



ALASKA SHEEP HUNTER SURVEY

Resident Sheep Hunter Responses

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Summary

In recent years, the Alaska Board of Game (BOG) has received an increasing number of proposals from the public to alter the management and regulation of Dall sheep hunting. Most of these proposals reported a decline in the quality of sheep hunts because of increased crowding and conflict between resident hunters, nonresident hunters, and commercial operators (professional guides, transporters, air taxis) providing services to sheep hunters. I was contracted by the Alaska Department of Fish & Game (ADF&G) in January 2014 to collect information for the BOG to use when considering changes to sheep hunting regulations. I conducted focus-group discussions with various interest groups (sheep hunters, commercial operators, ADF&G biologists) to better understand the sheep hunting system and clarify the type and range of issues important to interest groups. Essentially, focus-group discussions helped me design a survey that asked the right questions the right way to meet study objectives. I used a systematic and scientific approach to administer two surveys (sheep hunter, commercial services) that collected information on attitudes and behaviors of sheep hunters and commercial operators related to BOG sheep proposals. Any person that hunted sheep, received a sheep harvest ticket, or applied for a sheep drawing permit during the last 5 years (2009-2013) was eligible to receive a survey. I sent questionnaires to a sufficient sample of people to provide results with acceptable levels of statistical confidence ($\pm 5\%$). To maintain the same statistical confidence for the commercial services survey, I sent questionnaires to all commercial operators providing services to sheep hunters during the last 5 years. The survey questionnaire was designed to answer three questions:

- 1) *Is there a sheep hunting problem?*
- 2) *Why is there a sheep hunting problem?*
- 3) *How might sheep hunting be improved?*

I received a low survey response rate (9%) from people that have not hunted sheep in the last 5 years. Therefore, I focused my analysis on people that have hunted sheep during the last 5 years. I analyzed responses from 698 resident sheep hunters (1,889 sampled = 37% response rate), 70 commercial operators (140 sampled = 50% response rate), and 269 nonresident sheep hunters (522 sampled = 52% response rate). ***This report focused mainly on resident hunter responses.*** Characteristics of resident respondents, such as where they reside or hunt sheep, were relatively representative of a statewide cross-section of sheep hunters. Approximately 74% of resident hunters agreed or strongly agreed that sheep hunter crowding was a problem in either Alaska overall or the mountain range that is most important to them. Resident hunters most strongly agreed that the cause of the problem was related to the influence of commercial operators, nonresident hunters, and fewer legal sheep available for harvest. To reduce sheep hunting pressure and crowding, resident sheep hunters approved of several potential changes to the management and regulation of sheep. The options of potential changes that hunters chose from were identified during focus-group discussions and based on recommendations provided by the BOG. Adding percentages for all resident hunters that approved or strongly approved, these changes included:

- Reduce sheep permit allocation to nonresidents hunting with professional guides (77%)
- Increase sheep tag fees for nonresidents (73%)

- Reduce sheep permit allocation to nonresidents hunting with second-degree kindred residents (64%)
- Prohibit spotting sheep from an aircraft to facilitate sheep hunting during the hunting season (54%)
- Create more drawing hunts for sheep (52%)
- Reduce motorized access in sheep hunting areas (48%)

A strong majority of commercial operators (84%) agreed or strongly agreed that sheep hunter crowding was a problem in either Alaska overall or in the range most important to them. A minority of nonresident survey respondents (35%) agreed that sheep hunter crowding was a problem. Commercial operators (majority of responses were from guides) most strongly agreed that the cause of the crowding problem was related to the influence of transporters and air taxis, guides, and fewer legal rams available for harvest. To reduce sheep hunting pressure and crowding, commercial operators most strongly approved of the following potential changes to the management and regulation of sheep:

- Increase sheep tag fees for resident hunters (74%)
- After harvesting a sheep, a hunter must wait 3 years before sheep hunting again (74%)
- Reduce sheep permit allocation to nonresidents hunting with second-degree kindred residents (63%)
- Increase sheep tag fees for nonresidents (62%)
- Limit hunters to 1 sheep hunting permit every 3 years (60%)
- Prohibit spotting sheep from an aircraft to facilitate sheep hunting during the hunting season (59%)
- Reduce motorized access in sheep hunting areas (53%)

The sheep hunter and commercial operator surveys provided stakeholders with an opportunity to contribute their thoughts to the sheep management process. Results from this survey established a scientific-information baseline for comparison with future statewide evaluations of sheep hunter perceptions. Lastly, findings from this survey will serve as a decision-making resource for the BOG.

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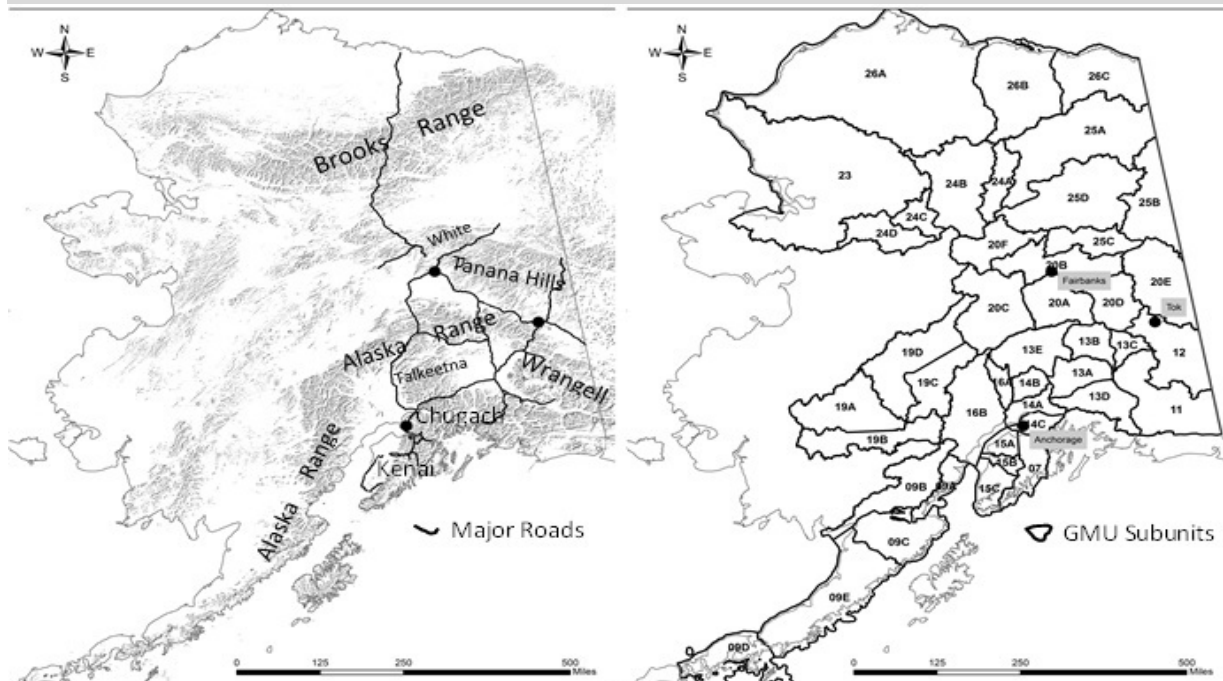
*Found in report at http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/mgt_rpts/14_sheep_hunter_survey_report.pdf

Introduction

Background

Dall sheep (*Ovis dalli dalli*) are a highly prized Alaska game species generally pursued by a relatively small but passionate percentage of hunters that enjoy challenging mountain hunting in remote areas. In some rural Alaska communities (Fig. 1), Dall sheep are an important subsistence resource. According to the Alaska Department of Fish and Game (ADF&G) harvest database, an annual average of 1,800 Alaska residents and 450 nonresidents hunted sheep during the last 5 years (2009-2013). During that period, resident harvest has averaged 450 sheep, and nonresident harvest has averaged roughly 300 sheep. Approximately 80% of Alaska sheep hunters are Alaska residents and they take approximately 60% of the annual harvest. The harvest success rate of nonresidents (67%) is about 2.7 times higher than residents (25%). Most Alaska sheep harvest occurs under a general harvest hunt (resident = 78%, nonresident = 91%) – the basic hunt where you buy a license, get a harvest ticket, and follow general season dates and bag limits. The remaining harvest occurs under drawing hunts (application fee and limited permits awarded by lottery) with a small percentage (<1%) being harvested under registration (hunt closed after harvest goals are met) or federal subsistence permits (available only to federally qualified subsistence users hunting on federal public lands). Hunters use several methods of transportation to reach their hunt area. The most common methods are airplane, ATV (e.g., 4-wheeler), and highway vehicle. However, because of the remoteness of sheep habitat, roughly 60% of harvest is taken by hunters using airplanes for access. Across most of the state, the sheep hunting season is open from August 10 through September 20.

Figure 1. Major mountain ranges and ADF&G Game Management Unit (GMU) subunits containing sheep hunts.



Dall sheep are also considered an important economic resource to the State of Alaska. A study contracted by the Alaska Professional Hunters Association (APHA) indicated that State revenue in 2012 from sheep tags purchased by guided nonresident and alien (not US citizens) hunters totaled \$183,900 (McDowell Group 2014). In addition to license and tag revenue, many professional big-game guides, air transporters, and air taxis (hereafter referred to jointly as commercial operators; see BGCSB 2014 for details) generate significant income by providing services to sheep hunters. Nonresident sheep hunters are required to use a guide unless they are hunting with an Alaska resident that is second-degree of kindred (e.g., brother, stepfather). A nonresident can obtain a Big Game Commercial Services license and guide nonresident sheep hunters in Alaska. The price of guided sheep hunts range between \$10,000 and \$20,000 per hunter. The price of an air transporter ranges between \$1,000 and \$3,000 per hunter. The appeal of an Alaska sheep hunt is illustrated each year is by the ADF&G-administered auction of two Dall sheep permits. The auction generates funds for nonprofit hunting and conservation organizations and for state wildlife research and management. In recent years, Dall sheep permits have been auctioned for as much as \$180,000.

Surveys of sheep population status and trends have been conducted on an irregular basis in most of sheep range in Alaska. Sheep population size fluctuates through time and is influenced by a variety of factors including predation, weather, habitat conditions, and hunter harvest levels. An updated comprehensive summary of Dall sheep population dynamics and harvest trends was prepared by ADF&G to complement this report (DOWC 2014). The report summarizes ADF&G's knowledge of Dall sheep trends from the 1970s to the present.

Problem Statement

In recent years, Alaska residents have voiced increased dissatisfaction with Dall sheep hunting and harvest opportunities. This concern has been documented and supported by an increasing number of proposals being submitted by the public to the Alaska Board of Game (BOG). The BOG is charged with making allocative and regulatory decisions to conserve and develop Alaska's wildlife resources. Many of the proposals have noted that the quality of sheep hunting has declined because of unacceptable levels of crowding, competition, and conflict among resident sheep hunters, nonresident sheep hunters, and commercial operators providing services to sheep hunters. To solve this problem, most proposals have suggested changes in sheep hunting season dates, permit allocation, and harvest limits (Appendix A).

Research Need

The BOG and ADF&G have acknowledged that sheep hunter concerns need to be addressed. However, the BOG also expressed concern that they have insufficient information to effectively evaluate sheep hunter concerns and make informed and defensible regulatory decisions. For example, the BOG does not know if the concerns, perceptions, opinions, and management suggestions noted in the proposals mentioned above are representative of the majority or minority of Alaska residents that hunt sheep. The perspectives of other interest groups, such as nonresident sheep hunters and commercial operators also have not been systematically evaluated.

Research Objectives

I was contracted by ADF&G in January 2014 to conduct a scientific survey (reliable, valid, representative, repeatable, and generalizable (Vaske 2008)) that addressed information needs related to BOG proposals submitted by Alaska sheep hunters and others interested in Alaska sheep management and regulation. I designed the survey to collect information on the characteristics, attitudes, norms, and behaviors of sheep hunters and commercial operators. In addition, the survey collected information on hunter and commercial operator approval or disapproval of potential changes for improving sheep hunting opportunities, harvest opportunities, and regulations. The survey assessed three key questions through three primary objectives:

- 4) ***Is there a sheep hunting problem?*** Determine if the concerns expressed in BOG proposals are shared by a large and representative sample of sheep hunters and commercial operators.
- 5) ***Why is there a sheep hunting problem?*** If sheep hunter concerns are prevalent, explore characteristics that may be related to concerns and quantify the extent of hunter satisfaction or dissatisfaction with important aspects related to the quality of sheep hunting.
- 6) ***How might sheep hunting be improved?*** Identify actions that may help address the concern by quantifying the extent of hunter approval or disapproval of potential changes to sheep hunting regulations and management.

This survey was designed to provide a resource to the BOG and ADF&G to use when developing regulations for the management and allocation of sheep. This effort also engaged interest groups in the research process and provided a new stream of communication between hunters, commercial operators, and decision makers. This study aimed to improve the sheep management environment for decision makers by expanding the information base on interest groups. The sheep management environment also may improve for interest groups by enhancing their understanding, evaluation, and influence on factors informing decision making.

Methods

This research was conducted by the University of Alaska Fairbanks (UAF) and was funded by ADF&G. This study was approved by UAF Office of Research Integrity's Institutional Review Board (IRB# 554304-1). IRB reviews each UAF study proposal that involves human participants to confirm that the research adheres to basic ethical principles of conduct.

Focus-group discussions

In collaboration with ADF&G, my first step was to identify relevant interest groups. I considered interest groups to be people, groups, or organizations that can affect or that are affected by sheep hunting regulations and management in Alaska. I invited members from interest groups to participate in focus-group discussions. Focus-group discussions are semi-structured interviews that stimulated thinking and elicit ideas on a particular subject (Vaske 2008). I conducted focus-group discussions with 120 individuals. Focus groups generally consisted of 2-3 individuals at a time. Focus-group participants were members of several sheep-hunting interest groups including (in alphabetical order): Alaska Board of Game, Alaska Chapter of the Backcountry Hunters and Anglers, ADF&G, Alaskan Bowhunters Association, Alaska Outdoor Council, Alaska Professional Hunters Association, Alaska resident sheep hunters, Alaska Wildlife Troopers, Big Game Commercial Services Board, commercial operators providing services to sheep hunters, Federal Subsistence Management Regional Advisory Councils, Foundation for North American Wild Sheep, Local Fish and Game Advisory Committees, and

nonresident sheep hunters. Participants did not identify specific locations of the advisory councils and committees that they served. Focus-group discussions helped me finalize research objectives, better understand the sheep hunting system, and clarify the type and range of issues important to interest groups. Further, focus groups helped me to inform the public of the intentions of the survey and to engage interest groups in the research process. The latter improves survey response rate and public understanding and acceptance of results. Participants resided in urban areas, rural areas connected to road, and rural areas off the road system. For logistical reasons, I conducted focus-group discussions at locations connected to the road network. However, I also connected with residents living off the road network through telephone conferences. The information I collected during focus-group discussions was used to develop and concentrate a survey questionnaire that would be administered to a large and representative sample of sheep hunters and commercial operators. Essentially, focus-group discussions helped me design a survey that asked the right questions the right way to meet study objectives. However, it should be noted that the small sample size and open-ended nature of the data collected during focus-group discussions limited the representativeness and generalizability of this technique (Vaske 2008). Therefore, qualitative data collected during focus groups was considered exploratory, rather than conclusive.

Questionnaire

Using information collected from focus-group discussions, BOG proposals, agency hunter databases, and harvest and management reports, I designed two survey questionnaires: a sheep hunter survey and a commercial operator survey. Prior to administering the formal surveys, I pre-tested a draft of the questionnaire on all focus-group participants, additional federal and state agency biologists, and additional sheep hunters with a wide range of hunting experience to better capture input from a representative sample. During the pretest, I asked reviewers to give special attention to the following questions:

- Did the survey hit the target and effectively address important sheep hunter issues?
- What important questions were missing?
- What questions could or should be removed?
- Is the wording clear and understandable to a typical sheep hunter?
- Do any questions seem biased or loaded?

I received feedback and comments on the first draft of the questionnaires from approximately 40 reviewers. Based on input, I revised the questionnaires accordingly into a formal Alaska Sheep Hunter Survey questionnaire (Appendices B & C) that consisted of 45 primary questions and a formal Alaska Sheep Commercial Services Survey questionnaire (Appendix D) that consisted of 37 questions. The formal questionnaires addressed each objective described above and included three general sections:

1. Hunter or commercial operator characteristics (e.g., demographics) & behaviors.
2. Hunter or commercial operator attitudes toward current sheep hunting regulations and management.
3. Hunter or commercial operator attitude toward potential changes to sheep hunting regulations and management.

The questionnaires included multiple choice, matrix of choices, ranking, and rating questions that facilitated quantification of responses.

Study Population

ADF&G and the BOG jointly determined who would be included in the study population. Their intention was to cast a wide net and allow many different interest groups to participate. Ultimately, the study

population included Alaska residents and nonresidents that either have hunted sheep, received a sheep harvest ticket, or applied for sheep permit between 2009 and 2013. The study population also included commercial operators (guides, transporters, and air taxis) providing a service to sheep hunters between 2009 and 2013. ADF&G and members participating in focus-group discussions suggested that there has been an increase in the number of “disenfranchised” hunters. Disenfranchised hunters were described as people that were active sheep hunters in the past (e.g., >5-10 years ago) that have decreased their participation in sheep hunting because of frustration with the quality and management of sheep hunts in Alaska. ADF&G suggested that many of these disenfranchised hunters may not hunt unless they draw a sheep permit. This was the primary reason that the study population was expanded to anyone that applied for sheep drawing permit. Including sheep permit applicants that haven’t hunted sheep in the last 5 years significantly increased the size of the study population from 7,842 to 29,091 people.

I quantified the study population using the following sources: ADF&G’s database on sheep hunters and sheep hunt applicants, which is based on hunting license and harvest information; and Alaska Dept. of Commerce, Community, and Economic Development’s (ADCC&ED) records on activities of licensed big game guides and transporters. Because air taxis do not specifically document or report services provided to sheep hunters, air taxi operators were compiled through focus-group discussions and additional phone interviews with commercial operators. Hunter and commercial operator information was received under the following conditions:

- The information will be used for the sole purpose of researching the demographics and opinions of Alaska sheep hunters and Commercial operators.
- The information will not be released outside of UAF except to persons in a contractual relationship with UAF who will be performing work for or on behalf of the UAF, on a need-to-know basis, in which case UAF will require the contractors to agree to and abide by the conditions in this document.
- Personal information (names and addresses or unique identification numbers provided by ADF&G) will not be published by UAF or its contractors by any means or in any form that would allow connection between individuals and harvest information.

Study Sample

I selected a stratified random sample of sheep hunters (n=3,601) from the study population database to participate in the survey. A stratified random sample process involves: 1) dividing the sample population into different non-overlapping groups (i.e., strata) that are of interest or deserve special attention because of the project hypothesis, and then 2) selecting a simple random sample from each stratum (Vaske 2008). As the population size of the strata becomes smaller, a greater proportion of that population must be sampled to maintain adequate statistical error and confidence. Our general strata included resident and nonresident hunters and resident and nonresident hunters that received or applied for a permit but did not hunt or did not draw. The latter group was designed to potentially capture responses from “disenfranchised” hunters as described above. The BOG and ADF&G expressed special interest in different groups (e.g., rural and urban) of Alaska residents that have hunted sheep in the last 5 years. Therefore, I sampled a greater proportion of Alaska residents to maintain adequate statistical error and confidence for smaller strata (Example: rural Alaska hunters that successfully harvested a sheep in the last 5 years). My sampling design provided a margin of error of roughly $\pm 5\%$ at a 95% confidence level for different strata under the assumption of a 30% response rate.

I surveyed all commercial operators (N=171) in the database that provided a commercial service to sheep hunters. With the small study population, 119 survey participants (70% response rate) were needed to provide a margin of error of $\pm 5\%$ at a 95% confidence level.

Mailing

I administered the questionnaire to the study samples using internet and mail survey methods. Each hunter/commercial operator selected to participate in the survey received a unique 5-digit code linked to their hunter/harvest record in ADF&G's database or their commercial operator record in the ADCC&E database. Assignment of the 5-digit code allowed the removal of personal identification information. The internet survey was delivered using SurveyMonkey®, an online survey tool that allows each survey participant to enter their 5-digit code and provide responses to the questionnaire. The mail survey included multiple mailings:

1. Postcard with internet link to the survey providing advance notification of mail-out questionnaire (sent to hunters in late May and early June, 2014, sent to commercial operators June 18, 2014).
2. Questionnaire packet (i.e., cover letter, questionnaire, return envelope) was mailed two weeks after the first postcard mailing to those that had not completed the survey online.
3. Second postcard sent one month after first questionnaire packet as a reminder to non-respondents.
4. Second mailing of questionnaire packet sent to non-respondents two weeks after second postcard.

