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Subsistence Harvests of Land Mammals in Bethel, Alaska, 2011

by

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and

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March 2014

Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly-accepted abbreviations e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures):	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

Harvest and use of land mammals by residents of Bethel, Alaska, are not well documented. The Alaska Department of Fish and Game Division of Subsistence surveyed a sample of Bethel households to estimate harvest and use of land mammals among residents of the community in 2011. Study results indicated that 27% of Bethel households harvested an estimated total of 221,778 edible pounds of land mammals. Moose composed the majority (68%) of all land mammals harvested, with caribou constituting the next greatest portion (27%). Beavers, brown bears, black bears, and muskoxen together comprised a total of 5% of all land mammal harvests, with several other species representing the remaining harvest. An estimated 73% of Bethel households used land mammal resources in 2011, with 62% of all households receiving land mammal resources and 35% giving them away to other households. In 2011, Bethel hunters harvested moose throughout Game Management Unit 18, primarily in the lower Yukon and lower Kuskokwim river drainages, as well as in several locations in Game Management Units 19 and 21E. Nearly all the caribou harvest by Bethel hunters occurred in the lower Kuskokwim River region. This was the first systematic study to provide information regarding land mammal harvests in Bethel. Data from this study will assist wildlife managers in developing accurate estimates of harvest amounts of large and small land mammals and furbearers throughout the territory used by Bethel hunters and trappers. These data will be useful to the Alaska Board of Game in future deliberations regarding changes to subsistence and other hunting and trapping regulations in the area.

Key words: beaver, Bethel, black bear, brown bear, caribou, Dall sheep, furbearers, hunting, Kilbuck caribou herd, large land mammals, moose, Mulchatna caribou herd, muskox, reindeer, small land mammals, subsistence, trapping, wolf.

INTRODUCTION

Documentation of Alaska residents' harvest and use of land mammal resources for subsistence is an essential component of the Alaska Department of Fish and Game's (ADF&G) process of wildlife management. When the department develops management strategies and implements changes to hunting and trapping regulations, wildlife biologists and other department personnel must consider all sources of mortality in game populations. Wildlife harvests can represent a significant portion of the total mortality among some land mammal species, particularly big game animals such as moose and caribou. State of Alaska hunting regulations require hunters to report harvests of many species of large land mammals by returning their harvest report documentation from a general hunt harvest ticket, registration hunt permit, drawing hunt permit, or Tier I and Tier II subsistence hunt permits (5 AAC 92.010 and 92.050).

For the purpose of enacting and implementing fish and game regulations, State of Alaska statutes and the Alaska State Board of Game (BOG) define "subsistence hunting" and "subsistence uses" in fairly general terms (AS 16.05.940(32) and (33)). Within the context of these definitions, the BOG also makes determinations as to whether there exists a demonstrable customary and traditional use of specific wildlife populations within GMUs throughout the state. Alaska residents are permitted to harvest individuals of these wildlife populations for which the BOG has made a positive customary and traditional use determination, provided that there exists a harvestable surplus of animals. Results from this study indicate that in 2011 Bethel residents principally harvested moose and caribou within GMUs 18, 19, and 21, each of which have positive customary and traditional use determinations for moose and caribou. Each of these GMUs also have positive customary and traditional use determinations for brown bear, wolf, and all furbearers, and for Dall sheep in GMU 19. The BOG has made negative customary and traditional use findings in GMU 18 for muskox and in GMU 19 for bison (5 AAC 99.025). The BOG has specified a number of subsistence hunts, including those that result in the issuance of so-called "Tier I" and "Tier II" hunt permits. Tier I hunt permits may be issued when the BOG has identified a game population that is customarily and traditionally used for subsistence and where it is anticipated that a reasonable opportunity can be provided to all residents who desire to engage in that subsistence use (5 AAC 92.990(a)(47)). Tier II hunt permits may be issued when the BOG has identified a game population that is customarily and traditionally used for subsistence and where it is anticipated that a reasonable opportunity to engage in that subsistence use cannot be provided to all residents eligible at Tier I who desire to participate (5 AAC 92.990(a)(47)). Federal regulations also allow for subsistence hunting opportunities for federally qualified rural residents (50 CFR §100.5). The authors would also like to note that while the hunting of wildlife in Alaska is regulated under a variety of both general hunt and subsistence hunt provisions in state law, as well as specific subsistence hunt provisions in federal law, residents may define the terms "subsistence hunting" and "subsistence uses" without making specific distinctions that reflect the language of this regulatory framework.

