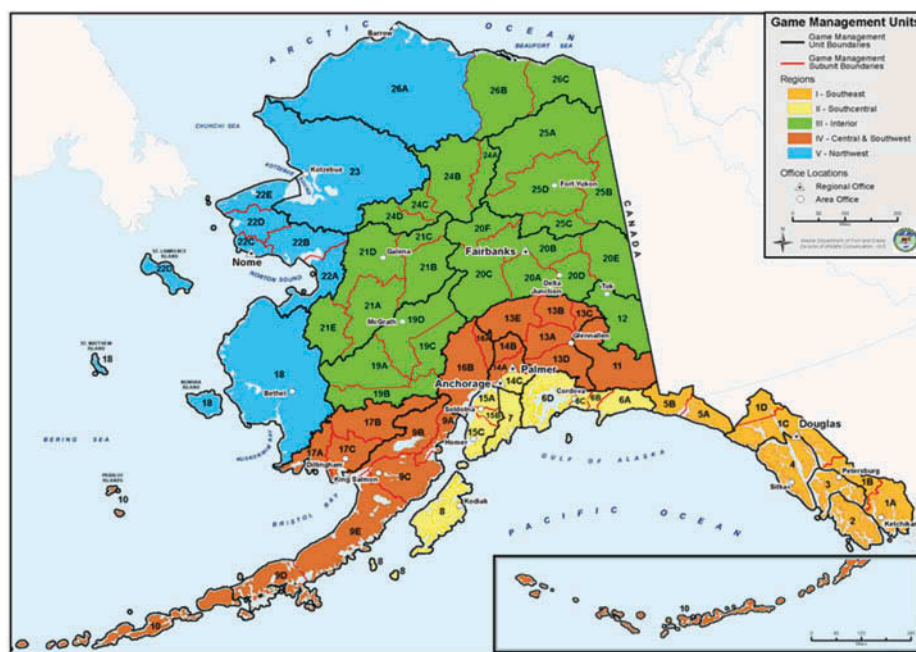
Social issues pertaining to trapping may also influence trapping effort. Increased urbanization, reduced access to land, and the animal rights movement all contributed to recent declines in trapper participation across the United States (Daigle et al., 1998; Jung & Slough, 2011). Although participation in trapping is still relatively high in Alaska, the proportion of licensed trappers in Alaska has declined steadily since the 1980s (Alaska Department of Fish and Game, 2015; Andersen, 1993). This decline may be due to low trapper recruitment, anti-trapping sentiment, conflicts with recreationists and other trappers, and difficulty finding access to land. In Canada, governments typically require that trap lines are registered, which reduces conflicts over trap line ownership (Canadian Wildlife Services, 2014). In comparison, Alaska does not have registered trap lines, and the majority of public land is open to trapping. It is legal for trappers to cut small trails on designated state land, although trappers have no legal rights to trails they create (Alaska Department of Natural Resources, 2015). Thus, an informal system exists in Alaska where trap lines are “owned” by those who originally cleared the trail. Other trappers and recreationalists may legally use these trails, potentially leading to conflicts.

The objectives of this article were to: (a) characterize motivations and describe unique groups of interior Alaskan trappers, and (b) identify the primary motivations, external factors, and social issues influencing trapping effort. The goal was to provide insight into a potentially unique group of trappers (i.e., Alaskans), provide data comparable to previous studies of trapper motivations for regional comparisons, and extend research on trapper motivations to better understand harvest.

## Methods

### *Study area and study population*

We defined the study area as “interior” Alaska that includes game management units 12, 19–21, 24, and 25 (Figure 1; Alaska Department of Fish and Game, 2014). To identify trappers operating in the study area, we obtained physical addresses of trapping license holders in 2012 from the Alaska Department of Fish and Game. This included all persons who purchased a trapping license (trapping, combination hunting-trapping, hunting-fishing-trapping licenses) during 2012. We assumed addresses within interior Alaska belonged to trappers that trapped in the interior during the 2012 trapping season, which we later verified by respondents’ indication of the game management unit in which they trapped. Trappers with physical addresses outside of the interior were not included in the study.