The hunter survey was officially closed on Sept. 1, 2014, and the commercial operator survey was officially closed Sept. 15, 2014.

Data analysis

I provided basic descriptive statistics of responses for all resident sheep hunters (Appendix B), nonresident sheep hunters (Appendix C), and commercial operators (Appendix D) to all questions on the survey. Because of differences in characteristics and responses between resident sheep hunters, nonresident sheep hunters, and commercial operators, these groups were analyzed separately. ***This report focuses on responses of Alaska residents that have hunted sheep during the last 5 years.*** A low percentage (9%) of people responded to the survey that had not hunted sheep in Alaska during the last 5 years. Therefore, only people that have hunted sheep in Alaska were included in the analysis. I explain details on this decision in the first section of the Results section. To determine existence or prevalence of sheep hunter concerns (Objective 1), I included questions on the survey that measured the extent of agreement or disagreement that sheep hunter crowding and competition was a problem (**hereafter, "problem"**). I divided hunters into two groups based on their response to questions that assessed the existence of a problem. The first group contained hunters that agreed or strongly agreed there was a problem (i.e., **problem group**). The second group included the remaining responses, which were hunters that disagreed, strongly disagreed, neither agreed or disagreed, or were unsure if there was a problem (i.e., **no problem group**). I identified significant differences between each group by comparing patterns in each group's demographic and hunting characteristics, and extent of satisfaction or dissatisfaction with current sheep regulations and management (Objective 2). Identification of significant differences between groups highlighted potential factors contributing to perceptions that a problem did or did not exist. The last part of my analysis sought to identify approval or disapproval of potential regulatory and management changes that may help to resolve sheep hunting pressure, crowding, and competition

(Objective 3). I reported similarities and significant differences among groups of hunters that did and did not perceive a problem.

Results

Survey results focused on Alaska residents that have hunted sheep (n=698). The Appendices (B-D) include resident hunter, nonresident hunter, and commercial operator responses to all questions asked on the survey. A summary comparison between resident, nonresident, and commercial operator responses to questions directly addressing problems and solutions related to sheep hunter crowding is provided in Appendix E and briefly described in the Discussion. A more comprehensive evaluation and comparison of each group will be performed at a later time.

Survey Response

After accounting for redundant and undeliverable addresses (n = 230), I sampled approximately 3,371 people (Table 1). I received 1,163 responses of which 1,055 were valid (response rate = 31%). Response rates were significantly different between people that have (40%) and have not hunted (9%) during the last 5 years. Further, the respondents that haven't hunted sheep during the last 5 years often completed a small portion of the questionnaire. Therefore, I excluded respondents that have not hunted sheep from the analysis. For people that hunted sheep in the last 5 years, the survey provided a sampling error of 3.0± at the 95% confidence level (Table 1). This sampling error indicates that if the survey was repeated 20 times, the results from 19 of those surveys should be within 3% of the estimates of this study.

Table 1. Alaska Sheep Hunter Survey sampling design and response values.

Group	Subgroup	Population	Sampled ²	Valid Responses	Response Rate	Survey Sampling Error ³
Hunted in last 5 years	Resident	5,901	1,889	698	37%	±3.5%
	Nonresident	1,941	522	269	52%	±5.5%
	Total	7,842	2,411	967	40%	±3.0%
Did not hunt in last 5 years ¹	Resident	19,397	661	51	8%	±13.7%
	Nonresident	1,780	299	37	12%	±15.9%
	Total	21,177	960	88	9%	±10.4%
Total		29,019	3,371	1055	31%	±3.0%

¹This strata includes people that have received a sheep permit and did not hunt, and people that applied for a sheep drawing hunt and did not draw. This strata of the population was excluded from analysis in this report.

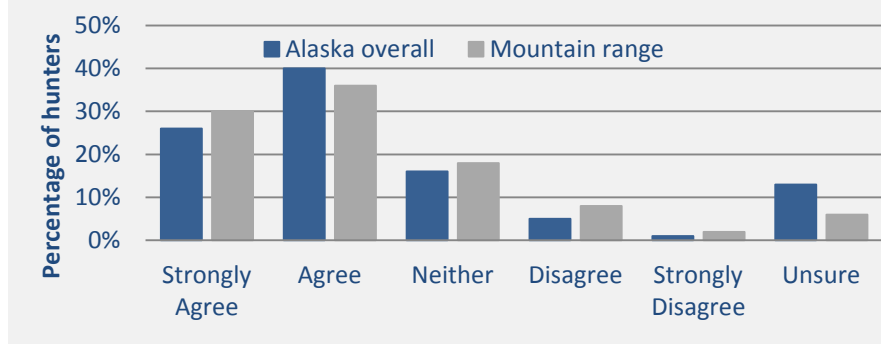
²These values account for undeliverable addresses.

³At 95% confidence level

Is there a sheep hunting problem?

When asked if sheep hunter crowding and competition was a problem in Alaska, the majority of resident hunters reported that a problem existed (Fig. 2). A total of 74% of resident hunters agreed or strongly agreed that

Figure 2. Resident hunter extent of agreement or disagreement that sheep hunter crowding and competition is a problem in Alaska overall (n=672) or in the mountain range (n=670) most important to each hunter.



sheep hunter crowding was a problem in either the mountain range most important to them (66%) or in Alaska overall (66%) (Table 2). The remaining 26% of Alaska residents neither agreed or disagreed, disagreed, strongly disagreed, or were unsure if sheep hunter crowding and competition was a problem.

Table 2. Extent of agreement or disagreement that sheep hunter crowding is a problem in Alaska overall and the range most important to each hunter when **ALL** resident hunters were pooled.

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=672)	26%	40%	16%	5%	1%	13%
In the range most important to you (n=670)	30%	36%	18%	8%	2%	6%

Why is there a sheep hunting problem?

The resident hunters that reported a problem agreed with several possible causes of the problem; more professional guides, more nonresident hunters, fewer legal rams, and more professional transporters and air taxis scored the highest (Fig. 3). Based on response averages, resident hunters did not disagree with any potential causes listed.

Figure 3. Mean extent of agreement among resident hunters (n=498) with different causes of sheep hunter competition and crowding. (-2 = strongly disagree, -1 = disagree, 0 = neither agree or disagree, 1 = agree, 2 = strongly agree)



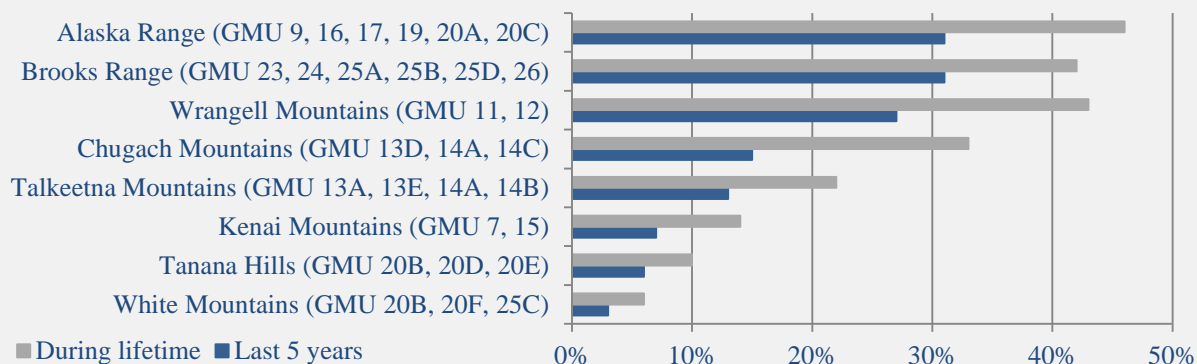
To explore potential reasons why some people did or did not perceive a problem, I compared responses of resident hunters that perceived a problem (74%, n=506) with those that did not or were unsure if a problem existed (26%, n=174). Information on hunter demographics and harvest characteristics were collected from the survey and through ADF&G’s database on hunter license and harvest records. The two groups’ demographics and sheep hunting characteristics differed statistically in several ways (Table 3). Comparing mean or median responses of the two groups, hunters that perceived a problem hunted sheep more times in the last 5 years, hunted sheep more times in their life, were a few years younger, and had received a slightly higher level of education. The number of sheep harvested during the last 5 years, sheep harvest success rate, year when the respondent started hunting sheep, length of residency, and household income in 2013 were similar between residents hunters that perceived a problem and those that did not (or were unsure) (Table 3).

Table 3. Comparisons of demographics and hunting characteristics of all Alaska resident sheep hunters (n=698) and those that did (74%) and did not (26%) perceive a sheep hunter crowding and competition problem. *Problem and no problem groups significantly different at 0.05.

Variable	All residents (SD)	Problem (SD)	No problem (SD)	P value
Number of times hunted during the last 5 years* (mean)	1.8 (1.3)	1.8 years (1.3)	1.5 years (1.2)	0.003*
Number of sheep harvested during last 5 years (mean)	0.7 (0.9)	0.7 sheep (0.9)	0.6 sheep (0.9)	0.166
Harvest success rate during last 5 years (mean)	0.35 (0.42)	0.35 (0.42)	0.33 (0.44)	0.600
Year started sheep hunting (mean)	1998 (13.5)	1998 (13.4)	1999 (13.8)	0.233
Number of years sheep hunted* (mean)	9 yrs (10)	10 yrs (10.5)	7 yrs (7.9)	<0.001*
Age of respondent* (mean)	47 yrs old (14.0)	46 yrs old (13.5)	49 yrs old (14.3)	0.004*
Length of Alaska residency (mean)	26 yrs (19)	26 yrs (20.0)	26 yrs (15.0)	0.910
Household income in 2013 (median)	\$75,001-\$100,000	\$75,001-\$100,000	\$75,001-\$100,000	0.091
Level of education received* (median)	Graduated from college	Graduated from college	Some college	0.004*

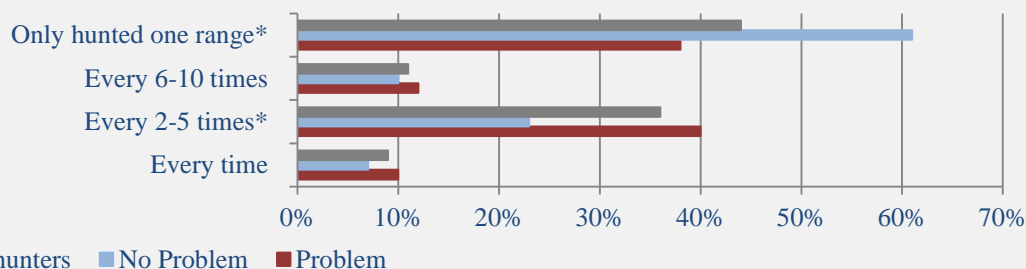
When asked where they hunt sheep, most residents reported that they hunted in the Alaska, Brooks, and Wrangell mountain ranges during the last 5 years and during their lifetime (Fig. 4). The proportions of hunters that did and did not perceive a problem were statistically similar (P=0.971) across all mountain ranges hunted. Also, groups did not differ based on the individual mountain range identified by each hunter as most important (P=0.225).

Figure 4. Percent of resident sheep hunters (n=692) who hunted in various mountain ranges during the last 5 years and during their lifetime.



Forty-four percent of hunters reported that they have only hunted in one mountain range (Fig. 5). Residents that perceived a problem were less likely (P<0.001) to have hunted sheep in only one mountain

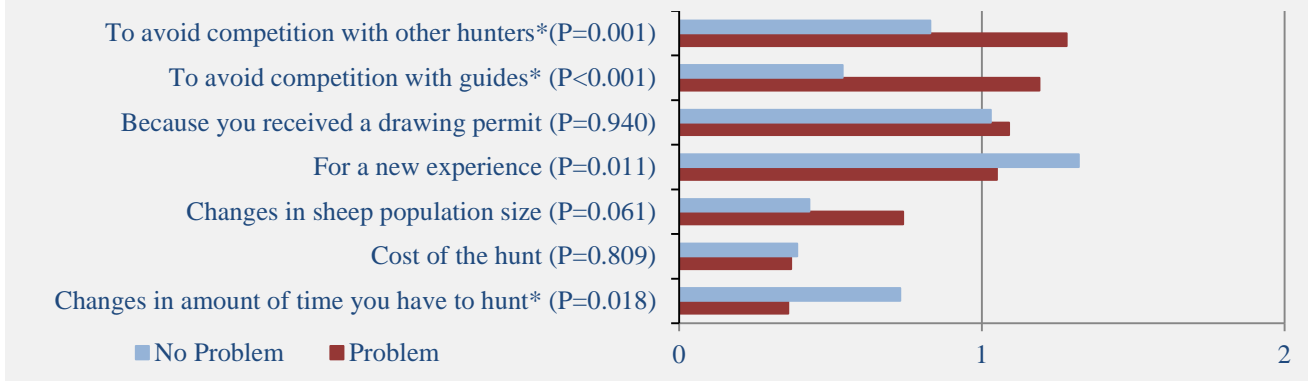
Figure 5. Frequency that all resident hunters and hunters that did (n=500) and did not (n=176) perceive a sheep hunter problem switched mountain ranges to hunt sheep in.*Problem and no problem groups significantly different at 0.05.



range. Residents that perceived a problem were more likely ($P < 0.001$) to have switched mountain ranges every 2-5 times they went sheep hunting (Fig. 5).

Of those that said they had hunted sheep in different mountain ranges (66%), the reasons for switching ranges was different between those that did and did not perceive a problem (Fig. 6). Resident hunters that perceived a problem were more likely to switch areas to avoid competition with other hunters ($P = 0.001$) and professional guides ($P < 0.001$) compared to hunters that did not perceive a problem.

Figure 6. Mean extent of agreement or disagreement with reasons why residents, that did ($n = 303$) and did not ($n = 64$) perceive a sheep hunter problem, switched mountain ranges to hunt in (2=strongly agree, 1=agree, 0=neither, -1=disagree, -2=strongly disagree). *Groups significantly different at 0.05.



Hunters that perceived a problem were less likely to switch mountain ranges because of the amount of time they had to hunt ($P = 0.038$). When all residents were grouped, hunter agreement was stronger than disagreement for all reasons, but most hunters agreed or strongly agreed that they switched ranges for a new experience (82%) or to avoid other hunters (80%) (Table 4).

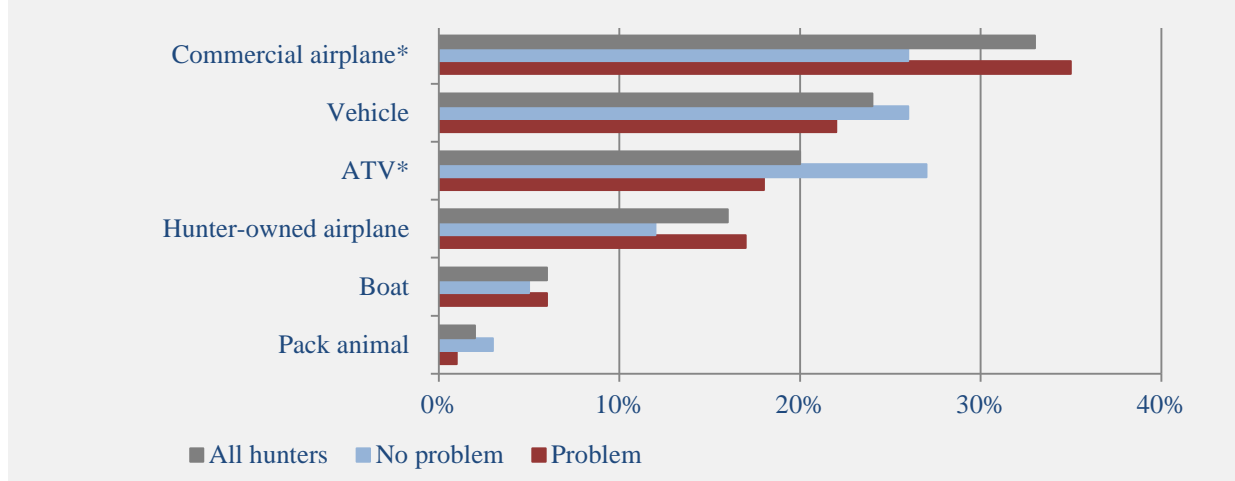
Table 4. Extent of agreement or disagreement with reasons why they switched ranges to hunt in when ALL resident hunters were pooled.

Reason	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Because you received a drawing permit (N=373)	52%	17%	23%	2%	7%
To avoid competition with professional guides (N=370)	46%	24%	23%	4%	3%
To avoid competition with other hunters (N=368)	45%	35%	16%	2%	2%
For a new experience (N=369)	36%	46%	13%	4%	1%
Changes in sheep population size (N=372)	18%	44%	30%	4%	4%
Changes in amount of time you have to hunt (N=361)	14%	36%	37%	6%	7%
Cost of the hunt (N=361)	12%	37%	36%	6%	9%

When asked about modes of access used the most to get to hunting areas, the overall trends were similar between resident hunters that did and did not perceive a problem (Fig. 7). When pooling all resident hunters ($n = 682$), the largest proportion (33%) used a commercial airplane service to hunt sheep. Hunters that did and did not perceive a problem differed in proportion of use of individual modes of access ($P = 0.016$) (Fig. 7). Hunters that perceived a problem were more likely to have used a commercial

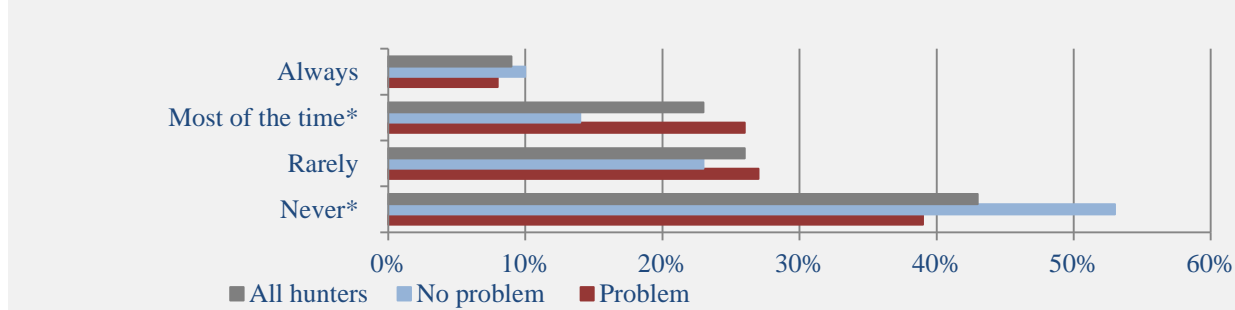
airplane. Hunters that used an ATV were proportionally less likely to perceive a problem compared to other modes of access. Sample sizes of hunters using snowmachines (n=4) and pack animals (n=11) the most were too small for an informative statistical analysis.

Figure 7. Proportional differences in mode of access used the most by all resident hunters and hunters that did (n=499) and did not (n=171) perceive a sheep hunter problem. *Problem and no problem groups significantly different at 0.05.



Ninety-six percent (n=691) of resident hunters reported that they had never used a professional guide to hunt sheep in Alaska. Frequency of use of transporters or air taxis was different between hunters that did and did not perceive a problem (P=0.003) (Fig. 8). Hunters that perceived a problem were more likely to use a transporter/air taxi most of the time and less likely to never use a transporter/air taxi to sheep hunt.

Figure 8. Frequency of transporter or air taxi use by all resident hunters (n=680) and hunters that did (n=506) and did not (n=174) perceive a sheep hunter problem. *Problem and no problem groups significantly different at 0.05.



With the focus of the study being on existence and extent of hunter perceptions of sheep hunter crowding and competition, it was important to evaluate hunter tolerance of crowding. In general, resident sheep hunters have a relatively limited tolerance for crowding. Interrupted stalk or the inability to get away from other hunters were most intolerable situations (Table 5). The overall trend in level of tolerance of various levels of crowding was similar among those that did and did not perceive a problem (Fig. 9). However,

hunters that perceived a problem were statistically less tolerant of all situations presented. Resident sheep hunters found interruptions to their stalk, the inability to get away from other hunters, and the sight of multiple other hunters and camps while hunting the least tolerable situations. The sight of a small plane passing over was the only situation that both groups found tolerable.