Harvest reports are the principal source of information that managers use to document hunting mortality each year; however, harvest report documents, such as harvest ticket reports usually fail to capture total subsistence harvests in the state. Hunters residing in rural Alaska communities are less likely to return harvest tickets to the department than are hunters residing in the state's more populous areas. This results in underreporting of big game harvests by people living in rural Alaska (Andersen and Alexander 1992). Data from household surveys often result in much more accurate total harvest estimates, and, as such, they provide an important supplement to harvest ticket reports. Also, land mammal harvests typically compose a large portion of rural Alaska households' total annual subsistence resource use, with some rural Alaska communities harvesting large amounts of land mammals each year. For example, research conducted by ADF&G Division of Subsistence staff shows that in the communities of Russian Mission, Nikolai, and Anaktuvuk Pass, households harvested on average 584 lb, 785 lb, and 1,058 lb of land

mammals, respectively, in 2011 (Holen, Hazell, and Koster 2012)[1]. Therefore, conducting household surveys to record land mammal harvests is essential for proper management of wildlife resources and for accurate documentation of Alaskan households' uses of subsistence resources.

The Division of Subsistence has conducted harvest surveys of varying scope in numerous communities, demonstrating that harvests of land mammals typically compose a large portion of the total production of wild foods throughout rural Alaska. Results of recent—2009–2011—comprehensive subsistence surveys conducted in 8 communities in the lower Kuskokwim River region indicate that nearly all households reported using land mammals as a subsistence resource, with use of land mammal resources ranging from 86% to 98% of households (Brown et al. 2012; Brown et al. 2013; Ikuta et al. *In prep*). Similar information regarding subsistence harvests for the community of Bethel is limited; however, various sources have documented Bethel residents' historical harvests of a variety of subsistence resources, including Pacific salmon, nonsalmon fishes, migratory waterfowl, large land mammals, small land mammals, furbearers, and berries and greens (Klein 1966; Lenz 1985; Barker 1993; Fienup-Riordan 2007; J. Simon et al. 2007; Hamazaki 2011).

Bethel is situated in the lower Kuskokwim River region in proximity to the communities that have participated in these recent Division of Subsistence comprehensive survey projects. As such, the community shares some qualities with others of the area; however, as a hub for the region Bethel is distinct from nearby villages due to its demographic and economic characteristics. With the largest population in the non-urban area of the Arctic–Yukon–Kuskokwim region of Alaska, Bethel's residents outnumber many Yukon–Kuskokwim Delta communities by nearly an order of magnitude. Its Alaska Native residents represent a smaller portion of the population than they do in adjacent villages. In addition, there is a high degree of transiency between Bethel and other communities, with many residents moving into Bethel for relatively brief intervals in order to access wage employment opportunities, obtain medical care, and connect with family (Hamilton et al. 2011). This movement occurs not only within the Yukon–Kuskokwim Delta region, but also between other regions of Alaska and the contiguous United States. Each of these characteristics likely affects the overall nature of subsistence resource use in Bethel in a manner that further distinguishes it from communities in the region. Studying harvest patterns in Bethel might provide a better understanding of subsistence resource uses in regional population centers or hub communities. Other studies have investigated the socioeconomic factors related to Bethel's position as a regional population center; however, results from these studies have provided limited descriptions of subsistence activity or quantifications of harvest amounts (Wolfe et al. 1986; Stinson 1990; Shanks 2009; Hamilton et al. 2011; Fall 2013). With a paucity of information regarding harvests and uses of wild food resources by Bethel residents, investigating the nature of subsistence activities in the community may reveal patterns of resource use that researchers have not clearly documented or described. Despite extensive research that has revealed characteristics of subsistence activities in rural Alaska over three decades, the division had never conducted a survey in Bethel quantifying subsistence land mammal resource use before this study.