**Figure 1.** Map of game management units in Alaska, USA. For this study, game management units 12, 19–21, 24, and 25 are defined as “interior” Alaska (Alaska Department of Fish and Game, 2014).

## Data collection

### Determination of sample size

In 2012, 4,194 people bought trapping licenses in interior Alaska. We used Raosoft (2004) to determine that a sample of 352 useable questionnaires would provide adequate statistical power to address our research objectives. We mailed questionnaires to 1,760 trappers, conservatively estimating we would receive a 20% response rate. Trapping license holders ages 18 years and older received a questionnaire. Trappers over the age of 60 years old have the option of obtaining a permanent identification card for hunting, fishing, and trapping instead of a trapping license in Alaska. We could not differentiate between card-holders that trapped and those that did not, and thus excluded them from the study.

### Questionnaire design

To guide questionnaire development, we conducted 16 semi-structured interviews by telephone and in person to explore external factors and identify social issues that may influence trapping effort of interior Alaskan trappers. Content analysis (Krippendorff, 2013) of those interviews confirmed seven motivational dimensions (lifestyle orientation, nature appreciation, affiliation with others, wildlife management, personal achievement, escape or relaxation, personal fitness), used by Daigle et al. (1998), Schroeder and Fulton (2015), and Siemer et al. (1994). Content analysis also revealed two additional dimensions: subsistence and economic. To allow for comparisons, generalization, and theory building we used the scales from Daigle et al. (1998) and Siemer et al. (1994) (with minor wording

changes for Alaska-specific context), but also developed scales to measure subsistence and economic motivations because the latter two motivations could be important to many Alaskan trappers. Interviewees then received a pilot questionnaire and we refined questions based on their feedback. After testing and a review of the literature, the final questionnaire contained a 19-item scale with six dimensions to measure the importance of social issues that could impact future trapping effort, a 28-item scale with six dimensions to measure the influence of external factors and social issues on future trapping effort, and a 30-item scale with nine hypothesized dimensions to measure the influence of motivations on trapping effort (Daigle et al., 1998; Siemer et al., 1994; Zwick, Muth, & Solan, 2006).

We presented social issues as statements and measured responses on a 7-point scale with endpoints strongly disagree and strongly agree. We provided a list of external factors and social issues that could affect trapping effort of the respondents, with responses measured on a 7-point scale with end points significantly decrease effort and significantly increase effort. The motivations were measured with a 7-point scale with endpoints strongly disagree and strongly agree. To explore differences among trappers, the final section contained questions about trapping effort (number of individual trap lines, length of each trap line in miles, months spent trapping, number of traps and snares set during the 2013–2014 season), questions about general demographics (population of residence, age, race), and general questions about trapping habits (mode of transportation on trap line, proportion of income earned from trapping). We recorded effort and demographic questions with a combination of fill in the blank, and multiple choice answers.

### ***Mailings***

We used the Dillman Total Design Method (Dillman, 2011) to maximize the response rate. Personalized mailings informed and supplied questionnaires to trappers. To announce the study, we sent a post card for initial contact in April, near the end of the 2013–2014 trapping season. We mailed the questionnaire with a cover letter 2 weeks after the post card. We contacted 1,760 trappers out of a total of 4,194 who purchased a trapping license in 2012. We sent the initial contact post card to the additional recipients four weeks after the original mailing, followed by the questionnaire 1 week later. Seven weeks after the initial contact post card, we sent a reminder post card. Eight and 10 weeks after the initial contact postcard, we sent a second questionnaire and a third questionnaire along with a modified cover letter. We randomly chose five people who returned completed questionnaires to receive \$50 gas gift cards 3 weeks after the final mailing. This reward provided extra incentive to return fully completed questionnaires.

### ***Non-response bias***

We conducted a non-response bias test through brief telephone interviews to see if a random selection of non-respondents differed from respondents. We used a shortened version of the questionnaire during interviews to reduce respondent burden. These interviews contained only key questions such as whether individuals trapped, which external factors affected their trapping effort, social issues of concern, motivations for trapping, the number of traps, and snares they typically set in one season.