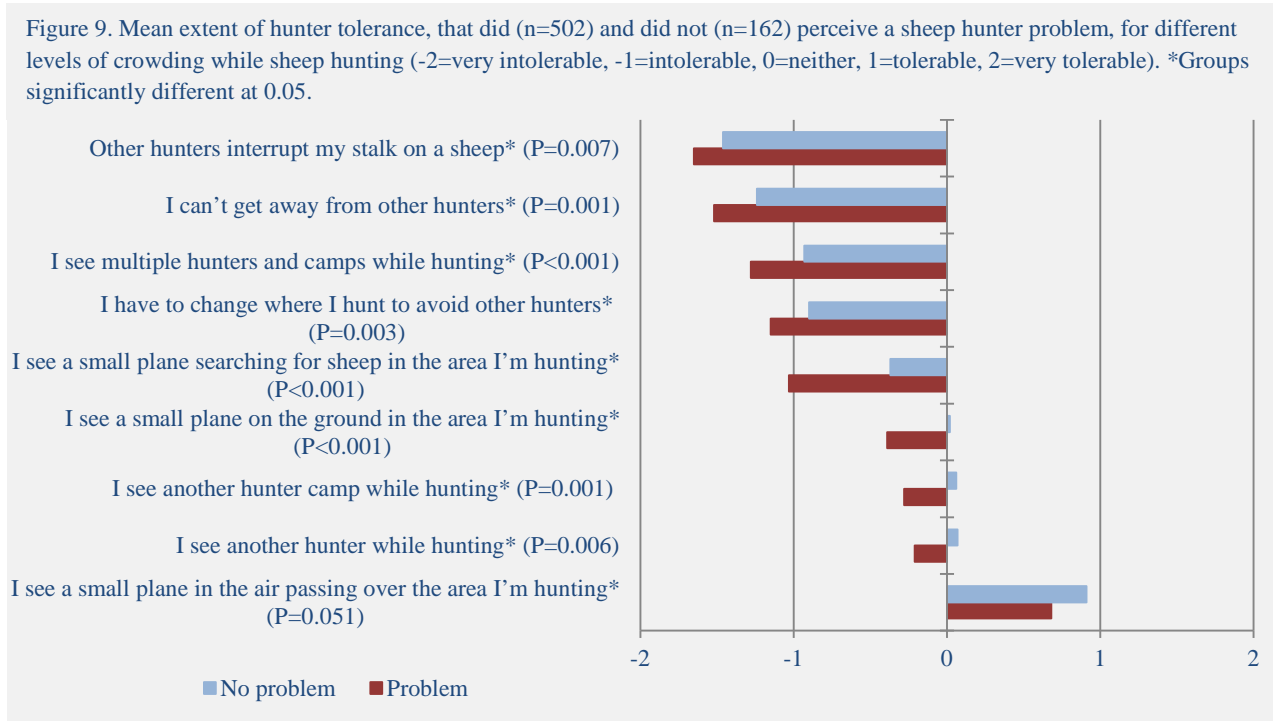


Table 5. Extent of tolerance or intolerance with different levels of crowding while sheep hunting when ALL resident hunters were pooled.

Levels of crowding	Very tolerable	Somewhat tolerable	Neither	Somewhat intolerable	Very intolerable
Other hunters interrupt my stalk on a sheep (n=665)	1%	2%	8%	12%	77%
I can't get away from other hunters (n=662)	1%	2%	14%	15%	67%
I see multiple hunters and camps while hunting (n=665)	3%	6%	8%	35%	48%
I have to change where I hunt to avoid other hunters (n=665)	3%	8%	13%	30%	46%
I see a small plane searching for sheep in the area I'm hunting (n=665)	3%	15%	11%	32%	38%
I see a small plane on the ground in the area I'm hunting (n=666)	6%	27%	18%	32%	18%
I see another hunter while hunting (n=664)	6%	30%	21%	31%	13%
I see another hunter camp while hunting (n=664)	5%	26%	24%	33%	12%
I see a small plane in the air passing over the area I'm hunting (n=667)	30%	38%	13%	14%	4%

Perceptions of hunter crowding and competition were highly correlated with agreement or disagreement with too much harvest pressure in the mountain range most important to individual hunters (Pearson correlation coefficient = 0.413) and in Alaska overall (Pearson correlation coefficient = 0.474). Hunters that perceived a problem agreed and hunters that did not perceive a problem disagreed that there was too much pressure on the sheep population in the sheep mountain range most important to them ($P < 0.001$) and in Alaska overall ($P < 0.001$) (Fig. 10). When all resident hunters were pooled, a slight majority agreed or strongly agreed that there is too much pressure on sheep in the range most important to them (53%) and in Alaska overall (52%) (Table 6).

Figure 10. Mean extent of agreement or disagreement by hunters, that did (n=502) and did not (n=162) perceive a sheep hunter problem, that there is too much harvest pressure on the sheep population in the range most important to them and in Alaska overall (-2 = strongly disagree, -1 = disagree, 0 = neither, 1 = agree, 2 = strongly agree). *Groups significantly different at 0.05.

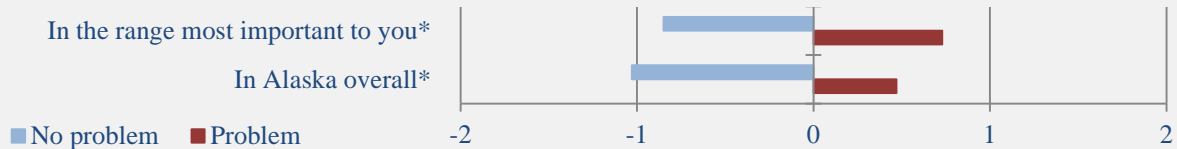


Table 6. Extent of agreement or disagreement that there is too much harvest pressure on the sheep population in the following areas when **ALL** resident hunters were pooled.

Areas	Strongly agree	Agree	Neither	Disagree	Strongly agree	Unsure
In Alaska overall (n=671)	14%	38%	24%	6%	2%	16%
In the range most important to you (n=673)	23%	30%	26%	11%	2%	9%

When asked if the sheep population size has increased or decreased since each hunter started hunting, mean response of hunters that did and did not perceive a problem were similar (Fig. 11). Both groups felt that the sheep population has decreased in the sheep mountain range most important to them ($P = 0.124$) and in Alaska overall ($P = 0.240$) since they started hunting sheep (Fig. 11). When all resident hunters were pooled, very few hunters felt the population has increased (Table 7).

Figure 11. Mean extent that hunters, that did (n=502) and did not (n=162) perceive a sheep hunter problem, felt the sheep population has increased or decreased since each hunter started hunting sheep (-2 = significant decrease, -1 = decrease, 0 = neither, 1 = increase, 2 = significant increase).

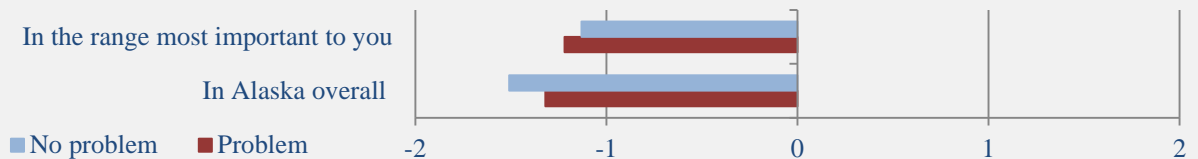
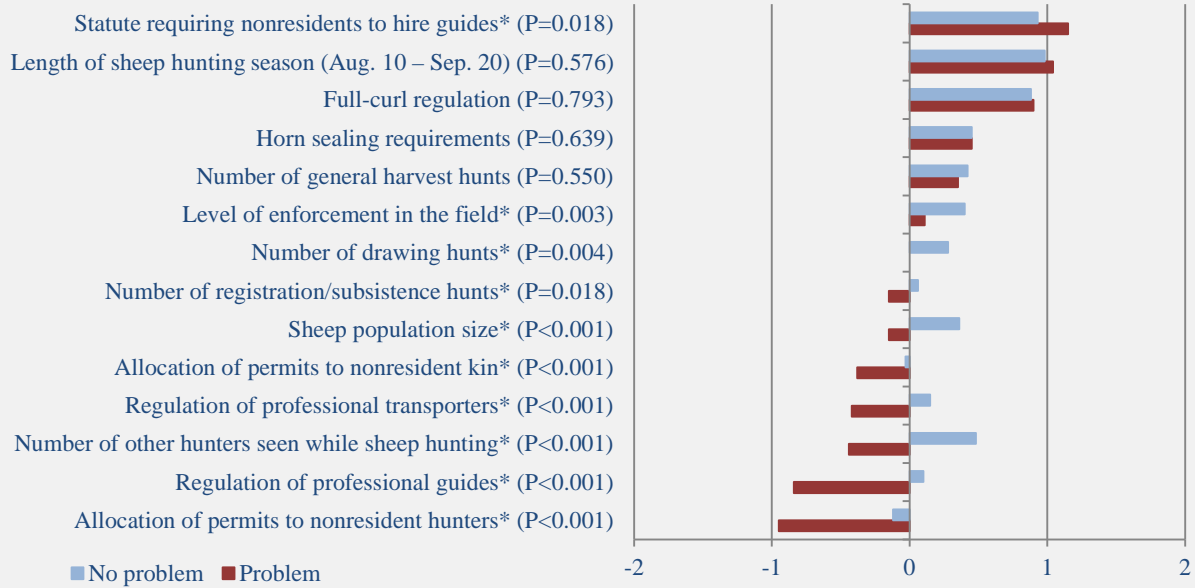


Table 7. Extent that hunters felt the sheep population has increased or decreased since each hunter started hunting sheep when **ALL** resident hunters were pooled.

Areas	Significant increase	Slight increase	Neither	Slight decrease	Significant decrease	Unsure
In Alaska overall (n=671)	1%	3%	25%	26%	21%	24%
In the range most important to you (n=669)	2%	4%	25%	25%	28%	16%

Figure 12. Mean extent of satisfaction or dissatisfaction by hunters, that did (n=499) and did not (n=164) perceive a sheep hunter problem, with a various sheep management and regulation characteristics (-2 = very dissatisfied, -1 = somewhat dissatisfied, 0 = neither, 1 = somewhat satisfied, 2 = very satisfied). *Groups significantly different at 0.05.



I also asked hunters to provide their extent of satisfaction or dissatisfaction with several sheep management and regulation characteristics (Fig. 12). The mean response from all resident hunters indicated satisfaction with the statute requiring nonresidents to hire guides, the length of the sheep hunting season, the full-curl regulation, horn-sealing requirements, the number of general harvest hunts, and the level of law enforcement in the field (Table 8). When comparing groups, hunters that perceived a problem expressed significantly more dissatisfaction with several management and regulation characteristics such as allocation of permits to nonresidents (including nonresident kin) and the regulation of professional guides and transporters (Fig. 12).

Table 8. Extent of satisfaction or dissatisfaction with several different sheep management and regulation characteristics when ALL resident hunters were pooled.

Characteristic	Very satisfied	Somewhat satisfied	Neither	Somewhat dissatisfied	Very dissatisfied
Requirement for nonresidents to hire guides (n=664)	52%	23%	14%	7%	5%
Length of sheep hunting season (Aug. 10 – Sep. 20) (n=666)	41%	35%	13%	8%	3%
Full-curl regulation (n=662)	40%	32%	10%	13%	5%
Horn sealing requirements (n=657)	24%	28%	28%	11%	10%
Number of general harvest hunts (n=666)	13%	35%	33%	14%	5%
Level of enforcement in the field (n=664)	12%	26%	39%	17%	7%
Number of drawing hunts (n=660)	7%	30%	35%	21%	7%
Number of registration/subsistence hunts (n=661)	7%	15%	49%	19%	11%
Sheep population size (n=661)	6%	33%	23%	29%	9%
Allocation of permits to nonresident 2nd-degree of kindred hunters (n=658)	6%	14%	41%	24%	15%
Number of other hunters seen while sheep hunting (n=664)	5%	21%	29%	36%	8%
Regulation of professional transporters (n=662)	5%	16%	40%	23%	16%
Regulation of professional guides (n=661)	4%	15%	26%	27%	29%
Allocation of permits to nonresident hunters (n=657)	3%	8%	29%	32%	29%

When asked about the level of importance of multiple factors, the general trend in factors that are important to the satisfaction of a sheep hunt was similar among resident sheep hunters that did and did not perceive a problem (Fig. 13). Hunters that perceived a problem assigned the strongest importance to the level of hunter crowding and competition, and to the seclusion from other hunters (Fig. 13). The opportunity to hunt sheep every year and the number of legal rams were most important to hunters that did not perceive a problem. However, the level of importance assigned to various factors differed between the two groups. Crowding, competition, seclusion from other hunters, and plane traffic were significantly more important to hunters that perceived a problem compared to those that did not. When all residents were pooled, number of legal rams seen (93%), crowding and competition (92%), and seclusion from other hunters (92%) received the most support when “important” and “very important” were pooled (Table 9). However, the opportunity to hunt sheep every year was assigned “very important” by more hunters than any other factor (Table 9).

Figure 13. Mean level of importance or unimportance assigned by hunters, that did (n=500) and did not (n=170) perceive a sheep hunter problem, to factors related to sheep hunter satisfaction (-2 = very unimportant, -1 = somewhat unimportant, 0 = neither, 1 = somewhat important, 2 = very important). *Groups significantly different at 0.05.

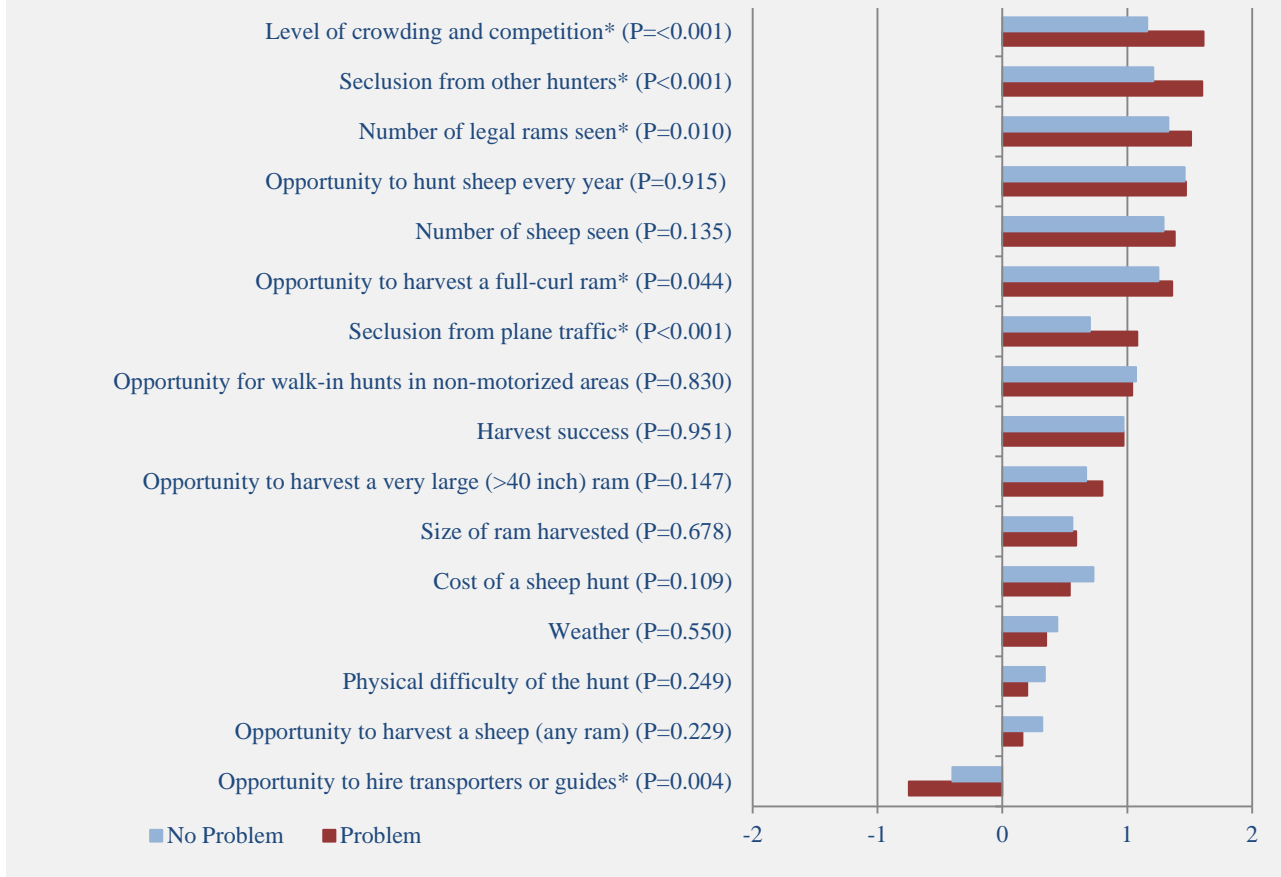


Table 9. Extent of importance or unimportance of several factors related to sheep hunter satisfaction in Alaska when **ALL** resident hunters were pooled.

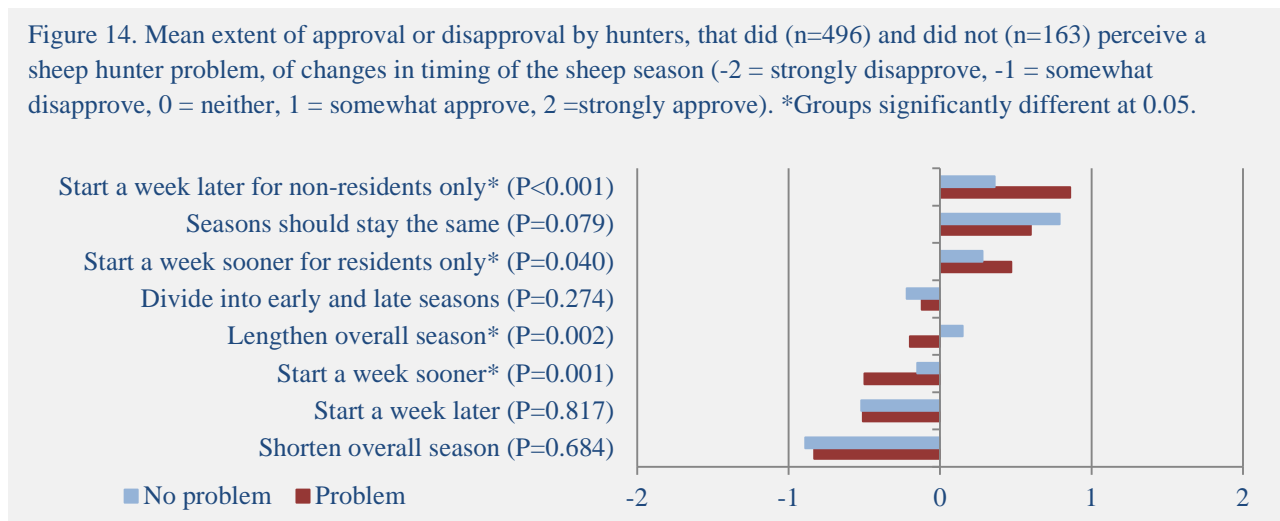
Factor	Very important	Somewhat important	Neither	Somewhat unimportant	Very unimportant
Opportunity to hunt sheep every year (n=673)	64%	25%	6%	5%	1%
Seclusion from other hunters (n=675)	60%	32%	6%	1%	1%
Level of crowding and competition (n=673)	60%	32%	6%	1%	1%
Number of legal rams seen (n=674)	56%	37%	5%	2%	0%
Opportunity to harvest a full-curl ram (n=672)	50%	38%	7%	3%	1%
Number of sheep seen (n=675)	49%	41%	7%	3%	0%
Opportunity for walk-in hunts in non-motorized areas (n=675)	43%	32%	15%	6%	4%
Seclusion from plane traffic (n=673)	34%	41%	17%	5%	2%
Opportunity to harvest a very large (>40 inch) ram (n=673)	33%	34%	18%	11%	6%
Harvest success (n=675)	30%	47%	15%	6%	2%
Cost of a sheep hunt (n=670)	26%	33%	23%	12%	7%
Opportunity to harvest a sheep (any ram) (n=674)	20%	27%	21%	17%	15%
Weather (n=666)	18%	30%	30%	14%	8%
Size of ram harvested (n=674)	16%	46%	22%	12%	4%
Physical difficulty of the hunt (ex: distance you have to walk) (n=672)	13%	34%	26%	17%	10%
Opportunity to hire professional transporters or guides (n=670)	7%	14%	23%	17%	39%

How might sheep hunting be improved?

This section of the study explored ways to improve sheep hunting and harvest opportunities (Objective 3) by estimating the extent of approval or disapproval of potential changes to many sheep management and regulation characteristics. The options of potential changes that hunters chose from were identified during focus-group discussions and based on recommendations provided by the BOG.

When all resident hunters were asked about their extent of approval or disapproval of changing the length or timing of the sheep hunting season, hunters approved of nonresidents starting later, residents starting earlier, or seasons staying the same (Fig. 14, Table 10). All hunters disapproved of shortening the sheep

Figure 14. Mean extent of approval or disapproval by hunters, that did (n=496) and did not (n=163) perceive a sheep hunter problem, of changes in timing of the sheep season (-2 = strongly disapprove, -1 = somewhat disapprove, 0 = neither, 1 = somewhat approve, 2 =strongly approve). *Groups significantly different at 0.05.



hunting season and starting it a week later or a week sooner for all hunters (residents and nonresidents). However, hunters that perceived a problem expressed stronger disapproval of the season starting a week earlier for all hunters. Hunters that perceived a problem also expressed stronger approval of the sheep hunting season starting a week later for nonresidents and a week earlier for residents (Fig. 14).