The purpose of this study was to address the department's need for improved understanding of land mammal harvests by Bethel households. The Division of Subsistence and Division of Wildlife Conservation identified the need for more accurate information regarding harvests of land mammals in the lower Kuskokwim River region. In particular, resource managers of the Division of Wildlife Conservation were interested in understanding more about patterns of big game harvest in the area, especially in regard to harvests of moose and caribou. Wildlife biologists desired more accurate harvest and subsistence use information to improve management of lower Kuskokwim River moose populations and the Mulchatna caribou herd. Also, the department identified the need for improved regional harvest

[1]. See also Ikuta, Hiroko, Caroline L. Brown, and David S. Koster. *In prep.* "Subsistence Harvests in 8 Communities in the Kuskokwim and Yukon River Drainages, 2011". Fairbanks: Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. NNN. Hereinafter cited as (Ikuta et al. *In prep*).

data to continue to provide reasonable opportunities for subsistence uses of land mammals by Bethel residents.

In March 2012, Division of Subsistence researchers conducted land mammal harvest surveys with a sample of Bethel households. The survey instrument (Appendix A) was designed to record amounts of several land mammal species harvested by Bethel hunters and trappers, including large land mammals, small land mammals, and furbearers. The survey also recorded evidence of sharing of land mammal resources by Bethel households, locations of large land mammal harvest, and household demographic characteristics. Survey results indicated that in 2011, 73% of Bethel households used land mammals, with moose and caribou representing the majority (94%) of all land mammal harvests. Bethel respondents also reported that they shared land mammal resources widely between households, with 35% of households giving land mammal resources away and 62% receiving them. Bethel hunters harvested moose throughout the lower Yukon, lower Kuskokwim, and middle Kuskokwim River regions. Nearly all the caribou harvest by Bethel hunters occurred in the lower Kuskokwim River region. This study advances the department's understanding of the nature of subsistence land mammal use in Bethel. It also provides data that will inform the BOG in development of subsistence and other hunting and trapping regulations, including, potentially, reevaluation of the amounts reasonably necessary for subsistence (ANS) within the hunting and trapping areas that Bethel households access.

METHODS

SURVEY INSTRUMENT

Division of Subsistence staff designed a household survey to document harvest and use of land mammals in Bethel from January 1 to December 31, 2011 (Appendix A). The primary purpose of the household survey was to collect information about the harvest and uses of wild land mammals. The survey recorded use of large and small land mammals by each Bethel household during this period. The survey was designed to record information only for those individuals who had resided in the respondent's household for a period of at least 3 months during 2011. For the purposes of this survey, use of land mammals was defined as harvesting, receiving from or giving to another household, or any other consumptive use of harvested land mammal products (e.g. eating, processing, fashioning into handicrafts). The survey recorded household use of several large game and furbearer species. Species listed in the survey were caribou *Rangifer tarandus*, moose *Alces alces*, brown bear *Ursus arctos*, black bear *Ursus americanus*, Dall sheep *Ovis dalli*, muskox *Ovibos moschatus*, wolf *Canis lupus*, beaver *Castor canadensis*, wolverine *Gulo gulo*, river otter *Lutra canadensis*, lynx *Lynx canadensis*, red fox *Vulpes vulpes*, Arctic fox *Alopex lagopus*, American mink *Neovison vison* (hereafter mink), and muskrat *Ondatra zibethicus*. Additionally, the survey included questions regarding the use of feral reindeer, animals that some respondents identified as resident in the area surrounding Bethel.[2]