**Statistical analyses**

We used exploratory factor analysis (EFA) for data reduction using a varimax rotation with principal-components extraction, where we retained dimensions with eigenvalues greater than 1 (Morgan, Gliner, & Harmon, 2006). To identify multicollinearity, we examined results of the EFA for both theoretical overlap among dimensions (i.e., face validity), and correlations between scales. Correlations greater than .5 suggested the presence of multicollinearity (Grewal, Cote, & Baumgartner, 2004). We interpreted factor loadings from EFA greater than .5 as a strong relationship between questions (Morgan et al., 2006). When EFA suggested two of our a priori dimensions loaded on a single factor, we combined those items into one scale if theoretical overlap was high (i.e., strong face validity). We tested internal consistency of the hypothesized external factor and social issue dimensions, as well as the motivation scales created through EFA, with Cronbach's alpha coefficient (Cronbach, 1951). Given the exploratory nature of the social issues and external factors we set the minimum Cronbach's alpha level at .6 as suggested in the literature (Peterson, 1994; Table 1). Variables with an alpha value of .6 or higher were averaged within each scale (Table 1). To identify groups of trappers with similar

**Table 1.** Exploratory factor analysis and reliability analysis of motivations to trap in interior Alaska, 2013.

Reason for trapping	<i>M</i>	<i>SD</i>	Factor loading	<i>α</i>
<b>Outdoor recreation</b>	<b>6.08</b>	<b>0.95</b>		<b>.894</b>
Enjoy nature	6.52	0.93	.741	
Learn about wildlife	6.29	1.09	.814	
Observing wildlife	6.25	1.13	.827	
Getting exercise	5.82	1.27	.718	
Feel like I am a part of nature	5.82	1.31	.684	
Staying in shape	5.77	1.31	.723	
<b>Personal achievement</b>	<b>5.75</b>	<b>1.08</b>		<b>.857</b>
Test my skills and abilities	5.85	1.26	.746	
Doing something challenging	5.84	1.19	.768	
Feeling a sense of accomplishment	5.69	1.37	.549	
Being self-sufficient	5.64	1.38	.54	
<b>Lifestyle orientation</b>	<b>5.63</b>	<b>1.15</b>		<b>.846</b>
Important part of lifestyle	5.80	1.31	.748	
Maintain tradition	5.66	1.40	.758	
Participate in favorite activity	5.60	1.33	.627	
Remain in touch with heritage	5.43	1.54	.707	
<b>Escape or relaxation</b>	<b>5.08</b>	<b>1.27</b>		<b>.832</b>
Getting a chance to spend time alone	5.46	1.44	.555	
Time to think	5.12	1.48	.769	
Getting away from everyday problems	4.87	1.74	.797	
For a change of routine	4.85	1.54	.799	
<b>Wildlife management</b>	<b>5.01</b>	<b>1.38</b>		<b>.816</b>
Predator control	5.32	1.63	.774	
Manage furbearer populations	5.04	1.53	.624	
Nuisance wildlife control	4.69	1.67	.806	
<b>Subsistence use of wildlife</b>	<b>4.82</b>	<b>1.38</b>		<b>.796</b>
Use furbearers to make clothes	5.41	1.47	.8	
Use fur for crafts or ceremonies	4.88	1.68	.822	
Use furbearers for food	4.14	1.77	.727	
<b>Economic</b>	<b>4.39</b>	<b>1.61</b>		<b>.855</b>
For a little extra spending money	4.91	1.71	.696	
To supplement family income	4.69	1.85	.783	
Provide main source of income	3.52	1.90	.781	

Note. Response scaled from 1 = strongly agree to 7 = strongly disagree.



motivational characteristics, we used a k-means cluster analysis with an ipsative transformation (Beaman & Vaske, 1995). We used chi-squared tests to determine whether demographics differed among groups.

We used one-way ANOVAs to determine whether social issues of importance differed among groups. Scheffé's and Tamhane's T2 (for unequal variances) post hoc tests were used to identify differences among trapper groups. We calculated trapping effort as:

$$\text{trapping effort} = \# \text{ traps and snares set} \times \text{length of trap line (km)} \times \text{weeks trapped.}$$

One-way ANOVAs, based on our significance level chosen, determined if trapping effort differed among groups, and Scheffé's post hoc tests were used to determine differences among groups. We log transformed trapping effort data to meet assumptions of normality. We used a significance level of  $p < .05$  for all tests.