Table 10. Extent of approval or disapproval of changes in the timing of the sheep hunting season when **ALL** resident hunters were pooled.

Timing of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Start a week later for nonresidents only (n=656)	35%	30%	17%	8%	10%
Start a week sooner for residents only (n=654)	29%	27%	18%	13%	14%
Seasons should stay the same (n=661)	29%	24%	35%	8%	5%
Lengthen overall season (n=654)	12%	19%	34%	16%	19%
Divide into early and late seasons (Example: Aug. 10-25 & Aug. 26-Sept. 20) (n=653)	8%	22%	36%	12%	21%
Start a week sooner (n=665)	6%	14%	38%	19%	24%
Start a week later (n=656)	4%	9%	44%	21%	23%
Shorten overall season (n=649)	2%	5%	33%	27%	33%

Currently, hunters are not allowed to hunt sheep the same day airborne, and it is against the law to hunt until 3:00am the following day after a hunter has flown. Also, an aircraft can be used during the hunting season to spot sheep. When hunters were asked about potential changes to the same day airborne regulations, hunters that did and did not perceive a problem expressed strong disapproval of removing the regulation that restricts hunters from sheep hunting the same day airborne (Table 11, Fig. 15). When comparing hunters that did and did not perceive a problem, hunters that perceived a problem approved of a ban on spotting sheep from an aircraft during the hunting season. A ban would mean that an aircraft could not be used to search for and locate sheep by a sheep hunter or anyone facilitating a sheep hunt during the hunting season. Hunters that did not perceive a problem slightly disapproved of a ban on spotting sheep using an aircraft during the hunting season. Hunters that did not perceive a problem had the strongest approval for regulations staying the same as they are now. Whereas, hunters that perceived a problem had strongest approval for a ban on spotting sheep from an aircraft during the hunting season (Fig. 15). When all residents were pooled, prohibition of spotting sheep from an aircraft received the largest response in the “strongly approve” category (Table 11).

Figure 15. Mean extent of approval or disapproval by hunters, that did (n=492) and did not (n=167) perceive a sheep hunter problem, of changes in same-day airborne regulation (-2 = strongly disapprove, -1 = somewhat disapprove, 0 = neither, 1 = somewhat approve, 2 =strongly approve). *Groups significantly different at 0.05.

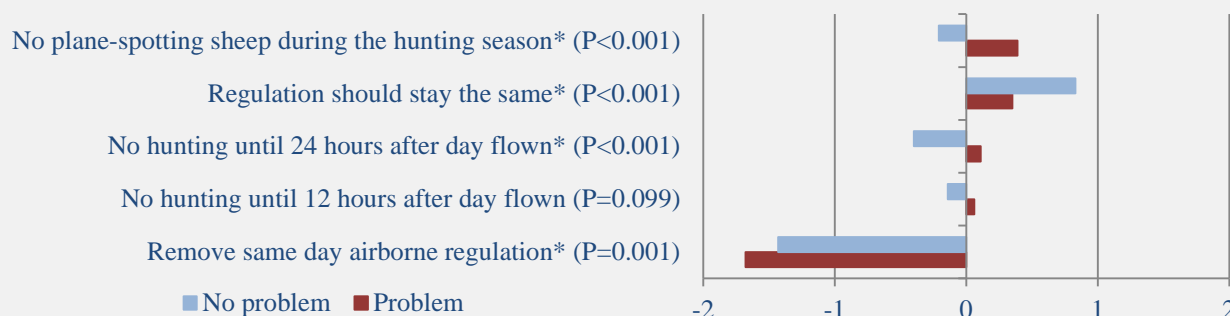


Table 11. Extent of approval or disapproval of changes in the same-day airborne hunting regulation when **ALL** resident hunters were pooled.

Change in regulation	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Do not allow hunters to spot sheep with an aircraft during the hunting season (n=663)	31%	18%	16%	15%	20%
Regulation should stay the same (n=656)	28%	22%	28%	12%	10%
Do not allow hunting until 24 hours after day flown (n=656)	27%	13%	18%	15%	27%
Do not allow hunting until 12 hours after day flown (n=655)	18%	26%	19%	15%	22%
Remove same day airborne regulation (n=664)	3%	2%	5%	11%	79%

When asked if additional special sheep hunts should be implemented, hunters expressed some approval for more non-motorized hunts, trophy (large and old rams) hunts, and for hunts to stay the same (Table 12, Fig. 16). Hunters disapproved of more muzzleloader and subsistence hunts. Compared to hunters that did not perceive a problem, hunters that perceived a problem expressed stronger approval for non-motorized hunts and less approval for hunts to stay the same. Hunters that perceived a problem also expressed stronger disapproval of subsistence hunts than hunters that did not perceive a problem (Fig. 16).

Figure 16. Mean extent of approval or disapproval by hunters, that did (n=492) and did not (n=168) perceive a sheep hunter problem, of additions of special Alaska sheep hunts (-2 = strongly disapprove, -1 = somewhat disapprove, 0 = neither, 1 = somewhat approve, 2 =strongly approve). *Groups significantly different at 0.05.

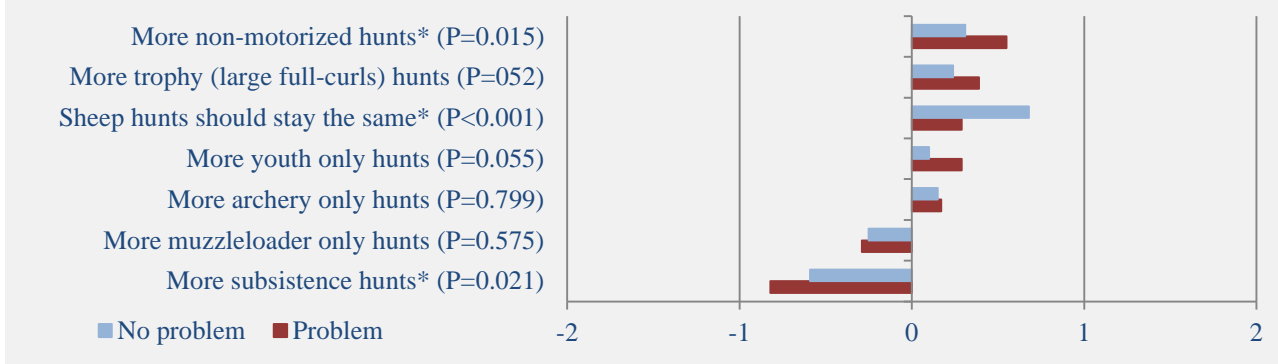


Table 12. Extent of approval or disapproval of increases in special Alaska sheep hunts when **ALL** resident hunters were pooled.

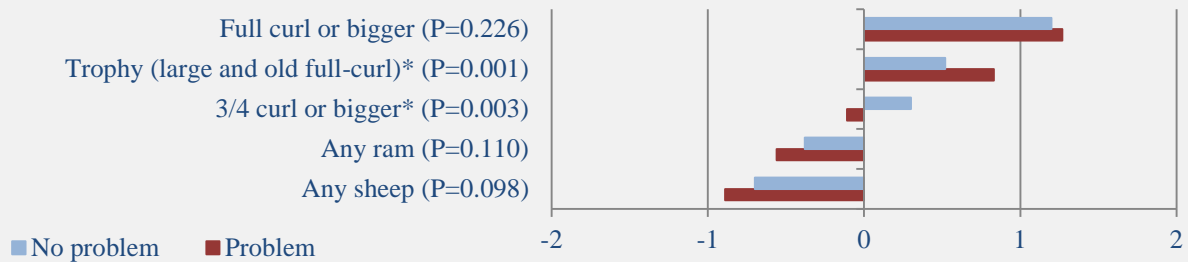
Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More archery only hunts (n=656)	28%	22%	28%	12%	10%
More non-motorized hunts (n=655)	27%	24%	30%	10%	10%
More trophy (old and large rams) management hunts (n=655)	19%	30%	29%	13%	10%
More youth only hunts (n=667)	17%	24%	31%	15%	13%
Sheep hunts should stay the same (n=655)	15%	30%	37%	12%	5%
More muzzleloader only hunts (n=664)	7%	15%	41%	19%	19%
More subsistence hunts (n=658)	7%	9%	26%	17%	40%

When asked about approval of different horn regulations and sheep types in drawing permit areas, mean hunter response suggests strongest approval for full-curl regulations and some approval for trophy (large and old full-curl rams) (Fig. 17, Table 13). Hunters’ response indicated disapproval for any ram or any sheep hunts. Hunters that perceived a problem had stronger approval for trophy management than hunters that did not perceive a problem. Also, hunters that perceived a problem slightly disapproved of ¾-curl ram regulations. Whereas, hunters that did not perceive a problem expressed some approval for ¾-ram regulations.

Table 13. Extent of approval or disapproval of changes in horn regulations, in drawing areas only, when **ALL** resident hunters were pooled.

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Full curl or bigger (n=657)	54%	27%	11%	5%	3%
Trophy (large and old full-curl rams) (n=655)	36%	26%	23%	8%	8%
¾ curl or bigger (n=647)	16%	30%	14%	15%	25%
Any ram (n=656)	12%	20%	11%	21%	37%
Any sheep (n=656)	8%	13%	12%	21%	46%

Figure 17. Mean extent of approval or disapproval by hunters, that did (n=490) and did not (n=161) perceive a sheep hunter problem, of changes in horn regulations in drawing permit areas (-2 = strongly disapprove, -1 = somewhat disapprove, 0 = neither, 1 = somewhat approve, 2 =strongly approve). *Groups significantly different at 0.05.



Both hunters that did and did not perceive a problem felt that limits should be placed on the percentage of permits allocated to nonresidents (Table 14). However, hunters that perceived a problem were more in favor of the limit. The median percentage of the total allocation of sheep permits that nonresidents should receive was significantly lower for hunters that perceived a problem (Table 14).

Table 14. Comparison of attitudes of all Alaska resident sheep hunters, and those that did (n=495) and did not (n=170) perceive a sheep hunter problem, toward changes in sheep tag prices and permit allocation limits to nonresidents.

Question	All	Problem	No problem
Should limits be placed on allocation of sheep permits to nonresidents* (P<0.001)	Yes 88%	Yes 93%	Yes 73%
If yes, what % of total allocation should nonresidents receive* (median) (P=0.008)	10%	10%	15%
Should Alaska residents pay for a sheep tag* (P<0.001)	Yes 40%	Yes 45%	Yes 25%
If yes, how much should a resident pay for a sheep tag (median) (P=0.245)	\$50	\$50	\$38
Should the price of a nonresident sheep tag change* (P<0.001)	Yes 70%	Yes 77%	Yes 49%
If yes, how much should a nonresident pay for a sheep tag (median)* (P<0.001)	\$1,000	\$1,000	\$750

*Groups significantly different at 0.05.

A minority of hunters felt that residents should pay for a sheep tag. For those that approved of a resident tag fee, the median price suggested was \$50 for hunters that perceived a problem and \$38 for those that did not. Most hunters that perceived a problem thought the price of a nonresident tag (current price = \$425) should increase to a median price of \$1000. Roughly half of the hunters that did not perceive a problem felt that the price of a nonresident tag fee should increase. Of those, the median price suggested was \$750 (Table 14).

When hunters were asked to consider several different changes to reduce hunting pressure, competition, and crowding, the most approved changes all involved reducing nonresident hunting opportunities (Table 15). Prohibition of spotting sheep from an aircraft during the hunting season, reduced motorized access, and more drawing hunts were also approved changes (Table 15). Mean response indicated strongest approval for a reduction in permit allocation to guided nonresidents, followed by approval of an increase in nonresident tag fees and a reduction in permit allocation to nonresident kin (Fig. 18). Strongest disapproval was given to reducing the length of the hunting season and limiting hunters to an allocation of one sheep permit every three years.

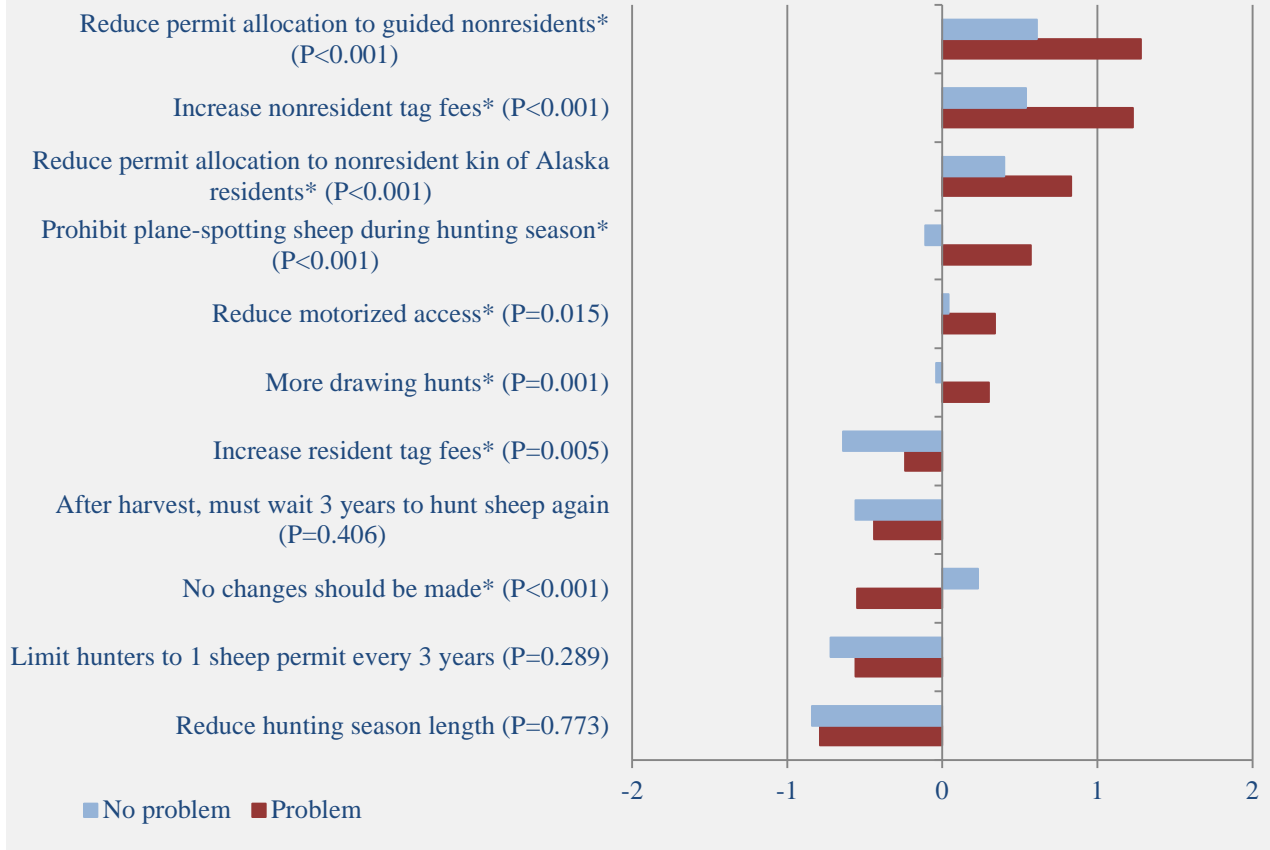
Table 15. Extent of approval or disapproval of potential changes to reduce sheep hunting pressure, competition, and crowding when **ALL** resident hunters were pooled.

Potential change	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Reduce permit allocation to nonresidents hunting with professional guides (n=668)	51%	26%	12%	5%	6%
Increase nonresident tag fees (n=662)	49%	24%	15%	7%	5%
Reduce permit allocation to nonresidents hunting with second-degree of kindred (see question 15 for definition) Alaska residents (n=663)	33%	31%	18%	12%	7%
Prohibit spotting sheep from aircraft during hunting season (n=664)	31%	22%	19%	14%	14%
Reduce motorized access (n=657)	20%	28%	22%	17%	12%
More drawing hunts (n=660)	16%	36%	16%	19%	14%
Increase resident tag fees (n=664)	16%	16%	19%	19%	30%
After harvesting a sheep, hunters must wait 3 years to hunt sheep again (n=663)	12%	23%	8%	17%	39%
Limit hunters to 1 sheep permit every 3 years (n=665)	11%	20%	9%	21%	40%
No changes should be made (n=621)	7%	11%	44%	19%	20%
Reduce hunting season length (n=652)	3%	10%	22%	37%	29%

When comparing hunters that did and did not perceive a problem, significant differences in approval and disapproval existed between groups for several potential changes (Fig. 18). Hunters that perceived a problem expressed stronger approval for reduced allocation to nonresidents and increased nonresident tag fees. Hunters that perceived a problem approved of a prohibition on spotting sheep from an aircraft during the hunting season, whereas hunters that did not perceive a problem expressed slight disapproval of a prohibition. Hunters that perceived a problem also expressed significantly higher approval of reduced motorized access and more drawing hunts. Lastly, hunters that did not perceive a problem expressed some approval for no changes to be made. Hunters that perceived a problem disapproved of no management or regulatory changes (Fig. 18).

Figure 18. Mean extent of approval or disapproval by hunters, that did (n=496) and did not (n=167) perceive a sheep hunter problem, of potential changes to reduce sheep hunting pressure, competition, and crowding (-2 = strongly disapprove, -1 = somewhat disapprove, 0 = neither, 1 = somewhat approve, 2 =strongly approve).

*Groups significantly different at 0.05.



Discussion

Findings from this survey indicated that approximately three out of four resident sheep hunters agreed or strongly agreed that crowding and competition while sheep hunting is currently a problem in either Alaska overall or the mountain range most important to them. One out of every ten resident sheep hunters disagreed or strongly disagreed that sheep hunter crowding and competition was a problem (Table 2), and the remainder were unsure or neither agreed or disagreed. Based on these results, I concluded that concerns reported in sheep proposals submitted to the BOG in recent years (Appendix A) were representative ($\pm 3.5\%$ margin of error at a 95% CI) of the majority of resident sheep hunters in Alaska.

The responses to several survey questions differed between resident hunters that did and did not (included those that were unsure) perceive sheep hunter crowding as a problem. Although perceptions of crowding were unrelated to sheep harvest success of the hunter, hunters that perceived a problem hunted sheep more times during the last 5 years and during their life (Table 3). I suspect that people that hunt sheep more frequently may have a greater chance of encountering other hunters and experiencing crowding. I did not identify a relationship between where people hunt and the perception of crowding. However, I

evaluated the crowding problem at a mountain-range scale. This mountain-range evaluation may have missed relationships at the scale of a Game Management Unit or specific hunt area (e.g., Tok Management Area). Hunters that used a commercial airplane (Fig. 7) or a transporter most of the time (Fig. 8) to access their hunting area were more likely to perceive a sheep hunter crowding problem. This relationship may be related to increased numbers of commercial operators in general or increased numbers of resident hunters with their own plane using a limited number runways. However, I did not have reliable data to confirm either of these causes. The relationship also may be related to hunter expectations. For instance, hunters paying for access by aircraft may expect a higher quality hunt than hunters that walk in from a road (Fig. 7). The association between airplane use and perceptions of crowding may also be related to how an airplane is used once a hunter reaches their hunting area. Hunters perceiving a problem approved of a prohibition on using an airplane to facilitate sheep hunting during the hunter season. Hunters that did not perceive a problem expressed slight disapproval of banning plane-spotting of sheep during the hunting season (Fig. 18).

Overall, I speculate that individual sheep hunter expectations may have contributed to differences in perceptions of a crowding problem as much as individual demographic or behavioral characteristic of a sheep hunter. In general, hunters that perceived a hunter crowding problem were less tolerable of all different scenarios of crowding presented (Fig. 9), and they also assigned a higher level of importance to various factors related to sheep hunter satisfaction (Fig. 13). At this time, the exact reason why 24% of hunters did not perceive a crowding problem is unclear. My unsupported explanations include the following: these hunters' expectations have been met in recent years, these hunters simply don't think that sheep hunting pressure is a problem (Fig. 10), or they are concerned that BOG changes in response to a hunter-crowding problem may be more drawing hunts that could limit annual opportunities. For hunters that did not perceive a problem, the most important factor related to sheep hunter satisfaction was the opportunity to hunt sheep every year (Fig. 14). Further, the potential changes of "limiting hunters to 1 sheep permit every 3 years" received strong disapproval by resident hunters that did not perceive a problem (Fig. 18).