## Results

Our returned questionnaires revealed a high portion of licensed trappers do not engage in trapping. Of the 1,760 mailings sent to trappers, 149 were returned as undeliverable, for a total sample of 1,611 potentially eligible trapping license holders. We received a total of 617 responses (38% response rate) of which 273 stated that they had never trapped, leaving a total sample of 344 eligible respondents that completed questionnaires for our analyses.

We contacted 25 non-respondents by telephone for a six-question survey based on the questionnaire. Forty percent of these non-respondents said they did not complete the questionnaire because they had never trapped, which is similar to respondents (44%). The remaining 60% of non-respondents did not respond for other reasons, such as being out of mail contact, or having recently moved. Non-respondents reported furbearer abundance, weather, access to land, and human conflict as the most important external factors and social issues influencing their trapping effort, which was similar to respondents. Chi-square tests of responses to the questions yielded non-significant differences among respondents and non-respondents, for example, human conflict,  $\chi^2(1) = 0.70$ ,  $p = .402$ . Weather concerned respondents slightly more than non-respondents (40% compared to 33%, respectively), though this difference was not significant,  $\chi^2(1) = 0.15$ ,  $p = .697$ . The proportion of respondents from communities with less than 1,000 residents was similar among respondents and non-respondents (41%,  $n = 344$ ; 45%,  $n = 447$ , respectively). Because non-respondents appeared to be similar to respondents, we did not weight the data.

Motivation questions reduced to seven dimensions based on eigenvalues greater than one (Table 1). The first dimension loaded on items from our hypothesized "nature appreciation" and "personal fitness" dimensions, with factor loadings ranging from .684–.827, and .718–.723, respectively. Based on high factor loadings, theoretical overlap between the two dimensions, and a strong correlation ( $r = .61$ ,  $p < .001$ ), we combined these dimensions to form a new dimension called "outdoor recreation." The two items from "affiliation with others" did not load above .5 on the seven dimensions. However, because the "affiliation with others" dimension was supported by Daigle et al. (1998) and Siemer et al. (1994) and based on high internal consistency ( $\alpha = .78$ ), we retained it as a scale and included it in the cluster analysis.



Interviewees consistently mentioned affiliation with other trappers as a reason for participation in trapping. Correlation matrices indicated no multicollinearity among motivational dimensions with the highest correlation ( $r = -.332$ ) between the “economic” and “escape or relaxation” dimensions.

A four-group solution of trappers provided the clearest distinctions between trapper motivational groups. We based group distinctions on an analysis of  $F$ -values associated with each group solution, and profiling groups based on variables (Grimm & Yarnold, 2000; Table 2). Defining characteristics of groups included: the “recreational” groups (the largest group; Table 2) high ipsative transformed mean (ITM) score on the outdoor recreation dimension (ITM = 0.91), the “management” groups high score on the wildlife management dimension (ITM = 0.6), the “subsistence” groups high score on the subsistence use of wildlife dimension (ITM = 0.53), and the “solitude” groups low score on affiliation with others dimension (ITM = -0.86). The recreational group scored lowest among groups on the economics dimension (ITM = -1.61), compared to the subsistence group who scored the highest, and had the only positive ITM of 0.06 (Table 2). Compared to others, the management group scored lowest on the escape or relaxation dimension (ITM = -1.18).

Trappers possessed distinct demographic differences among motivational groups. Among all groups, trappers mean age ranged from 44–49 with an overall mean of 45.5 ( $SD = 11.8$ ;  $n = 314$ ). The majority of interior Alaskan trappers were Caucasian/white trappers (72.9%,  $n = 310$ ), although the subsistence group was comprised mainly of Alaska Natives (61.5% Alaska Native, 38.5% Caucasian/white,  $n = 52$ ). Males held the majority compared to females among trapper groups (84.7% and 15.3% respectively,  $n = 340$ ). Average trapping experience was relatively high ( $M = 22$  years,  $SD = 15$ ,  $n = 336$ ), but subsistence trappers ( $M = 26$ ,  $SD = 15$ ,  $n = 55$ ) had more experience than recreational trappers ( $M = 18$ ,  $SD = 14$ ,  $n = 123$ ),  $F(3) = 4.39$ ,  $p = .005$ , Scheffé’s post hoc tests  $p = .018$ . More subsistence trappers (31.5%,  $n = 54$ ) gained greater than 21% of their annual income from trapping,  $\chi^2(3) = 32.939$ ,  $p < .001$ , Cramer’s  $V = .325$ , compared to others (management = 7.3%,  $n = 55$ ; recreational = 2.4%,  $n = 123$ ; solitude = 15%,  $n = 80$ ). Subsistence trappers were also most likely to live in a town or village with less than 500 people (63%),

**Table 2.** Mean motivational scores by cluster group.

Motivation scales	Management (Group 1) $n = 57$	Recreational (Group 2) $n = 125$	Subsistence (Group 3) $n = 58$	Solitude (Group 4) $n = 85$
Outdoor recreation	0.62 <sup>ac</sup> (6.08) <sup>a</sup>	0.91 <sup>b</sup> (6.32) <sup>a</sup>	0.34 <sup>ac</sup> (5.48) <sup>b</sup>	0.89 <sup>ab</sup> (6.11) <sup>a</sup>
Escape or relaxation	-1.18 <sup>a</sup> (4.22) <sup>a</sup>	0.29 <sup>b</sup> (5.54) <sup>b</sup>	-0.84 <sup>c</sup> (4.27) <sup>a</sup>	0.15 <sup>b</sup> (5.43) <sup>b</sup>
Personal achievement	0.25 <sup>a</sup> (5.63) <sup>abcd</sup>	0.55 <sup>b</sup> (5.89) <sup>abd</sup>	-0.01 <sup>a</sup> (5.15) <sup>ac</sup>	0.84 <sup>c</sup> (6.06) <sup>abd</sup>
Wildlife management	0.60 <sup>a</sup> (5.99) <sup>a</sup>	-0.29 <sup>b</sup> (4.77) <sup>b</sup>	-1.08 <sup>c</sup> (4.07) <sup>c</sup>	-0.01 <sup>d</sup> (5.22) <sup>b</sup>
Subsistence use of wildlife	-0.45 <sup>a</sup> (4.98) <sup>a</sup>	-0.35 <sup>a</sup> (4.71) <sup>a</sup>	0.53 <sup>b</sup> (5.74) <sup>b</sup>	-1.08 <sup>c</sup> (4.11) <sup>c</sup>
Affiliation with others	0.63 <sup>a</sup> (6.00) <sup>a</sup>	0.24 <sup>b</sup> (5.46) <sup>b</sup>	0.18 <sup>b</sup> (5.33) <sup>b</sup>	-0.86 <sup>c</sup> (4.39) <sup>c</sup>
Economic	-0.67 <sup>a</sup> (4.61) <sup>a</sup>	-1.61 <sup>b</sup> (3.28) <sup>b</sup>	0.06 <sup>c</sup> (5.21) <sup>a</sup>	-0.15 <sup>c</sup> (5.09) <sup>a</sup>
Lifestyle orientation	0.19 <sup>a</sup> (5.61) <sup>abc</sup>	0.26 <sup>a</sup> (5.52) <sup>ab</sup>	0.83 <sup>b</sup> (6.03) <sup>ac</sup>	0.22 <sup>a</sup> (5.48) <sup>ab</sup>

*Note.* An original scale ranging from 1 = strongly disagree, 4 = neutral, 7 = strongly agree was used to record respondents’ motivations (numbers inside parenthesis). Respondents’ answers to variables were reduced through factor analysis to an 8-item scale of motivations. A k-means cluster analysis was used to group similar responses into trapper types. Numbers in parentheses are the original means for the scale. Numbers outside the parentheses are the ipsative transformed score (z-score) based on the original mean. Sheffé’s post hoc tests were conducted for both the ipsative value and the original mean. Numbers with different superscripts (<sup>abcd</sup>) represent tests between groups within scales that were significant at  $p < .05$ .