Survey respondents were proportionally representative of where all resident sheep hunters reside (urban or rural) and choose to hunt (mountain range). The proportions of survey respondents hunting sheep in various mountain ranges (Fig. 4) were similar to Division of Wildlife Conservation (DWC) (2014) data on the sheep hunter numbers in each mountain range between 2001 and 2013. Based on ADF&G harvest records, approximately 75% of residents that hunted sheep between 2009-2013 resided in nonsubsistence use areas (i.e., urban areas according to Alaska Statute 16.05.258c). Of the 25% of rural sheep hunters, 20% resided in communities on the road network and 5% resided in communities off the road network. Sixty-nine percent of survey respondents resided in urban areas, 18% resided in rural communities on the road network, and 13% resided in rural communities off the road network. Overall, the survey results slightly underrepresented urban sheep hunters and overrepresented sheep hunters residing in rural communities off the road network. However, there were a few exceptions. A combination of low response rates and mail rerouting problems resulted in underrepresentation by some rural communities near or in the Brooks Range (e.g., Kotzebue, Anaktuvuk Pass, Wiseman, Kaktovik). Some rural communities also may be underrepresented because of low compliance with sheep harvest reporting requirements. In general, correcting for over or underrepresentation based on location of residence is unlikely to change results. Among hunters living in urban, rural on road, and rural off road communities, I found no

difference in perceptions of crowding in Alaska overall ($P = 0.971$) and in the mountain range most important to each hunter ($P = 0.069$).

The harvest success rate of survey respondents (35%) was higher than the 5-year average for all resident sheep hunters (25%) based on ADF&G harvest records. The overrepresentation of successful hunters in the survey may have been related to the nature of the survey. I spoke with approximately 25 survey nonrespondents (people that received the survey and did not return it). The majority of nonrespondents indicated that they did not complete the survey for two reasons: 1) they were not interested enough in sheep hunting to devote the time to the survey, or 2) they did not feel qualified to answer the questions based on their knowledge of sheep hunting in Alaska. I speculate that people less interested in and less knowledgeable about sheep hunting may have lower harvest success. If a more detailed analysis of groups (e.g., GMU hunted) will help evaluate sheep hunter concerns, then data variables can be weighted to correct for under or overrepresentation of the subgroup of interest. Results from focused comparisons of specific groups may differ from unweighted results presented in this report.

Resident hunters reporting a crowding (74%) primarily attributed the problem to more guides, more nonresident hunters, fewer legal rams, and more transporters and air taxis (Fig. 3). Hunters linking the problem to fewer legal rams was supported by DWC (2014) findings that sheep populations may be declining in several mountain ranges. I was unable to find reliable and precise independent data to assess changes in commercial operator activity. Big Game Commercial Services (under the ADCC&ED) does not have a readily accessible database that facilitates an analysis of how numbers of guides and transporters providing services to sheep hunters has changed over time. Further, there is currently no objective method to identify and quantifying the services that air taxis provide sheep hunters. Additional efforts to better quantify changes in spatial and temporal activities (Ex. Fig. 11 in DWC 2014) of commercial operators providing services to sheep hunters will advance understanding of how sheep management functions.

Resident hunters attributing the crowding and competition problem to more nonresident hunters does not directly corroborate with DWC (2014) findings that nonresident hunter numbers have been stable over time. However, resident hunter concerns may be more related to nonresident hunter influence on sheep harvest, rather than concerns over actual number of nonresident hunters. While the number of nonresident hunters has remained relatively constant over time, the number of legal rams that all hunters are competing for has likely decreased in many mountain ranges (DWC 2014). Resident hunter numbers have declined by roughly 20% since the early 1990s. The reason for the resident decline is unknown. The concept of a “disenfranchised” hunter that was identified during focus-group discussions and BOG proposals suggests that declines in resident hunter numbers are associated with a decline in the quality of sheep hunts driven by more competition with other hunters, especially professionally-guided nonresidents.

Other indicators commonly used to assess hunter opportunity, such as harvest success and hunting effort (mean days hunted), have slightly declined or been relatively stable, respectively (DWC 2014). However, neither of these parameters may be good indicators of sheep hunter satisfaction (i.e., hunter actual experience/hunter expectation). Harvest success was ranked 9th in importance of 16 choices when survey respondents assigned importance to factors related to hunter satisfaction (Fig. 13). Physical difficulty of the hunt (potential gauge of effort) ranked 14th in importance. Survey results indicated that sheep hunter

satisfaction was strongly linked to the following factors: levels of hunter crowding while sheep hunting, seclusion from other hunters, numbers of sheep seen, and opportunities to hunt every year. With the current sheep population size and distribution, hunter expectations related to satisfaction may be difficult to achieve if all sheep hunters expect an opportunity to harvest legal rams every year in seclusion. To attain ideal hunter satisfaction while reducing harvest pressure on sheep populations (Fig. 10), either hunter expectations or hunter densities need to be reduced. Survey results indicated that residents would prefer to address the problem by reducing nonresident hunter numbers.

Most (88%) of resident hunters reported that a limit of 10% (median) of sheep permits should be allocated to nonresidents. In certain sheep management areas (e.g., Tok, Delta Controlled Use, 14A), 10% limits on nonresident sheep hunters have been established (DWC 2014). Some professional guides participating in my focus-group discussions commented that reducing nonresident sheep permits will significantly reduce state revenue for management and research of sheep. With an annual average of 450 nonresident sheep hunters paying \$425 per tag, ADF&G generates an estimated \$191,250 from these tag sales. A permit allocation of 10% (approximately half of current participation) to nonresident sheep hunters would reduce tag revenue by \$95,625. With an annual average of 1,800 resident sheep hunters, each resident hunter would need to pay \$53 for a tag to make up the loss in tag revenue due to reductions in nonresident sheep hunters. Seventy percent of resident hunters felt that fees on nonresident tags should be increased to \$1,000 (median, Table 14). Considering the scenario where allocation limits (10%) reduce numbers of nonresident sheep hunters (approximately 225 people), a \$1,000 nonresident tag would increase current state revenue from sheep tags by \$33,750. However, revenue from sheep tags may be relatively small compared to other nonresident hunter expenditures associated with the guiding industry in Alaska (Watson 1990, McDowell Group 2014). A few professional guides participating in focus group discussions also quoted a section of ADF&G's mission statement (2014) that states that game resources are to be developed "...in the best interest of the economy and the well-being of the people of the state".

Resident hunter dissatisfaction with (Fig. 12) current management of sheep hunting did not corroborate precisely with their approval of changes (Fig. 18) to reduce sheep hunting pressure, competition, and crowding. For example, resident hunters were most dissatisfied with the current allocation of permits to nonresidents and the regulation of guides. Resident hunters expressed strong approval of changes that reduce allocation of the permits to nonresidents (approval of changes to guide regulations was absent). This discrepancy was likely related to the structure of the questionnaire. The questionnaire asked hunters to express their satisfaction or dissatisfaction with the regulation of commercial operators. The questionnaire did not ask for their approval or disapproval of potential changes to the regulation of commercial operators. Not including "regulation of guides" as an option on the approval or disapproval question was deliberate. BOG requested that survey questions exploring hunter suggestions for improvement to sheep management and regulation focus on issues that the BOG could adequately address during the 2015 BOG meetings. Regulation of guides is not under the jurisdiction or authority of the BOG or ADF&G. In addition, other efforts were underway during this survey to address regulation of big game guides (DML&W 2014). Changes in tag fees for sheep hunters (also not directly regulated by the BOG) were included in the questionnaire because of a more substantive connection between license and tag fees and ADF&G's operations which directly affect sheep management and research programs.

Potential management changes in the questionnaire receiving strongest approval by resident hunters may reduce sheep hunting opportunities for other interest groups. Although I was not contracted to analyze

responses from other interest groups with the same detail as resident hunter responses, it is important to explore and compare nonresident and commercial operator responses to survey questions that directly addressed problems and solutions related to sheep hunter crowding (Appendix E). Compared to resident hunters, a higher number of commercial operators agreed or strongly agreed (84%) that sheep hunter crowding and competition is a problem in either Alaska overall or in the mountain range most important to them. A minority (35%) of nonresident sheep hunters agreed or strongly agreed that sheep hunter crowding was a problem (Appendix E).

All three groups agreed that more professional guides and few legal rams were two of the top three causes of sheep hunter crowding and competition (Appendix E). Nonresident hunters differed with their perception that resident hunters were causing the problem. According to commercial operators, the main cause of the problem was more transporters and air taxis. However, transporters and air taxis were underrepresented in the commercial services survey. Therefore, this finding may better indicate the perceptions of professional guides. Of the 69 valid responses to the commercial services survey (response rate = 50%), 62 respondents provided guiding services, 8 provided transporter services, and 11 provided air taxi services to sheep hunters. Adding these services indicates some commercial operators provided multiple services.

All three groups differed with regard to dissatisfaction with sheep management and regulation characteristics (Appendix E). Commercial operators were strongly dissatisfied with regulation of transporters and air taxis providing services to sheep hunters. Nonresidents were dissatisfied with the statute requiring them to have a guide when sheep hunting if they were not accompanied by an Alaska resident within second-degree of kindred. All three groups expressed strong satisfaction with length of the sheep hunting season and full-curl regulations

Approval of sheep management and regulation changes to reduce sheep hunting pressure, crowding, and competition differed among all three groups. Commercial operators most strongly approved of increasing resident tag fees and requiring sheep hunters to wait three years to hunt again after harvesting a sheep. Nonresidents expressed strongest approval of sheep hunters waiting three years to hunt after harvesting a sheep. Nonresidents also approved of reducing motorized access and creating more drawing hunts to reduce sheep hunting pressure, crowding and competition (Appendix E). As mentioned above, approval or disapproval of changes in guiding and transporting regulations was not included as an option to choose from in the question because the BOG has no authority to regulate commercial services. Similar to residents expressing strongest approval for changes that would impact nonresidents and their guides, professional guides and nonresidents strongly approved of changes that would primarily impact residents. A management change requiring sheep hunters to wait three years to hunt again after harvesting a sheep would be unlikely to hinder professional guide activity and the practices of their clients (93% are nonresidents, Appendix D, Question 10). Most nonresidents only hunt sheep in Alaska once and very few hunt sheep consecutive years in Alaska.

To my knowledge, quantitative data collected from previous statewide research on Alaska sheep hunter attitudes and behaviors no longer exists. Statewide surveys on attitudes and satisfaction of Alaska sheep hunters were conducted by ADF&G in 1973 (Smith, unpublished) and 1980 (Cica, unpublished). The questionnaires used in those surveys have been located. Both ADF&G and I have been unable to find the results. Although not directly related to my survey, Watson (1990) conducted an in-depth study on the

economics of sheep hunting in Alaska. ADF&G (Gardner 2002) conducted a study in 2000 to assess hunter satisfaction with sheep hunts within the Tok Management Area (TMA: drawing permit area). Similar to my study, the Tok study reported that most (89%) hunters agreed that solitude while sheep hunting was important. Different from my statewide analysis, Gardner (2002) found that 77% of respondents were satisfied with the quality of sheep hunts.

Using data from these previous studies with different intentions, I am unable to objectively quantify whether perceptions of sheep hunter crowding and the quality of sheep hunts in Alaska has changed over time. Although my focus-group discussions provided qualitative insight on the quality sheep hunts in the past, this information should be considered exploratory rather than objective and scientifically conclusive.

This survey provided a statewide “snapshot” on sheep hunter attitudes and behaviors relating to concerns about hunter crowding and other issues relevant to sheep management and regulation. These data will serve as baseline of scientific information for comparison with future efforts. This survey also created a new stream of communication from sheep hunters to the BOG and ADF&G. Effective management of a highly-prized public resource with economic importance requires a careful balance and compromise among conflicting interests. The engagement of multiple stakeholders in the research process will likely contribute to more informed management decisions and an improved public understanding (and possibly acceptance) of why decisions were made.

Acknowledgments

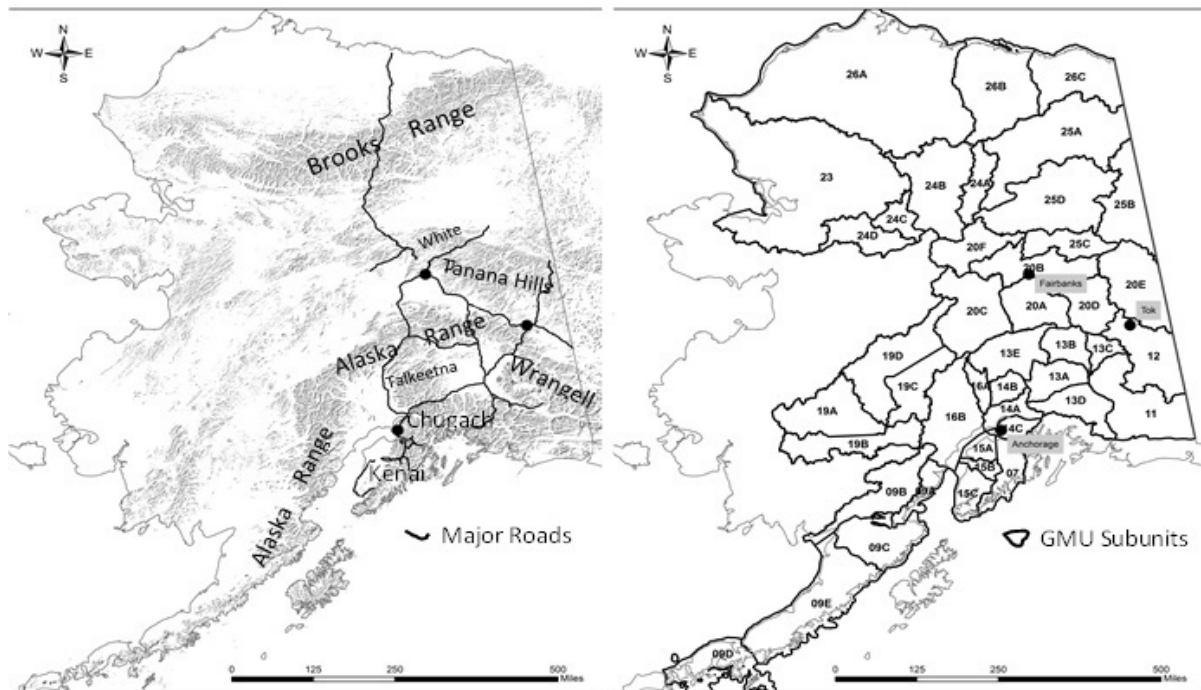
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Appendix B. Responses (red font) from Alaska resident sheep hunters to all questions asked on the 2014 Alaska Sheep Hunter Survey. This survey (conducted summer 2014) addressed specific information needs identified by the Alaska Board of Game (BOG). Information needs were related to proposals (Appendix A) submitted to the BOG in recent years expressing concern of a decline in the quality of sheep hunting in Alaska because of unacceptable levels of crowding, competition, and conflict among interest groups. Interest groups included resident sheep hunters, nonresident sheep hunters, and commercial operators (hunting guides, transporters, and air taxis) providing services to sheep hunters. The questionnaire collected information on characteristics and attitudes of sheep hunters to answer the following questions: 1) Is there a sheep hunter problem? 2) Why is there a sheep hunter problem? and 3) How might sheep hunting be improved? *NOTE: Some values reported in Appendix B may differ from Final Report on Resident Sheep Hunter Responses because the Final Report excluded responses from people that had never hunted sheep (7% of responses) in Alaska.*



Map 1. Major mountain ranges of Alaska containing sheep hunts.

Map 2. Alaska Department of Fish & Game’s Game Management Unit (GMU) Subunits containing sheep hunts.

Question 1: Have you hunted sheep in Alaska?

- Yes (n=698) 93%
- No (skip to question 29) (n=51) 7%

Question 2: Which mountain ranges (please see maps 1 & 2) in Alaska have you hunted sheep in (fill in all that apply)? (n=698)

	During the last 5 years (2009-2013)	During your life
Alaska Range (GMU 9, 16, 17, 19, 20A, 20C)	31%	46%
Brooks Range (GMU 23, 24, 25A, 25B, 25D, 26)	31%	42%
Chugach Mountains (GMU 13D, 14A, 14C)	15%	33%
Kenai Mountains (GMU 7, 15)	7%	14%
Talkeetna Mountains (GMU 13A, 13E, 14A, 14B)	13%	22%
Tanana Hills (GMU 20B, 20D, 20E)	6%	10%
White Mountains (GMU 20B, 20F, 25C)	3%	6%
Wrangell Mountains (GMU 11, 12)	27%	43%

Question 3: Which mountain range (please see maps 1 & 2) in Alaska is most important to you for sheep hunting (**please fill in one**)? (n=692)

- Alaska Range 23% Kenai Mountains 4% White Mountains 1%
 Brooks Range 22% Talkeetna Mountains 7% Wrangell Mountains 19%
 Chugach Mountains 11% Tanana Hills 3% Unsure 10%

Question 4: How frequently do you switch mountain ranges that you hunt Alaska sheep in (please see question 2 for ranges)? (n=685)

- I switch ranges every time that I go sheep hunting 9%
 I switch ranges every 2-5 times that I go sheep hunting 36%
 I switch ranges every 6-10 times that I go sheep hunting 11%
 I have only hunted sheep in one range (**skip to question 6**) 44%

Question 5: To what extent do you agree or disagree with the following reasons why you switch ranges to hunt in?

Reason	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Changes in sheep population size (n=372)	18%	44%	30%	4%	4%
To avoid competition with other hunters (n=368)	45%	35%	16%	2%	2%
To avoid competition with professional guides (n=370)	46%	24%	23%	4%	3%
Because you received a drawing permit (n=373)	52%	17%	23%	2%	7%
Changes in amount of time you have to hunt (n=361)	14%	36%	37%	6%	7%
For a new experience (n=369)	36%	46%	13%	4%	1%
Cost of the hunt (n=361)	12%	37%	36%	6%	9%
Other (describe):					

Question 6: What year did you start hunting sheep in Alaska? (please write response YYYY) (n=677) Mean = 1998 (SD = 13.5)

Question 7: How many years have you gone sheep hunting in Alaska? (please write response) (n=680) Mean = 9 years (SD = 10.0)

Question 8: Which methods have you used to hunt sheep in Alaska (fill in all that apply)? (n=698)

- Rifle 95% Muzzleloader 1% Archery 16% Pistol 2%

Question 9: Which mode of access do you use the **most** to get to where you begin hunting on foot for sheep in Alaska? (n=682)

- Airplane (commercial service) 33% Pack animal (horse, mule, alpaca) 2%
 Airplane (my own, family member's, friend's) 16% Passenger vehicle (car, truck) 24%
 ATV (4-wheeler, track vehicle, side-by-side) 20% Other: _____
 Snow machine 1%
 Boat (includes raft and canoe) 6%

Question 10: Which type of sheep hunt have you participated in (**fill in all that apply**)? (n=698)

Type of hunt	During the last 5 years (2009-2013)	During your life
Drawing	31%	48%
General harvest	72%	85%
Registration/Subsistence	10%	13%

Question 11: To what extent do you agree or disagree with the following reasons why you hunt sheep in Alaska?

Reason	Strongly agree	Agree	Neither	Disagree	Strongly agree
For the meat (n=686)	63%	30%	4%	2%	1%
To interact with nature (n=667)	70%	25%	5%	0%	1%
For the trophy opportunity (n=666)	41%	40%	11%	4%	5%
To spend time with family & friends (n=665)	47%	34%	14%	3%	2%
For customary and traditional reasons (n=641)	16%	20%	45%	8%	11%
For sport and the challenge (n=675)	67%	26%	5%	1%	1%

Question 12: Compared to the hunting of other game species in Alaska, how important is sheep hunting to you?

Species or group of species	Less important than sheep hunting	Equally important to sheep hunting	More important than sheep hunting
Black bear (n=685)	76%	21%	3%
Brown/Grizzly bear (n=681)	69%	28%	4%
Bison (n=677)	65%	25%	10%
Caribou (n=684)	47%	38%	15%
Deer (n=680)	63%	28%	10%
Elk (n=676)	77%	20%	4%
Moose (n=681)	29%	42%	29%
Mountain goat (n=677)	54%	42%	4%
Muskox (n=674)	78%	18%	4%
Small game (grouse, hares, ptarmigan, waterfowl) (n=681)	60%	32%	8%

Question 13: How frequently do you use a professional guide to hunt sheep in Alaska? (n=691)

- Never 96%
 Rarely 3%
 Most of the time 0%
 Always 1%

Question 14: How frequently do you use a professional transporter/air taxi to hunt sheep in Alaska? (n=692)

- Never 43%
 Rarely 26%
 Most of the time 23%
 Always 9%

Question 15: (Nonresidents only) Do you have second-degree of kindred that are residents of Alaska? *Second-degree of kindred includes father, mother, brother, sister, son, daughter, spouse, grandparent, grandchild, brother/sister-in-law, son/daughter-in-law, father/mother-in-law, stepfather, stepmother, stepsister, stepbrother, stepson, or stepdaughter.*

NA

Question 16: (Nonresidents only) When you sheep hunt in Alaska, how frequently do you hunt with Alaska residents that are second-degree of kindred (see question 15 for definition)?