$n = 57$ ;  $\chi^2(12) = 64.648$ ,  $p < .001$ , Cramer's  $V = .261$ , compared to management, recreational, and solitude groups (25%,  $n = 14$ ; 19%,  $n = 23$ ; 36%,  $n = 29$ , respectively).

Trapper motivations and demographics aided in distinguishing trapping effort among groups. The management group had more trap lines than both the solitude group and recreational group ( $M = 2.3$ ,  $SD = 1.5$ ;  $M = 1.7$ ,  $SD = 1$ ;  $M = 1.5$ ,  $SD = 0.80$ , respectively),  $F(3) = 8.49$ ,  $p < .001$ , Scheffé's post hoc tests  $p < .001$ ,  $p = .023$ , respectively, which was supported by their relatively high trapping effort. The recreational group had the lowest mean trapping effort ( $M = 3.55$ ,  $n = 60$ ,  $SD = 1.09$ ) compared to management ( $M = 4.52$ ,  $n = 31$ ,  $SD = 0.89$ ), subsistence ( $M = 4.50$ ,  $n = 26$ ,  $SD = 1.07$ ), and solitude ( $M = 4.34$ ,  $n = 32$ ,  $SD = 0.94$ ) groups,  $F(3) = 9.525$ ,  $p < .001$ , Scheffé's post hoc tests  $p = .001$ ,  $p = .002$ ,  $p = .007$ , respectively.

The external factor most likely to influence trapping effort among groups was furbearer abundance. Although abundance of furbearers was an important issue to trappers in all groups, the subsistence group was less likely to increase trapping effort when furbearer populations were high compared to the management and recreational groups,  $F(3) = 3.96$ ,  $p = .009$ , Scheffé's post hoc tests  $p = .037$ ,  $p = .019$ , respectively. Economics were the least important factor influencing trapping effort with the only positive ITM from subsistence trappers (Table 2).

Trappers from all groups agreed that access to land and human conflict were the greatest social issues of concern. Although ANOVA results indicated a difference in social issues of concern (e.g., conflicts between trappers),  $F(3) = 2.96$ ,  $p = .032$ , Scheffé's post hoc tests indicated no significant differences among groups.

## Discussion

The various motivations for trapping determine the satisfactions trappers derive from pursuing their quarry. Outdoor recreation proved to be the most important motivation to trap in interior Alaska. This finding supports results from other studies of trapper motivations indicating that outdoor experience (Bailey, 1981), interaction with nature (Glass, More, & DiStefano, 1992), nature appreciation (Peek, 2000), and spending time outdoors (Siemer et al., 1994) were either the most or second most important motivations for trapping. This commonality among trappers indicates similar motivational profiles among trappers across the United States. In Alaska, outdoor recreation may be an important motivation during winter months as a way to get exercise and appreciate nature when there is little daylight and temperatures often stay well below freezing for months at a time.

"Doing something challenging" and "testing my skills and abilities" also motivated interior Alaskan trappers to connect with this historic lifestyle, which is still a source of pride for trappers today. These motivations are similar to other studies reporting lifestyle orientation as an important reason for trapping (Daigle et al., 1998; Zwick, Glass, Royar, & Decker, 2001; Zwick et al., 2006). Lifestyle orientation may be especially important in Alaska because of its prominent trapping history. Today trapping, hunting, and fishing create a unique personal identity that is a primary reason for Alaskans to participate in these activities. Both lifestyle orientation and the challenge and reward of trapping may connect Alaskans to the history of their land and foster a sense of pride in Alaska as the "Last Frontier."

Our results indicated the interior Alaskan trapping community is comprised of four major groups, of which the management group participated in trapping to engage in wildlife management. Alaska has a history of manipulating its wildlife populations through intensive management (Boertje, Keech, & Paragi, 2010), because reducing predator populations can increase the abundance of prey species such as moose and caribou (Boertje et al., 2010; Boertje, Valkenburg, & McNay, 1996; Keech, 2012). Predator reduction could motivate these trappers to increase their trapping effort to obtain game meat since many trappers also participate in hunting (Daigle et al., 1998; Zwick et al., 2006). These trappers could provide assistance to wildlife managers in attaining intensive management goals by aiding in the reduction of predators such as wolves and bears. For this group, trapping is not for relaxation, but for contributing to the manipulation of wildlife abundance, which is demonstrated by their substantial trapping effort. This group of devoted trappers gain satisfaction from applying their skills to control nuisance wildlife and aid wildlife manager's goals.

In contrast to the management group, the outdoor recreation dimension defined the recreational group's affinity for trapping as a way to appreciate nature and get exercise. Their relatively low trapping effort compared to other groups is likely tied to their emphasis on non-consumptive benefits of trapping compared to the consumptive benefits that the subsistence and management groups receive. This group's recreational motivations were supported by their short trap lines near urban areas, making access to and trap line check times convenient. The recreational group's defining characteristic of outdoor recreation is similar to findings from Zwick et al. (2006) who found "lifestyle activity," containing similar items such as "learn about wildlife" and "observing nature," as the strongest motivation for trapping in Vermont. Interestingly, this finding demonstrates the importance of the non-consumptive uses of wildlife acting as the main satisfaction received from this consumptive activity. As the largest and relatively less experienced trapper group, recreational trappers represent a crucial group for wildlife managers to communicate with about the proper methods and ethics of trapping.

The recreational group's motivations differed from subsistence trappers, whose participation in trapping was primarily a lifestyle orientation. The majority of these trappers are Alaska Native and typically live in small villages that have few economic opportunities (Brinkman et al., 2014), which exemplifies the economic and cultural importance of trapping to this group. Subsistence trappers traditionally use fur for clothing, crafts, and ceremonies, as well as a source of income in the winter, which is similar to findings in Canada (Stabler, Tolley, & Howe, 1990). Their dependence on furbearers illustrates the importance of maintaining trapping effort when furbearers are abundant. In contrast, all groups displayed sensitivity to low abundancies by decreasing their effort when furbearer abundance is low. During interviews, interviewees expressed concern over the lack of young trappers in villages taking up the activity. This sentiment is consistent with declining trends in trapping participation in Alaska (Andersen, 1993; Hatcher, 2013), which is of particular concern in villages. This loss of knowledge not only leads to fewer trappers continuing a long held tradition, but loss of critical information on furbearer abundance in rural areas. Wildlife managers should encourage local trappers to share their knowledge with youth in rural areas to stem the loss of future trappers.

This article was the first to identify subsistence oriented trappers as a strong motivation for trapping. The description of this small and unique group of trappers shows the need for a continuation of clustering trappers by motivations. Future studies that cluster trappers by motivations will benefit from using interviews to discover other potentially unique groups of trappers.

Although trappers in both the subsistence and solitude groups tended to live in small communities, the solitude group's low score on affiliation with others set them apart. Trapping can be a solitary pursuit to isolate oneself from society, and the desire for solitude motivates certain trappers to participate in trapping. This group is in contrast to trappers in the Northeastern United States who have strong motivations to affiliate with other trappers (Zwick et al., 2001). The solitude group may be affected to a greater degree than other groups by human conflict issues that disturb their solitude. Our study indicated that focusing on reducing conflicts among trappers and with the public would be the most effective way to improve trapper satisfaction among all groups, especially solitude trappers.

Across all trapping groups, perceived furbearer abundance was reported as the primary external factor affecting trapping effort. However, high furbearer abundances differentially influenced trapping effort among groups, indicating the potential direct and indirect influence of furbearer abundance and motivations, respectively, on trapping effort. When furbearer populations were high, trappers in the recreational and management groups indicated they would increase trapping effort more than trappers in the subsistence group. The lack of an increase in effort by subsistence trappers may occur because subsistence trappers maintain a relatively high effort irrespective of moderate or high furbearer abundances. The need to accurately account for changes in furbearer abundance is intensified by differential trapping effort among groups, as well as variables that are out of wildlife managers' control (e.g., harsh winters) and uncertainty regarding the drivers of furbearer population dynamics (Koskela et al., 2013; Mech & Boitani, 2010; O'Donoghue et al., 1998; Paragi, Johnson, Katnik, & Magoun, 1996). Managers can index abundance trends over time by tracking trapper harvest and effort. Because trapping effort mirrors furbearer abundance (DeVink et al., 2011), patterns of change in fur harvest are likely amplified in relation to changes in furbearer abundance. We recommend monitoring and accounting for changes in trapper effort when harvest is used as an index of furbearer abundance.