NA

Question 17: Do you feel that limits should be placed on the percentage of sheep tags allocated to nonresidents? (n=668)

- Yes 88% What percentage of total allocation should nonresidents receive? (please write response) Median = 10% (SD = 12)
- No 12%

Question 18: To what extent do you agree or disagree that sheep hunter crowding is a problem in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=672)	26%	40%	16%	5%	1%	13%
In the range most important to you (n=670)	30%	36%	18%	8%	2%	6%

Question 19: If you feel sheep hunter competition and crowding is a problem, to what extent do you agree or disagree with the following causes of competition and crowding? (Analyzed responses that agreed or strongly agreed on question 18)

Reason	Strongly agree	Somewhat agree	Neither	Somewhat disagree	Strongly disagree	Unsure
Fewer legal rams (n=496)	41%	42%	10%	3%	2%	2%
More resident hunters (n=491)	25%	44%	19%	7%	4%	2%
More nonresident hunters (n=498)	47%	36%	10%	2%	1%	4%
More professional guides (n=498)	58%	24%	11%	2%	2%	3%
More professional transporters/air taxis (n=496)	42%	31%	19%	3%	1%	4%
More Alaska residents with planes (n=494)	17%	34%	33%	9%	2%	5%
Decline in sheep distribution (n=489)	23%	34%	30%	5%	2%	6%
Drawing areas displacing hunters to general harvest areas (n=494)	29%	35%	24%	5%	2%	6%
Decline in hunter ethics (n=490)	19%	30%	34%	8%	5%	4%
Other (describe):						

Question 20: How tolerable or intolerable are the following levels of crowding while sheep hunting?

Levels of crowding	Very tolerable	Somewhat tolerable	Neither	Somewhat intolerable	Very intolerable
I see a small plane in the air passing over the area I'm hunting (n=667)	30%	38%	13%	14%	4%
I see a small plane on the ground in the area I'm hunting (n=666)	6%	27%	18%	32%	18%
I see a small plane searching for sheep in the area I'm hunting (n=665)	3%	15%	11%	32%	38%
I see another hunter while hunting (n=664)	6%	30%	21%	31%	13%
I see another hunter camp while hunting (n=664)	5%	26%	24%	33%	12%
I see multiple hunters and camps while hunting (n=665)	3%	6%	8%	35%	48%
I have to change where I hunt to avoid other hunters (n=665)	3%	8%	13%	30%	46%
Other hunters interrupt my stalk on a sheep (n=665)	1%	2%	8%	12%	77%
I can't get away from other hunters (n=662)	1%	2%	14%	15%	67%
Other (describe):					

Question 21: To what extent do you agree or disagree that there is too much harvest pressure on the sheep population in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=671)	14%	38%	24%	6%	2%	16%
In the range most important to you (n=673)	23%	30%	26%	11%	2%	9%

Question 22: Since you started hunting sheep in Alaska, to what extent do you feel that the sheep population has increased or decreased in following areas?

Areas	Significant increase	Slight increase	Neither	Slight decrease	Significant decrease	Unsure
In Alaska overall (n=671)	1%	3%	25%	26%	21%	24%
In the range most important to you (n=669)	2%	4%	25%	25%	28%	16%

Question 23: How satisfied or dissatisfied are you with the following current sheep management and regulation characteristics?

Characteristic	Very satisfied	Somewhat satisfied	Neither	Somewhat dissatisfied	Very dissatisfied
Sheep population size (n=661)	6%	33%	23%	29%	9%
Full-curl regulation (n=662)	40%	32%	10%	13%	5%
Length of sheep hunting season (Aug. 10 – Sep. 20) (n=666)	41%	35%	13%	8%	3%
Number of other hunters seen while sheep hunting (n=664)	5%	21%	29%	36%	8%
Number of drawing hunts (n=660)	7%	30%	35%	21%	7%
Number of general harvest hunts (n=666)	13%	35%	33%	14%	5%
Number of registration/subsistence hunts (n=661)	7%	15%	49%	19%	11%
Regulation of professional guides (n=661)	4%	15%	26%	27%	29%
Regulation of professional transporters (n=662)	5%	16%	40%	23%	16%
Level of enforcement in the field (n=664)	12%	26%	39%	17%	7%
Horn sealing requirements (n=657)	24%	28%	28%	11%	10%
Allocation of tags to nonresident hunters (n=657)	3%	8%	29%	32%	29%
Allocation of tags to nonresident second-degree of kindred (see question 15 for definition) hunters (n=658)	6%	14%	41%	24%	15%
Statute requiring nonresidents to hire professional guides (n=664)	52%	23%	14%	7%	5%
Other: Describe					

Question 24: To what extent do you approve or disapprove of the following changes in timing of the sheep hunting season?

Timing of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Start a week sooner (n=665)	6%	14%	38%	19%	24%
Start a week sooner for residents only (n=654)	29%	27%	18%	13%	14%
Start a week later (n=656)	4%	9%	44%	21%	23%
Start a week later for non-residents only (n=656)	35%	30%	17%	8%	10%
Lengthen overall season (n=654)	12%	19%	34%	16%	19%
Shorten overall season (n=649)	2%	5%	33%	27%	33%
Divide into early and late seasons (Example: Aug. 10-25 & Aug. 26-Sept. 20) (n=653)	8%	22%	36%	12%	21%
Seasons should stay the same (n=661)	29%	24%	35%	8%	5%
Other: Describe					

Question 25: Would you like to see more or less law enforcement in the field during the sheep hunting season? (n=669)

- Much more 10% Same 52% Much less 5%
 Slightly more 20% Slightly less 6% Unsure 7%

Question 26: Currently, hunters are not allowed to hunt sheep the same day airborne, and it is against the law to hunt until 3:00 a.m. the following day after you have flown. An aircraft can be used during the hunting season to spot sheep. To what extent do you approve or disapprove of the following changes?

Change in regulation	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Remove same day airborne regulation (n=664)	3%	2%	5%	11%	79%
Do not allow hunting until 12 hours after day flown (n=655)	18%	26%	19%	15%	22%
Do not allow hunting until 24 hours after day flown (n=656)	27%	13%	18%	15%	27%
Do not allow hunters to spot sheep with an aircraft during the hunting season (n=663)	31%	18%	16%	15%	20%
Regulation should stay the same (n=656)	28%	22%	28%	12%	10%

Question 27: To what extent do you approve or disapprove of the following increases in special Alaska sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More archery only hunts (n=656)	28%	22%	28%	12%	10%
More youth only hunts (n=667)	17%	24%	31%	15%	13%
More muzzleloader only hunts (n=664)	7%	15%	41%	19%	19%
More non-motorized hunts (n=655)	27%	24%	30%	10%	10%
More subsistence hunts (n=658)	7%	9%	26%	17%	40%
More trophy (old and large rams) management hunts (n=655)	19%	30%	29%	13%	10%
Sheep hunts should stay the same (n=655)	15%	30%	37%	12%	5%

Question 28: *In drawing areas only*, to what extent do you approve or disapprove of the following types of sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Any sheep (n=656)	8%	13%	12%	21%	46%
Any ram (n=656)	12%	20%	11%	21%	37%
3/4 curl or bigger (n=647)	16%	30%	14%	15%	25%
Full curl or bigger (n=657)	54%	27%	11%	5%	3%
Trophy (large and old full-curl rams) (n=655)	36%	26%	23%	8%	8%

Question 29: How important or unimportant are the **following factors** to your sheep hunting satisfaction in Alaska?

Factor	Very important	Somewhat important	Neither	Somewhat unimportant	Very unimportant
Opportunity to hunt sheep every year (n=673)	64%	25%	6%	5%	1%
Opportunity for walk-in hunts in non-motorized areas (n=675)	43%	32%	15%	6%	4%
Seclusion from other hunters (n=675)	60%	32%	6%	1%	1%
Seclusion from plane traffic (n=673)	34%	41%	17%	5%	2%
Level of crowding and competition (n=673)	60%	32%	6%	1%	1%
Number of sheep seen (n=675)	49%	41%	7%	3%	0%
Number of legal rams seen (n=674)	56%	37%	5%	2%	0%
Opportunity to harvest a sheep (any ram) (n=674)	20%	27%	21%	17%	15%
Opportunity to harvest a full-curl ram (n=672)	50%	38%	7%	3%	1%
Opportunity to harvest a very large (>40 inch) ram (n=673)	33%	34%	18%	11%	6%
Harvest success (n=675)	30%	47%	15%	6%	2%
Size of ram harvested (n=674)	16%	46%	22%	12%	4%
Cost of a sheep hunt (n=670)	26%	33%	23%	12%	7%
Opportunity to hire professional transporters or guides (n=670)	7%	14%	23%	17%	39%
Physical difficulty of the hunt (ex: distance you have to walk) (n=672)	13%	34%	26%	17%	10%
Weather (n=666)	18%	30%	30%	14%	8%

Question 30: Please rank the **following sources of information** based on how much or little they influence your opinion of sheep hunting opportunities in Alaska? (1 = most influence, 4 = least influence)

Source	1	2	3	4
Agency (ADF&G, USFWS) data and publications (n=668)	18%	32%	36%	14%
My own sheep hunting experience (n=667)	67%	20%	8%	6%
Conversations with fellow hunters (includes internet forums) (n=669)	17%	42%	30%	11%
Sheep hunting/conservation organizations (Example: WSF, FNAWS, SCI, GSCO) (n=663)	4%	8%	16%	72%
Other (describe):				

Question 31: How frequently do you apply for a sheep drawing tag? (n=676)

- Every year 54%
 Once every 6-9 years 3%
- Most years (2 out of every 3 years) 17%
 Once every 10 or more years 5%
- Once every 3-5 years 8%
 I've never applied for a drawing tag 15%

Question 32: If you **do NOT** draw a permit, how likely or unlikely are you to go sheep hunting? (n=665)

- Very likely 41%
 Somewhat likely 27%
 Neither 12%
 Somewhat unlikely 13%
 Very unlikely 8%

Question 33: To what extent do you approve or disapprove of the following changes to reduce sheep hunting pressure, competition, and crowding?

Change	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More drawing hunts (n=660)	16%	36%	16%	19%	14%
Reduce hunting season length (n=652)	3%	10%	22%	37%	29%
Reduce tag allocation to nonresidents hunting with second-degree of kindred (see question 15 for definition) Alaska residents (n=663)	33%	31%	18%	12%	7%
Reduce tag allocation to nonresidents hunting with professional guides (n=668)	51%	26%	12%	5%	6%
Limit hunters to 1 sheep tag every 3 years (n=665)	11%	20%	9%	21%	40%
After harvesting a sheep, hunters must wait 3 years to hunt sheep again (n=663)	12%	23%	8%	17%	39%
Reduce motorized access (n=657)	20%	28%	22%	17%	12%
Prohibit spotting sheep from aircraft during hunting season (n=664)	31%	22%	19%	14%	14%
Increase resident tag fees (n=664)	16%	16%	19%	19%	30%
Increase nonresident tag fees (n=662)	49%	24%	15%	7%	5%
No changes should be made (n=621)	7%	11%	44%	19%	20%
Other (describe):					

Question 34: Do you feel that Alaska residents should pay for a sheep tag (currently free with license)? (n=672)

- Yes 40%
 No (skip to question 37) 60%

Question 35: How much should an Alaska resident pay for a sheep tag? (n=268)

- \$10
 \$75
- \$25
 \$100
- \$50 (Median value of responses)
 Different amount \$_____

Question 36: (Alaska Resident only) How much would you be willing to pay for a sheep tag if allocation of nonresident sheep tags were reduced? (n=262)

- \$10
 \$75 (Median value of responses)
- \$25
 \$100
- \$50
 Different amount \$_____

Question 37: Do you feel that the price of a nonresident sheep tag should change (current price is \$425)? (n=675)

- Yes 70%
- No (skip to question 39) 30%

Question 38: How much should a nonresident pay for a sheep tag? (n=467)

- Less than \$425
- \$500
- \$750
- \$1000 (Median value of response)
- \$1250
- Different amount \$_____

Question 39: To what extent do you agree or disagree that the average Alaska sheep hunter is sufficiently educated on sheep hunting issues in Alaska? (n=671)

- Strongly agree 3%
- Somewhat agree 38%
- Neither 18%
- Somewhat disagree 28%
- Strongly disagree 11%
- Unsure 2%

Question 40: Which of the following categories best describes your approximate household income in 2013? (n=643)

- Less than \$25,000 4%
- \$25,001 - \$50,000 11%
- \$50,001 - \$75,000 17%
- \$75,001 - \$100,000 22%
- \$100,001 - \$125,000 18%
- \$125,001 - \$150,000 10%
- \$150,001 - \$175,000 7%
- More than \$175,000 12%

Question 41: Which of the following categories best describes the highest level of education that you have received? (n=661)

- Some high school 1%
- Graduated from high school 15%
- Some college 24%
- Graduated from college 33%
- Some graduate school 6%
- Completed graduate school 20%

Question 42: If you are an Alaska resident, how long have you been a resident? (n=670) (please write response) Mean = 26 (SD=19) years

Question 43: What is your age? (n=675) (please write response) Mean = 47 (SD=14) years old

Question 44: What is your gender? (n=930)

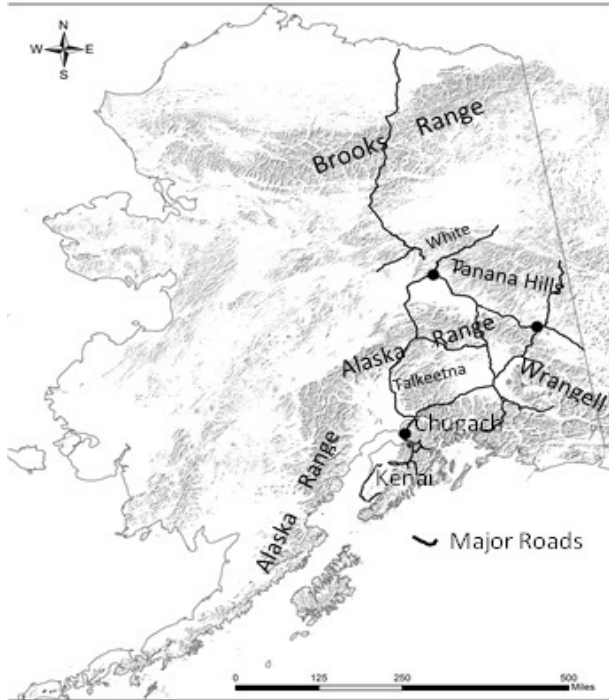
- Male 93%
- Female 7%

Questions? Please feel free to contact the project leader:

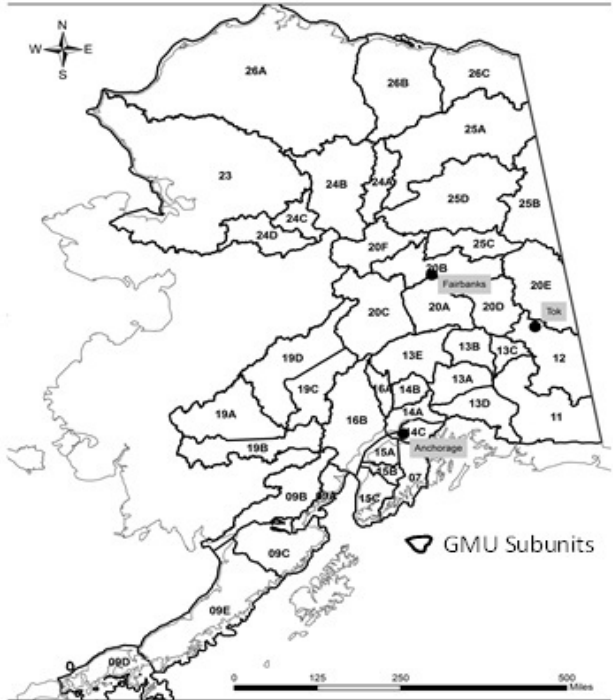
Dr. Todd Brinkman, Assistant Professor
Department of Biology and Wildlife, University of Alaska Fairbanks
Phone: (907)474-7139, Email: tjbrinkman@alaska.edu



Appendix C. Responses (red font) from nonresident sheep hunters to all questions asked on the 2014 Alaska Sheep Hunter Survey. This survey (conducted summer 2014) addressed specific information needs identified by the Alaska Board of Game (BOG). Information needs were related to proposals (Appendix A) submitted to the BOG in recent years expressing concern of a decline in the quality of sheep hunting in Alaska because of unacceptable levels of crowding, competition, and conflict among interest groups. Interest groups included resident sheep hunters, nonresident sheep hunters, and commercial operators (hunting guides, transporters, and air taxis) providing services to sheep hunters. The questionnaire collected information on characteristics and attitudes of sheep hunters to answer the following questions: 1) Is there a sheep hunter problem? 2) Why is there a sheep hunter problem? and 3) How might sheep hunting be improved?



Map 1. Major mountain ranges of Alaska containing sheep hunts.



Map 2. Alaska Department of Fish & Game's Game Management Unit (GMU) Subunits containing sheep hunts.

Question 1: Have you hunted sheep in Alaska?

- Yes (n=269) 88%
- No (skip to question 29) (n=37) 12%

Question 2: Which mountain ranges (please see maps 1 & 2) in Alaska have you hunted sheep in (fill in all that apply)? (n=269)

	During the last 5 years (2009-2013)	During your life
Alaska Range (GMU 9, 16, 17, 19, 20A, 20C)	34%	41%
Brooks Range (GMU 23, 24, 25A, 25B, 25D, 26)	31%	35%
Chugach Mountains (GMU 13D, 14A, 14C)	10%	16%
Kenai Mountains (GMU 7, 15)	0.4%	2%
Talkeetna Mountains (GMU 13A, 13E, 14A, 14B)	6%	10%
Tanana Hills (GMU 20B, 20D, 20E)	2%	3%
White Mountains (GMU 20B, 20F, 25C)	0.4%	1%
Wrangell Mountains (GMU 11, 12)	13%	20%

Question 3: Which mountain range (please see maps 1 & 2) in Alaska is most important to you for sheep hunting (**please fill in one**)? (n=264)

- Alaska Range 22% Kenai Mountains 0% White Mountains 0%
 Brooks Range 30% Talkeetna Mountains 1% Wrangell Mountains 10%
 Chugach Mountains 11% Tanana Hills 2% Unsure 19%

Question 4: How frequently do you switch mountain ranges that you hunt Alaska sheep in (please see question 2 for ranges)? (n=259)

- I switch ranges every time that I go sheep hunting 11%
 I switch ranges every 2-5 times that I go sheep hunting 11%
 I switch ranges every 6-10 times that I go sheep hunting 2%
 I have only hunted sheep in one range (**skip to question 6**) 76%

Question 5: To what extent do you agree or disagree with the following reasons why you switch ranges to hunt in?

Reason	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Changes in sheep population size (n=61)	15%	36%	38%	7%	5%
To avoid competition with other hunters (n=63)	33%	49%	11%	2%	5%
To avoid competition with professional guides (n=63)	21%	33%	35%	3%	8%
Because you received a drawing permit (n=66)	40%	21%	32%	0%	8%
Changes in amount of time you have to hunt (n=64)	6%	27%	41%	9%	17%
For a new experience (n=65)	54%	29%	14%	2%	1%
Cost of the hunt (n=64)	14%	31%	44%	3%	8%
Other (describe):					

Question 6: What year did you start hunting sheep in Alaska? (please write response YYYY) (n=259) Mean = 2007 (SD = 7.2)

Question 7: How many years have you gone sheep hunting in Alaska? (please write response) (n=264) Mean = 2 years (SD = 1.6)

Question 8: Which methods have you used to hunt sheep in Alaska (fill in all that apply)? (n=269)

- Rifle 94% Muzzleloader 1% Archery 7% Pistol 0%

Question 9: Which mode of access do you use the **most** to get to where you begin hunting on foot for sheep in Alaska? (n=253)

- Airplane (commercial service) 72% Pack animal (horse, mule, alpaca) 7%
 Airplane (my own, family member's, friend's) 5% Passenger vehicle (car, truck) 10%
 ATV (4-wheeler, track vehicle, side-by-side) 4% Other: _____
 Snow machine 0%
 Boat (includes raft and canoe) 2%

Question 10: Which type of sheep hunt have you participated in (**fill in all that apply**)? (n=269)

Type of hunt	During the last 5 years (2009-2013)	During your life
Drawing	21%	27%
General harvest	71%	83%
Registration/Subsistence	2%	2%

Question 11: To what extent do you agree or disagree with the following reasons why you hunt sheep in Alaska?

Reason	Strongly agree	Agree	Neither	Disagree	Strongly agree
For the meat (n=259)	28%	39%	19%	5%	9%
To interact with nature (n=260)	64%	30%	5%	1%	0%
For the trophy opportunity (n=263)	73%	22%	3%	1%	0%
To spend time with family & friends (n=257)	31%	28%	31%	4%	6%
For customary and traditional reasons (n=250)	10%	24%	51%	7%	9%
For sport and the challenge (n=263)	84%	14%	2%	0%	0%
Other (describe):					

Question 12: Compared to the hunting of other game species in Alaska, how important is sheep hunting to you?

Species or group of species	Less important than sheep hunting	Equally important to sheep hunting	More important than sheep hunting
Black bear (n=261)	84%	13%	3%
Brown/Grizzly bear (n=262)	37%	56%	7%
Bison (n=259)	78%	20%	3%
Caribou (n=262)	65%	32%	4%
Deer (n=258)	83%	14%	2%
Elk (n=260)	83%	14%	3%
Moose (n=260)	36%	57%	7%
Mountain goat (n=259)	41%	57%	2%
Muskox (n=259)	72%	25%	3%
Small game (grouse, hares, ptarmigan, waterfowl) (n=255)	87%	11%	2%

Question 13: How frequently do you use a professional guide to hunt sheep in Alaska? (n=264)

- Never 18% Rarely 5% Most of the time 8% Always 69%

Question 14: How frequently do you use a professional transporter/air taxi to hunt sheep in Alaska? (n=263)

- Never 15% Rarely 6% Most of the time 18% Always 61%

Question 15: (Nonresidents only) Do you have second-degree of kindred that are residents of Alaska? *Second-degree of kindred includes father, mother, brother, sister, son, daughter, spouse, grandparent, grandchild, brother/sister-in-law, son/daughter-in-law, father/mother-in-law, stepfather, stepmother, stepsister, stepbrother, stepson, or stepdaughter.* (n=257)

- Yes 20% No (Skip to question 17) 80%

Question 16: (Nonresidents only) When you sheep hunt in Alaska, how frequently do you hunt with Alaska residents that are second-degree of kindred (see question 15 for definition)? (n=52)

- Never 11% Sometimes 10% Always 79%

Question 17: Do you feel that limits should be placed on the percentage of sheep tags allocated to nonresidents? (n=255)

- Yes 24% What percentage of total allocation should nonresidents receive? (please write response) Median = 25% (SD = 15)
 No 76%

Question 18: To what extent do you agree or disagree that sheep hunter crowding is a problem in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=253)	8%	23%	31%	10%	4%	25%
In the range most important to you (n=251)	10%	21%	31%	16%	6%	17%

Question 19: If you feel sheep hunter competition and crowding is a problem, to what extent do you agree or disagree with the following causes of competition and crowding? (Analyzed responses that agreed or strongly agreed on question 18)

Reason	Strongly agree	Somewhat agree	Neither	Somewhat disagree	Strongly disagree	Unsure
Fewer legal rams (n=94)	43%	45%	7%	1%	2%	2%
More resident hunters (n=93)	32%	36%	19%	7%	2%	4%
More nonresident hunters (n=93)	14%	37%	27%	10%	5%	8%
More professional guides (n=91)	31%	37%	20%	4%	2%	6%
More professional transporters/air taxis (n=91)	21%	40%	31%	1%	3%	4%
More Alaska residents with planes (n=92)	28%	35%	24%	2%	3%	8%
Decline in sheep distribution (n=87)	25%	40%	18%	7%	1%	8%
Drawing areas displacing hunters to general harvest areas (n=92)	23%	32%	27%	5%	3%	10%
Decline in hunter ethics (n=91)	12%	34%	32%	9%	9%	4%
Other (describe):						

Question 20: How tolerable or intolerable are the following levels of crowding while sheep hunting?

Levels of crowding	Very tolerable	Somewhat tolerable	Neither	Somewhat intolerable	Very intolerable
I see a small plane in the air passing over the area I'm hunting (n=254)	27%	37%	16%	15%	5%
I see a small plane on the ground in the area I'm hunting (n=251)	3%	24%	19%	34%	20%
I see a small plane searching for sheep in the area I'm hunting (n=253)	4%	11%	13%	34%	38%
I see another hunter while hunting (n=252)	4%	21%	23%	34%	17%
I see another hunter camp while hunting (n=250)	4%	19%	21%	35%	20%
I see multiple hunters and camps while hunting (n=251)	3%	4%	13%	24%	57%
I have to change where I hunt to avoid other hunters (n=250)	2%	6%	19%	25%	48%
Other hunters interrupt my stalk on a sheep (n=252)	2%	2%	11%	10%	75%
I can't get away from other hunters (n=252)	3%	2%	15%	14%	66%
Other (describe):					

Question 21: To what extent do you agree or disagree that there is too much harvest pressure on the sheep population in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=255)	6%	24%	34%	9%	2%	25%
In the range most important to you (n=250)	10%	23%	34%	12%	3%	19%

Question 22: Since you started hunting sheep in Alaska, to what extent do you feel that the sheep population has increased or decreased in following areas?

Areas	Significant increase	Slight increase	Neither	Slight decrease	Significant decrease	Unsure
In Alaska overall (n=255)	0%	5%	36%	14%	5%	40%
In the range most important to you (n=249)	0%	6%	33%	17%	9%	35%

Question 23: How satisfied or dissatisfied are you with the following current sheep management and regulation characteristics?

Characteristic	Very satisfied	Somewhat satisfied	Neither	Somewhat dissatisfied	Very dissatisfied
Sheep population size (n=245)	9%	44%	29%	17%	2%
Full-curl regulation (n=253)	47%	32%	9%	9%	2%
Length of sheep hunting season (Aug. 10 – Sep. 20) (n=252)	43%	37%	14%	6%	1%
Number of other hunters seen while sheep hunting (n=247)	17%	27%	32%	20%	3%
Number of drawing hunts (n=247)	9%	23%	52%	15%	2%
Number of general harvest hunts (n=248)	11%	27%	46%	13%	4%
Number of registration/subsistence hunts (n=246)	5%	10%	56%	20%	9%
Regulation of professional guides (n=247)	18%	32%	30%	11%	9%
Regulation of professional transporters (n=248)	17%	31%	38%	9%	4%
Level of enforcement in the field (n=247)	21%	28%	43%	5%	3%
Horn sealing requirements (n=249)	33%	34%	25%	6%	1%
Allocation of tags to nonresident hunters (n=247)	18%	32%	32%	10%	9%
Allocation of tags to nonresident second-degree of kindred (see question 15 for definition) hunters (n=245)	12%	19%	53%	9%	8%
Statute requiring nonresidents to hire professional guides (n=249)	21%	29%	16%	14%	20%
Other: Describe					

Question 24: To what extent do you approve or disapprove of the following changes in timing of the sheep hunting season?

Timing of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Start a week sooner (n=250)	12%	14%	55%	14%	6%
Start a week sooner for residents only (n=249)	2%	5%	30%	18%	45%
Start a week later (n=245)	2%	6%	60%	16%	16%
Start a week later for non-residents only (n=246)	2%	4%	30%	15%	50%
Lengthen overall season (n=246)	11%	17%	49%	13%	9%
Shorten overall season (n=237)	3%	4%	50%	22%	21%
Divide into early and late seasons (Example: Aug. 10-25 & Aug. 26-Sept. 20) (n=245)	5%	20%	49%	13%	14%
Seasons should stay the same (n=247)	29%	28%	37%	4%	2%
Other: Describe					

Question 25: Would you like to see more or less law enforcement in the field during the sheep hunting season? (n=254)

- | | | |
|---|--|------------------------------------|
| <input type="radio"/> Much more 4% | <input type="radio"/> Same 58% | <input type="radio"/> Much less 3% |
| <input type="radio"/> Slightly more 18% | <input type="radio"/> Slightly less 6% | <input type="radio"/> Unsure 11% |

Question 26: Currently, hunters are not allowed to hunt sheep the same day airborne, and it is against the law to hunt until 3:00 a.m. the following day after you have flown. An aircraft can be used during the hunting season to spot sheep. To what extent do you approve or disapprove of the following changes?

Change in regulation	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Remove same day airborne regulation (n=251)	5%	8%	8%	14%	66%
Do not allow hunting until 12 hours after day flown (n=249)	18%	25%	18%	19%	21%
Do not allow hunting until 24 hours after day flown (n=250)	14%	10%	21%	18%	37%
Do not allow hunters to spot sheep with an aircraft during the hunting season (n=247)	25%	19%	20%	19%	18%
Regulation should stay the same (n=248)	35%	21%	31%	10%	4%

Question 27: To what extent do you approve or disapprove of the following increases in special Alaska sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More archery only hunts (n=250)	13%	20%	44%	11%	12%
More youth only hunts (n=250)	8%	18%	47%	14%	13%
More muzzleloader only hunts (n=250)	4%	16%	51%	13%	16%
More non-motorized hunts (n=246)	19%	22%	44%	7%	7%
More subsistence hunts (n=250)	0%	1%	42%	18%	38%
More trophy (old and large rams) management hunts (n=250)	27%	37%	29%	4%	4%
Sheep hunts should stay the same (n=246)	17%	31%	44%	6%	2%

Question 28: In drawing areas only, to what extent do you approve or disapprove of the following types of sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Any sheep (n=245)	2%	8%	12%	22%	56%
Any ram (n=248)	7%	8%	11%	18%	56%
3/4 curl or bigger (n=248)	9%	21%	16%	16%	38%
Full curl or bigger (n=249)	58%	25%	11%	4%	2%
Trophy (large and old full-curl rams) (n=244)	50%	24%	18%	5%	3%

Question 29: How important or unimportant are the following factors to your sheep hunting satisfaction in Alaska?

Factor	Very important	Somewhat important	Neither	Somewhat unimportant	Very unimportant
Opportunity to hunt sheep every year (n=251)	34%	33%	17%	10%	6%
Opportunity for walk-in hunts in non-motorized areas (n=253)	32%	35%	21%	8%	3%
Seclusion from other hunters (n=253)	57%	37%	5%	0%	1%
Seclusion from plane traffic (n=251)	28%	49%	16%	6%	1%
Level of crowding and competition (n=251)	57%	35%	7%	1%	0%
Number of sheep seen (n=254)	57%	39%	3%	1%	0%
Number of legal rams seen (n=254)	61%	35%	2%	1%	1%
Opportunity to harvest a sheep (any ram) (n=252)	16%	25%	21%	21%	17%
Opportunity to harvest a full-curl ram (n=251)	61%	34%	4%	1%	0%
Opportunity to harvest a very large (>40 inch) ram (n=248)	47%	36%	13%	5%	0%
Harvest success (n=254)	27%	57%	12%	4%	0%
Size of ram harvested (n=253)	29%	57%	11%	3%	1%
Cost of a sheep hunt (n=253)	41%	42%	11%	5%	1%
Opportunity to hire professional transporters or guides (n=252)	32%	43%	14%	4%	7%
Physical difficulty of the hunt (ex: walking distance) (n=250)	20%	47%	17%	10%	6%
Weather (n=254)	24%	37%	28%	8%	3%

Question 30: Please rank the **following sources of information** based on how much or little they influence your opinion of sheep hunting opportunities in Alaska? (1 = most influence, 4 = least influence)

Source	1	2	3	4
Agency (ADF&G, USFWS) data and publications (n=247)	21%	21%	22%	36%
My own sheep hunting experience (n=247)	50%	21%	15%	14%
Conversations with fellow hunters (includes internet forums) (n=247)	25%	39%	21%	15%
Sheep hunting/conservation organizations (Example: WSF, FNAWS, SCI, GSCO) (n=246)	16%	21%	29%	34%
Other (describe):				

Question 31: How frequently do you apply for a sheep drawing tag? (n=255)

- Every year 22%
 Once every 6-9 years 4%
 Most years (2 out of every 3 years) 9%
 Once every 10 or more years 6%
 Once every 3-5 years 15%
 I've never applied for a drawing tag 45%

Question 32: If you **do NOT** draw a permit, how likely or unlikely are you to go sheep hunting? (n=253)

- Very likely 12%
 Somewhat likely 23%
 Neither 23%
 Somewhat unlikely 15%
 Very unlikely 28%

Question 33: To what extent do you approve or disapprove of the following changes to reduce sheep hunting pressure, competition, and crowding?

Change	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More drawing hunts (n=247)	15%	45%	24%	12%	3%
Reduce hunting season length (n=241)	4%	12%	35%	34%	15%
Reduce tag allocation to nonresidents hunting with second-degree of kindred (see question 15 for definition) Alaska residents (n=248)	11%	19%	21%	18%	31%
Reduce tag allocation to nonresidents hunting with professional guides (n=245)	5%	6%	18%	24%	47%
Limit hunters to 1 sheep tag every 3 years (n=247)	23%	31%	13%	18%	15%
After harvesting a sheep, hunters must wait 3 years to hunt sheep again (n=248)	31%	34%	11%	14%	10%
Reduce motorized access (n=246)	29%	33%	24%	10%	5%
Prohibit spotting sheep from aircraft during hunting season (n=246)	28%	24%	23%	16%	9%
Increase resident tag fees (n=247)	24%	23%	33%	10%	10%
Increase nonresident tag fees (n=245)	7%	14%	28%	23%	29%
No changes should be made (n=230)	4%	17%	56%	14%	9%
Other (describe):					

Question 34: Do you feel that Alaska residents should pay for a sheep tag (currently free with license)? (n=252)

- Yes 92%
 No (skip to question 37) 8%

Question 35: How much should an Alaska resident pay for a sheep tag? (n=227)

- \$10
 \$100 (Median value of responses)
 \$25
 Different amount \$_____
 \$50
 \$75

Question 36: (Alaska Resident only) How much would you be willing to pay for a sheep tag if allocation of nonresident sheep tags were reduced? **NA**

- \$10 \$75
 \$25 \$100
 \$50 Different amount \$_____

Question 37: Do you feel that the price of a nonresident sheep tag should change (current price is \$425)? (n=256)

- Yes **32%**
 No (**skip to question 39**) **68%**

Question 38: How much should a nonresident pay for a sheep tag? (n=80)

- Less than \$425 (n=33)** \$1000
 \$500 \$1250
 \$750 (Median value of response >\$425 [n=47]) Different amount \$_____

Question 39: To what extent do you agree or disagree that the average Alaska sheep hunter is sufficiently educated on sheep hunting issues in Alaska? (n=255)

- Strongly agree **4%** Somewhat agree **37%** Neither **24%** Somewhat disagree **24%** Strongly disagree **5%** Unsure **6%**

Question 40: Which of the following categories best describes your approximate household income in 2013? (n=246)

- Less than \$25,000 **0%** \$100,001 - \$125,000 **13%**
 \$25,001 - \$50,000 **6%** \$125,001 - \$150,000 **9%**
 \$50,001 - \$75,000 **11%** \$150,001 - \$175,000 **8%**
 \$75,001 - \$100,000 **20%** More than \$175,000 **33%**

Question 41: Which of the following categories best describes the highest level of education that you have received? (n=254)

- Some high school **2%** Graduated from college **29%**
 Graduated from high school **14%** Some graduate school **5%**
 Some college **21%** Completed graduate school **30%**

Question 42: If you are an Alaska resident, how long have you been a resident? (please write response) **NA** years

Question 43: What is your age? (n=252) (please write response) **Mean = 51 (SD=10)** years old

Question 44: What is your gender? (n=253)

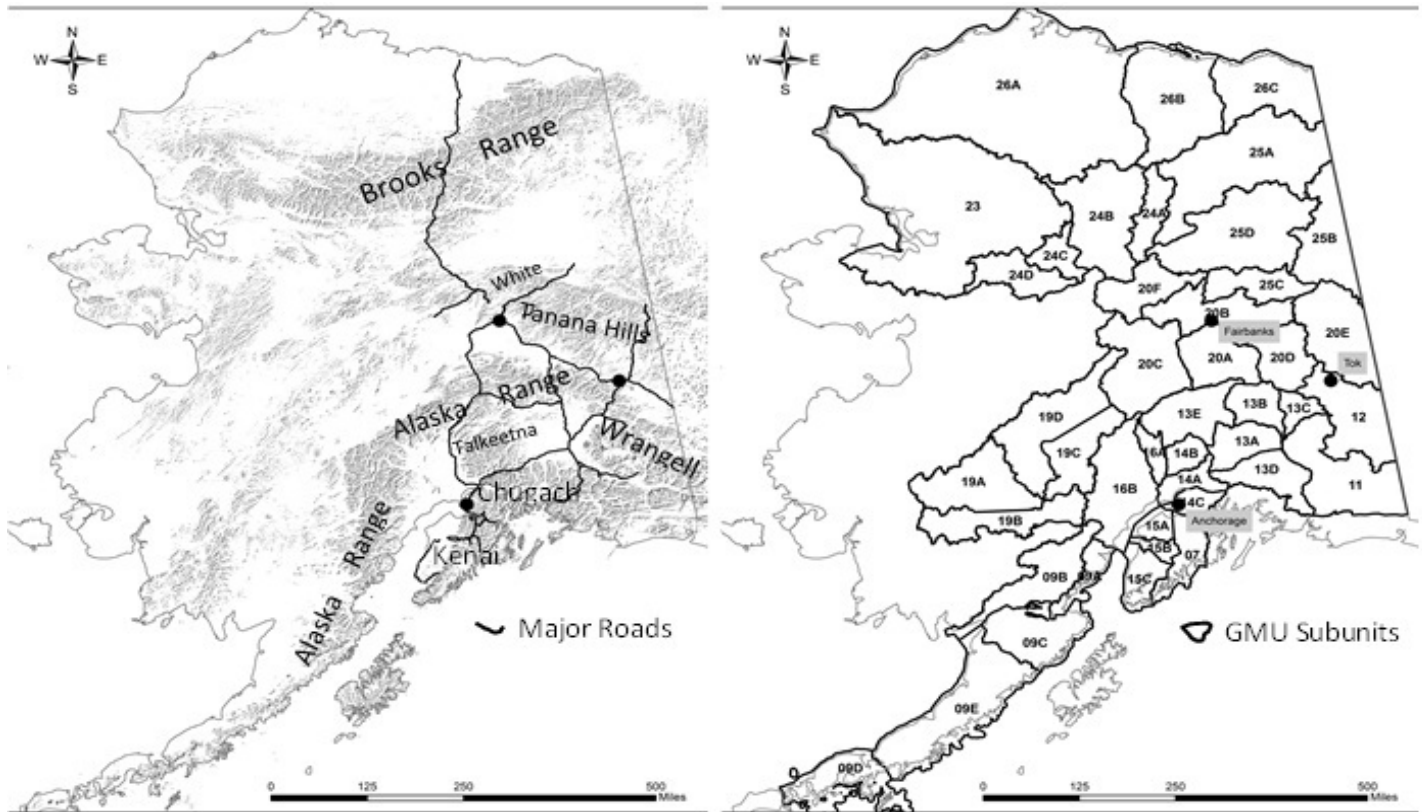
- Male **99%** Female **1%**

Questions? Please feel free to contact the project leader:

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Appendix D. Responses (red font) from commercial operators providing services to sheep hunters to all questions asked on the Alaska Sheep Commercial Services Survey. This survey (conducted summer 2014) addressed specific information needs identified by the Alaska Board of Game (BOG). Information needs were related to proposals (Appendix A) submitted to the BOG in recent years expressing concern in a decline in the quality of sheep hunting in Alaska because of unacceptable levels of crowding, competition, and conflict among interest groups. Interest groups included resident sheep hunters, nonresident sheep hunters, and commercial operators (hunting guides, transporters, and air taxis) providing services to sheep hunters. The Commercial Services questionnaire collected information on characteristics and attitudes of commercial operators to answer the following questions: 1) Is there a sheep hunter problem? 2) Why is there a sheep hunter problem? and 3) How might sheep hunting be improved?



Map 1. Major mountain ranges of Alaska containing sheep hunts. Map 2. Alaska Department of Fish & Game’s Game Management Unit (GMU) Subunits containing sheep hunts.

Question 1: Have you provided commercial services (guiding, transporting, air taxi) to Alaska sheep hunters?

- Yes (n=69)
- No (Please stop here and return the survey) (n=1)

Question 2: Which commercial services have you provided to Alaska sheep hunters (fill in all that apply)? (n=69)

Commercial service	During the last 5 years (2009-2013)	During your lifetime (before 2009)
Guiding	78%	90%
Transporting	10%	12%
Air Taxi	10%	16%

Question 3: Which mountain ranges (please see maps 1 & 2) in Alaska have you provided commercial services to sheep hunters in (fill in all that apply)? (n=69)

Mountain range (game management unit)	During the last 5 years (2009-2013)	During your lifetime (before 2009)
Alaska Range (GMU 9, 16, 17, 19, 20A, 20C)	36%	57%
Brooks Range (GMU 23, 24, 25A, 25B, 25D, 26)	23%	42%
Chugach Mountains (GMU 13D, 14A, 14C)	15%	33%
Kenai Mountains (GMU 7, 15)	1%	4%
Talkeetna Mountains (GMU 13A, 13E, 14A, 14B)	16%	28%
Tanana Hills (GMU 20B, 20D, 20E)	6%	9%
White Mountains (GMU 20B, 20F, 25C)	1%	4%
Wrangell Mountains (GMU 11, 12)	15%	29%

Question 4: Which mountain range (please see maps 1 & 2) in Alaska is most important to your commercial services that involve sheep hunters (please fill in one)?