Future studies should also examine the possibility that trapping motivations moderate the influence of external factors and social issues on trapping effort (Baron & Kenny, 1986). Our results suggested that motivational groups were differentially influenced by furbearer abundance, suggesting that motivations could have moderated the importance of this external factor on trapping effort. Because our questionnaire represented a snapshot in time, we were not able to establish a statistical relationship between actual changes in external factors and trapping effort, preventing us from testing for moderation with regression analysis or structural equation modeling. Managers could benefit from future studies conducting such analyses to determine how the effort of trappers in different motivational groups responds to changes in external factors and social issues over time.

The challenges and psychological benefits associated with trapping may influence trapping effort more than economics, indicating that income from trapping is secondary to the experience of trapping itself. Our study corroborated recent research

showing that pelt price is less of an influence on trapping effort (Hiller et al., 2011; Kapfer & Potts, 2012; Landriault et al., 2012). This shift from trapping for economic benefits to recreational purposes (i.e., psychological, physical benefits) is possibly related to a cultural change away from the uncertainty and difficulty associated with trapping for a living, toward the ease, availability, and reliability of wage employment. However, if fur prices increased several-fold, trappers that normally would not participate may decide to actively trap (Gehrt, Hubert, & Ellis, 2002; Peck & Heidt, 1985; Tumilson & McDaniel, 1986), thus mirroring results of studies mentioned above, which found that income from trapping was an important motivation for trapping. For example, the relationship between muskrat harvest and pelt price was stronger from 1948–1968 when pelt prices were higher compared to 1986–2006 when prices were relatively low (Roberts & Crimmins, 2010). This pattern supports the notion that large changes in price may influence harvest (Roberts & Crimmins, 2010). However, compared to prices in 2013, minor price fluctuations are not likely to significantly change trapping effort. It is unlikely that minor changes in prices of fur and fuel would strongly affect patterns of harvest or the validity of harvest as an index of furbearer abundance.

We were unable to survey trappers during a substantial fur price fluctuation, thus we may have missed a demographic of trappers. Although our non-response bias test suggested that our sample was unbiased, we were restricted to sampling trappers who purchased trapping licenses in 2012. If a sizeable proportion of trappers in interior Alaska do not purchase trapping licenses due to low perceived fur values and differ in motivations and effort compared to license holders, our results would then apply only to licensed trappers and not the entire trapping community.

Of the social issues, we found that trapping effort was most influenced by access to land and human conflict. These two factors are likely interrelated, because human conflict likely drives a lack of access to land. Although public land is plentiful in interior Alaska, access to trapping is likely restricted by many factors including social interactions. In Alaska, unwritten trapping “rules” based on tradition are a potential source of conflict. These “rules” in conjunction with competition for trap lines near urban centers may decrease access and increase conflicts among trappers and with the public. Trapping effort near urban centers may be influenced by competition for trap lines, thus potentially influencing harvest levels. Managers should support and encourage trapper education to reduce human conflicts, and encourage trappers to report trapping effort and harvest statistics.

## Conclusion

Although we identified four groups of trappers with distinct motivations, the social issues and external factors had similar effects on the effort of all trappers. With some exceptions, managers can expect similar reactions to variables such as changes in fur values, weather, furbearer populations, human conflicts, and access to land regardless of the motivations to trap in interior Alaska. The most important of these issues were access to land, human conflict, and furbearer population abundances, and the greatest motivation for trapping was outdoor recreation. When using trapping effort to adjust harvest based indices of abundance, managers should account for the influence of motivations, external factors, and social issues. Furbearer managers should incorporate questions pertaining to motivations, external factors, and social issues in annual trapping surveys in order to understand

changes in motivations to trap and potential forces that may change trapping effort, participation, and harvest.

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