- Alaska Range 40%
- Brooks Range 25%
- Chugach Mountains 10%
- Kenai Mountains 0%
- Talkeetna Mountains 12%
- Tanana Hills 0%
- White Mountains 0%
- Wrangell Mountains 13%
- Unsure 0%

Question 5: What year did you start providing commercial services to Alaska sheep hunters? (please write response YYYY) mean=1991 (SD=13)

Question 6: How many years have you provided commercial services to Alaska sheep hunters? (please write response) mean=22 (SD=12)

Question 7: Which mode of transportation do you use the most to get your clients to their sheep hunting area (please fill in one)? (n=67)

- Airplane 90%
- ATV (4-wheeler, track vehicle, side-by-side) 1%
- Snow machine 0%
- Boat (includes raft and canoe) 0%
- Pack animal (horse, mule, alpaca) 9%
- Passenger vehicle (car, truck) 0%
- Other: _____

Question 8: Which type of sheep hunter(s) have you provided services to (fill in all that apply)? (n=69)

Type of hunter	During the last 5 years (2009-2013)	During your lifetime (before 2009)
Drawing	28%	36%
General harvest	70%	83%
Registration/Subsistence	3%	6%
Alaska resident	36%	44%
Nonresident	77%	90%

Question 9: Which type of sheep hunter(s) have you provided services to the MOST (please fill in one)? (n=69)

- Drawing 10%
- General harvest 90%
- Registration/Subsistence 0%

Question 10: Which type of sheep hunter(s) have you provided services to the MOST (please fill in one)? (n=69)

- Alaska resident 7%
- Nonresident 93%

Question 11: Do you feel that limits should be placed on the percentage of sheep tags allocated to nonresidents? (n=66)

- Yes 39% If yes, what percentage of total allocation should nonresidents receive? (write response) median=20% (SD=15.7)
- No 61%

Question 12: Compared to other types of hunters in Alaska, how important are sheep hunters to your business?

Hunters	Less important than sheep hunting	Equally important to sheep hunting	More important than sheep hunting
Black bear hunters (n=65)	91%	8%	1%
Brown/Grizzly bear hunters (n=68)	29%	59%	12%
Bison hunters (n=60)	95%	3%	2%
Caribou hunters (n=63)	81%	14%	5%
Deer hunters (n=61)	97%	3%	0%
Elk hunters (n=61)	98%	2%	0%
Moose hunters (n=65)	42%	46%	12%
Mountain goat hunters (n=62)	74%	26%	0%
Muskox hunters (n=60)	97%	2%	2%
Small game (grouse, ptarmigan, waterfowl) hunters (n=59)	98%	2%	0%

Question 13: To what extent do you agree or disagree that sheep hunter crowding is a problem in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=68)	28%	44%	10%	6%	4%	7%
In the range most important to you (n=64)	34%	34%	14%	6%	11%	0%

Question 14: If you feel sheep hunter competition and crowding is a problem, to what extent do you agree or disagree with the following causes of competition and crowding?

Reason	Strongly agree	Somewhat agree	Neither	Somewhat disagree	Strongly disagree	Unsure
Fewer legal rams (n=65)	40%	37%	12%	8%	3%	0%
More resident hunters (n=68)	40%	32%	21%	1%	3%	3%
More nonresident hunters (n=64)	14%	39%	19%	11%	14%	3%
More professional guides (n=66)	46%	32%	12%	3%	4%	3%
More professional transporters/air taxis (n=68)	68%	19%	9%	0%	3%	1%
More Alaska residents with planes (n=66)	42%	30%	17%	3%	5%	3%
Decline in sheep distribution (n=62)	37%	34%	16%	8%	2%	3%
Drawing areas displacing hunters to general harvest areas (n=62)	34%	37%	18%	5%	3%	3%
Decline in hunter ethics (n=65)	34%	20%	29%	9%	5%	3%
Other (describe):						

Question 15: To what extent do you agree or disagree that there is too much harvest pressure on the sheep population in the following areas?

Areas	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Unsure
In Alaska overall (n=68)	29%	44%	12%	9%	2%	4%
In the range most important to you (n=66)	36%	35%	14%	11%	3%	2%

Question 16: Since you started providing services to sheep hunters in Alaska, to what extent do you feel that the sheep population has increased or decreased in following areas?

Areas	Significant increase	Slight increase	Neither	Slight decrease	Significant decrease	Unsure
In Alaska overall (n=64)	2%	2%	14%	30%	38%	16%
In the range most important to you (n=67)	2%	9%	22%	21%	46%	0%

Question 17: How tolerable or intolerable are the following levels of crowding while providing services to sheep hunters?

Levels of crowding	Very tolerable	Somewhat tolerable	Neither	Somewhat intolerable	Very intolerable
I see a small plane in the air passing over the area my clients are hunting (n=69)	41%	33%	7%	7%	12%
I see a plane on the ground in the area my clients are hunting (n=68)	7%	35%	12%	24%	22%
I see a plane searching for sheep in the area my clients are hunting (n=67)	5%	12%	8%	27%	49%
I see another hunter in the area my clients are hunting (n=68)	3%	21%	24%	32%	21%
I see other commercial operators in the area my clients are hunting (n=67)	1%	13%	15%	36%	34%
I see another hunter camp in the area my clients are hunting (n=68)	1%	19%	15%	41%	24%
I see multiple hunters and camps in the area my clients are hunting (n=68)	1%	4%	7%	24%	63%
I have to change where I take my clients to avoid other hunters (n=67)	1%	10%	16%	33%	39%
Other hunters interrupt my clients stalk on a sheep (n=67)	3%	0%	6%	10%	81%
I can't get away from other hunters (n=67)	5%	1%	6%	13%	75%
Other (describe):					

Question 18: How satisfied or dissatisfied are you with the following current sheep management and regulation characteristics?

Characteristic	Very satisfied	Somewhat satisfied	Neither	Somewhat dissatisfied	Very dissatisfied
Sheep population size (n=68)	3%	34%	9%	28%	27%
Full-curl regulation (n=69)	52%	25%	3%	9%	12%
Length of sheep hunting season (Aug. 10 – Sep. 20) (n=68)	57%	22%	6%	13%	2%
Number of other hunters seen while sheep hunting (n=68)	1%	28%	27%	25%	19%
Number of drawing hunts (n=67)	9%	22%	39%	21%	9%
Number of general harvest hunts (n=68)	18%	35%	31%	9%	7%
Number of registration/subsistence hunts (n=67)	9%	27%	40%	10%	13%
Regulation of professional guides (n=68)	19%	31%	4%	22%	24%
Regulation of professional transporters (n=69)	3%	9%	7%	22%	59%
Level of enforcement in the field (n=69)	12%	25%	30%	25%	9%
Horn sealing requirements (n=69)	33%	22%	10%	16%	19%
Allocation of tags to nonresident hunters (n=69)	22%	20%	28%	19%	12%
Allocation of tags to nonresident second-degree of kindred hunters (n=69)	4%	13%	23%	22%	38%
Statute requiring nonresidents to hire professional guides (n=69)	88%	6%	3%	1%	1%
Other: Describe					

Question 19: To what extent do you approve or disapprove of the following changes in timing of the sheep hunting season?

Timing of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Start a week sooner (n=68)	9%	6%	10%	19%	56%
Start a week sooner for residents only (n=68)	6%	9%	4%	4%	77%
Start a week later (n=67)	5%	3%	19%	16%	57%
Start a week later for non-residents only (n=66)	6%	9%	12%	8%	65%
Lengthen overall season (n=66)	5%	5%	12%	12%	67%
Shorten overall season (n=67)	13%	12%	19%	18%	37%
Divide into early and late seasons (Example: Aug. 10-25 & Aug. 26-Sept. 20) (n=66)	5%	12%	24%	12%	47%
Seasons should stay the same (n=69)	44%	26%	13%	6%	12%
Other: Describe					

Question 20: Would you like to see more or less law enforcement in the field during the sheep hunting season? (n=69)

- Much more 16%
 Slightly more 29%
 Same 44%
 Slightly less 6%
 Much less 1%
 Unsure 4%

Question 21: Currently, hunters are not allowed to hunt sheep the same day airborne, and it is against the law to hunt until 3:00 a.m. the following day after you have flown. No formal law prohibits an aircraft from being used during the hunting season to spot sheep. To what extent do you approve or disapprove of the following changes?

Change in regulation	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Remove same day airborne regulation (n=63)	3%	0%	1%	4%	91%
Do not allow hunting until 12 hours after day flown (n=66)	21%	20%	24%	14%	21%
Do not allow hunting until 24 hours after day flown (n=66)	23%	9%	17%	11%	41%
Do not allow aircrafts to be used to spot sheep during the hunting season (n=68)	40%	13%	12%	6%	29%
Regulation should stay the same (n=67)	37%	19%	18%	12%	13%
Other: Describe					

Question 22: To what extent do you approve or disapprove of the following increases in special Alaska sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More archery only hunts (n=69)	6%	12%	26%	10%	46%
More youth only hunts (n=69)	7%	23%	30%	9%	30%
More muzzleloader only hunts (n=69)	1%	10%	32%	7%	49%
More non-motorized hunts (n=69)	25%	26%	25%	10%	14%
More subsistence hunts (n=69)	0%	4%	20%	12%	64%
More trophy (old and large rams) management hunts (n=68)	27%	34%	28%	7%	4%
Sheep hunts should stay the same (n=67)	27%	31%	21%	12%	9%
Other: Describe					

Question 23: Please rank the following sources of information based on how much or little they influence your opinion of sheep hunting opportunities in Alaska? (1 = most influence, 5 = least influence) (n=54)

Source	1	2	3	4	5
Agency (ADF&G, USFWS) data and publications	11%	26%	28%	18%	17%
My own experience	83%	7%	4%	2%	4%
Conversations with sheep hunters (includes internet forums)	2%	17%	31%	30%	20%
Conversations with other guides, transporters, or air taxis	2%	39%	26%	24%	9%
Sheep hunting/conservation organizations (Example: WSF, FNAWS, SCI, GSCO)	2%	11%	11%	26%	50%

Question 24: How important or unimportant are the **following factors** to your client's sheep hunting satisfaction in Alaska?

Factor	Very important	Somewhat important	Neither	Somewhat unimportant	Very unimportant
Opportunity to hunt sheep every year (n=69)	15%	26%	13%	28%	19%
Opportunity for walk-in hunts in non-motorized areas (n=67)	16%	27%	25%	18%	13%
Seclusion from other hunters (n=69)	57%	36%	6%	1%	0%
Seclusion from plane traffic (n=69)	36%	36%	19%	6%	3%
Level of crowding and competition (n=69)	65%	26%	6%	3%	0%
Number of sheep seen (n=68)	47%	44%	4%	4%	0%
Number of legal rams seen (n=68)	65%	32%	1%	1%	0%
Opportunity to harvest a sheep (any ram) (n=67)	24%	24%	9%	8%	36%
Opportunity to harvest a full-curl ram (n=69)	78%	19%	1%	1%	0%
Opportunity to harvest a very large (>40 inch) ram (n=68)	27%	47%	18%	6%	3%
Harvest success (n=69)	59%	32%	6%	3%	0%
Size of ram harvested (n=68)	18%	66%	15%	1%	0%
Cost of a sheep hunt (n=68)	28%	47%	12%	9%	4%
Opportunity to hire professional transporters or guides (n=69)	61%	33%	1%	3%	1%
Physical difficulty of the hunt (ex: distance you have to walk) (n=69)	23%	46%	22%	7%	1%
Weather (n=69)	20%	39%	29%	9%	3%
Other (describe):					

Question 25: To what extent do you approve or disapprove of the following changes to reduce sheep hunting pressure, competition, and crowding?

Change	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
More drawing hunts (n=69)	13%	26%	7%	22%	32%
Reduce hunting season length (n=69)	12%	13%	17%	33%	25%
Reduce tag allocation to nonresidents hunting with second-degree of kindred Alaska residents (n=69)	41%	22%	12%	12%	15%
Reduce tag allocation to nonresidents hunting with professional guides (n=69)	10%	16%	7%	15%	52%
Limit hunters to 1 sheep tag every 3 years (n=68)	35%	25%	10%	6%	24%
After harvesting a sheep, hunters must wait 3 years to hunt sheep again (n=68)	49%	25%	7%	4%	15%
Reduce motorized access (n=69)	28%	25%	18%	15%	15%
Prohibit spotting sheep from aircraft during hunting season (n=68)	41%	18%	7%	7%	27%
Increase resident tag fees (n=69)	55%	19%	10%	7%	9%
Increase nonresident tag fees (n=68)	27%	35%	15%	9%	15%
No changes should be made (n=57)	9%	5%	37%	19%	30%
Other (describe):					

Question 26: In drawing areas only, to what extent do you approve or disapprove of the following types of sheep hunts?

Type of hunt	Strongly approve	Somewhat approve	Neither	Somewhat disapprove	Strongly disapprove
Any sheep (n=67)	5%	3%	6%	10%	76%
Any ram (n=68)	9%	9%	4%	15%	63%
3/4 curl or bigger (n=64)	5%	11%	20%	13%	52%
Full curl or bigger (n=68)	69%	16%	13%	2%	0%
Trophy (large and old full-curl rams) (n=65)	37%	26%	29%	3%	5%

Question 27: Do you feel that Alaska residents should pay for a sheep tag (currently free with license)? (n=69)

- Yes 87% No (skip to question 29) 13%

Question 28: How much should an Alaska resident pay for a sheep tag? (n=59)

- \$10 \$75
 \$25 \$100 (Median value of responses)
 \$50 Different amount \$_____

Question 29: Do you feel that the price of a nonresident sheep tag should change (current price is \$425)? (n=68)

- Yes 57% No (skip to question 31) 43%

Question 30: How much should a nonresident pay for a sheep tag? (n=40)

- Less than \$425 \$1000
 \$500 (Median value of responses) \$1250
 \$750 Different amount \$_____

Question 31: To what extent do you agree or disagree that the average Alaska sheep hunter is sufficiently educated on sheep hunting issues in Alaska? (n=68)

- Strongly agree 1% Somewhat agree 6% Neither 13% Somewhat disagree 40% Strongly disagree 40%

Question 32: Which of the following categories best describes your approximate household income in 2013? (n=62)

- | | | | |
|---|--|---|--|
| <input type="radio"/> Less than \$25,000 7% | <input type="radio"/> \$50,001 - \$75,000 23% | <input type="radio"/> \$100,001 - \$125,000 23% | <input type="radio"/> \$150,001 - \$175,000 3% |
| <input type="radio"/> \$25,001 - \$50,000 26% | <input type="radio"/> \$75,001 - \$100,000 11% | <input type="radio"/> \$125,001 - \$150,000 5% | <input type="radio"/> More than \$175,000 3% |

Question 33: Which of the following categories best describes the highest level of education that you have received?

- Some high school 3% Some college 40% Completed graduate school 9%
 Graduated from high school 15% Graduated from college 23%
 Some graduate school 9%

Question 34: If you are an Alaska resident, how long have you been a resident? (n=62) (please write response) Mean = 39 (SD=11)years

Question 35: What is your age? (n=65) (please write response) Mean = 54 (SD=11)years

Question 36: What is your gender? (n=67)

- Male 97% Female 3%

Questions? Please feel free to contact the project leader:

Dr. Todd Brinkman, Assistant Professor
 Department of Biology and Wildlife, University of Alaska Fairbanks
 Phone: (907)474-7139, Email: tjbrinkman@alaska.edu



Appendix E. Comparisons of top-3 responses (based on percentages) of resident sheep hunters, nonresident sheep hunters, and commercial operators (professional guides, transporters, and air taxis) providing services to sheep hunters to survey questions that directly addressed problems and solutions related to sheep hunter crowding and competition in Alaska. Hunter responses were to questions on the 2014 Alaska Sheep Hunter Survey (Appendix B & C). Commercial operator responses were to questions on the 2014 Alaska Sheep Commercial Services Survey (Appendix D).

Survey topic <i>Italicized font indicates location of actual survey question and results</i>	Resident Hunters Responses (n = 698) <i>Appendix B</i>	Nonresident Hunters Responses (n = 269) <i>Appendix C</i>	Commercial Operators Responses (n=69) <i>Appendix D</i>
Sheep hunter crowding is a problem¹ <i>Hunter – Appendices B & C, Question 18</i> <i>Commercial Operators – Appendix D, Question 13</i>	Agreed or Strongly Agreed: 74%	Agreed or Strongly Agreed: 35%	Agreed or Strongly Agreed: 84%
Causes of sheep hunter crowding² <i>Hunter – Appendices B & C, Question 19</i> <i>Commercial Operators – Appendix D, Question 14</i>	<ol style="list-style-type: none"> 1. Fewer legal rams (83%) 2. More nonresident hunters (83%) 3. More guides (82%) 	<ol style="list-style-type: none"> 1. Fewer legal rams (88%) 2. More resident hunters (68%) 3. More guides (68%) 	<ol style="list-style-type: none"> 1. More transporters/air taxis (87%)⁷ 2. More guides (78%) 3. Fewer legal rams (77%)
Dissatisfaction with sheep management and regulation characteristics³ <i>Hunter – Appendices B & C, Question 23</i> <i>Commercial Operators – Appendix D, Question 18</i>	<ol style="list-style-type: none"> 1. Allocation of permits to nonresidents (61%) 2. Regulation of guides (56%) 3. Number of other hunters seen while sheep hunting (44%) 	<ol style="list-style-type: none"> 1. Guide requirement for nonresidents (34%) 2. Number of subsistence hunts (29%) 3. Regulation of guides (20%) 	<ol style="list-style-type: none"> 1. Regulation of transporters/air taxis (81%)⁷ 2. Allocation of permits to nonresidents hunting with kin (61%) 3. Sheep population size (53%)
Satisfaction with sheep management and regulation characteristics⁴ <i>Hunters – Appendices B & C, Question 23</i> <i>Commercial Operators – Appendix D, Question 18</i>	<ol style="list-style-type: none"> 1. Length of season (76%) 2. Guide requirement for nonresidents (75%) 3. Full-curl regulation (62%) 	<ol style="list-style-type: none"> 1. Length of season (80%) 2. Full-curl regulation (79%) 3. Horn sealing requirement (67%) 	<ol style="list-style-type: none"> 1. Guide requirement for nonresidents (94%) 2. Length of season (79%) 3. Full-curl regulation (77%)
Approval of changes to reduce sheep hunting pressure, competition, and crowding⁵ <i>Hunters – Appendices B & C, Question 33</i> <i>Commercial Operators – Appendix D, Question 25</i>	<ol style="list-style-type: none"> 1. Reduce allocation of permits to guided nonresidents (77%) 2. Increase nonresident tag fees (73%) 3. Reduce allocation of permits to nonresidents hunting with kin (64%) 	<ol style="list-style-type: none"> 1. After harvesting a sheep, hunters must wait 3yrs to hunt again (65%) 2. Reduce motorized access (62%) 3. More drawing hunts (60%) 	<ol style="list-style-type: none"> 1. Increase resident tag fees (74%) 2. After harvesting a sheep, hunters must wait 3yrs to hunt again (74%) 3. Reduce permit allocation to nonresidents hunting with kin (63%)
Disapproval of changes to reduce sheep hunting pressure, competition, and crowding⁶ <i>Hunters – Appendices B & C, Question 33</i> <i>Commercial Operators – Appendix D, Question 25</i>	<ol style="list-style-type: none"> 1. Reduce season length (66%) 2. Limit hunters to one tag every 3yrs (61%) 3. After harvesting a sheep, hunters must wait 3yrs to hunt again (56%) 	<ol style="list-style-type: none"> 1. Reduce permit allocation to guided nonresidents (71%) 2. Increase nonresident tag fees (52%) 3. Reduce hunting season length (49%) 	<ol style="list-style-type: none"> 1. Reduce permit allocation to guided nonresidents (67%) 2. Reduce hunting season length (58%) 3. More drawing hunts (54%)
<ul style="list-style-type: none"> • Percent of responses that agreed or strongly agreed^{1,2}, were dissatisfied or strongly dissatisfied³, were satisfied or strongly satisfied⁴, that approved or strongly approved⁵, and that disapproved or strongly disapproved⁶. • ⁷Transporters and air taxi operators were underrepresented in the survey. Of a total of 69 responses from commercial operators, there were eight transporters and 11 air taxi services. • Note: “Top 3” responses are statistically arbitrary and were compiled to provide a general idea of rankings. Other responses that ranked lower may be statistically similar after accounting for sampling margin of error (at 95% confidence level: resident hunters (±3.5%), nonresident hunters (±5.5%), commercial operators (±8%)) 			