Respondents were asked whether their household used or attempted to harvest each of these resources during 2011. If they reported harvesting moose, caribou, feral reindeer, brown bear, black bear, Dall sheep, or muskox, they were asked in which ADF&G Uniform Coding Unit (UCU) the animals were harvested, what the sexes of the animals killed were, how many of each animal was harvested, and in what months the animals were harvested. The harvest area UCUs were depicted on printed maps of the region (Appendix B). To identify correct harvest locations, respondents were shown the maps with UCUs outlined and were asked to point to the location of harvest. Researchers recorded corresponding UCU numbers on the survey form. Respondents were also asked which household members attempted to harvest moose and caribou, how many total days each household member hunted for these animals in 2011, and whether or not they successfully harvested animals. The survey also included questions regarding use of furbearers (i.e., wolf, beaver, wolverine, river otter, lynx, red fox, Arctic fox, mink, and muskrat). Respondents were asked to indicate how many animals of each species of furbearer the household harvested in 2011, how many of the harvested animals were used for food, and how many of the animals were used for fur only.

The survey also recorded demographic characteristics of sampled households. Demographic questions inquired about the total number of household members and the age and sex of each, each member's relationship to the household head, as well as whether household members identified themselves to be of Alaska Native origin.

SAMPLING DESIGN

In March 2012, division staff administered the land mammal harvest survey in Bethel. Researchers selected a 25% simple random sample of all known Bethel households, and completed surveys at each of

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[2]. Researchers included feral reindeer as a harvest species in the survey form at the request of community members who reviewed and approved the proposed research plan. During informal conversations prior to field research, some Bethel residents indicated the presence of feral reindeer in the area, animals that they understood to be remnants of reindeer herds that historically ranged the lower Kuskokwim river region. In GMU 18, ADF&G specifically identifies and manages the species *Rangifer tarandus* only as a wild population of caribou. Although feral reindeer are present in some regions of Alaska, department wildlife biologists indicated to researchers that these animals are not present in the Yukon–Kuskokwim Delta region. Under State of Alaska hunting regulations, if a hunter in GMU 18 harvests an animal that she/he believes to be a feral reindeer, the hunter is required to report it on a caribou harvest ticket and include it in her/his season caribou bag limit.

the sampled households. Researchers developed a complete Bethel household list to determine the accurate number of households that represented a 25% simple random sample of the community. The survey household list was derived from a residential address list that had originated with the City of Bethel and had been updated by ADF&G Division of Commercial Fisheries in August 2011. The original list included approximately 1,920 addresses; however, while contacting survey households, researchers identified a number of residences that were not eligible for participation in the survey. Researchers determined an address to be ineligible for participation in the survey if it was a place of business, a residence for temporary or seasonal workers, or if the address did not exist. After removing ineligible addresses from this list, researchers identified a final master list with total number of 1,883 households in Bethel. It was from this master list that researchers selected a 25% sample of 473 households.

Researchers contacted respondents at the 473 sampled households. In order to participate in the survey, respondents were required to be 15 years of age or older. Researchers conducted a survey after the respondent gave verbal consent to participate. Participation in the survey was voluntary, and the respondent was permitted to refuse to answer any survey questions or to stop the survey at any time. If researchers failed to make contact at a selected address after 3 attempts to do so, the household was marked on the list as "no contact" and eliminated as a selected household in the sample. Also, if a respondent at a selected household refused to consent to completing the survey, the household was marked on the list as "refused" and eliminated as a selected household. In order to obtain a 25% sample, these "no contact" and "refused" households were replaced with other households randomly sampled from the master household list.

DATA ANALYSIS AND REVIEW

All data were coded for data entry by Division of Subsistence staff in Anchorage. Surveys were reviewed and coded by the project lead for consistency. Responses were coded following standardized conventions used by the Division of Subsistence to facilitate data entry. Information management staff within the Division of Subsistence set up database structures within Microsoft SQL Server[3] at ADF&G in Anchorage to hold the survey data. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were available on a secured Internet site. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than 1 hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice and each set compared in order to minimize data entry errors.

Once data were entered and confirmed, information was processed with the use of Statistical Package for the Social Sciences (SPSS) software, version 19. Initial processing included the performance of standardized logic checks of the data. Logic checks are often needed in complex data sets where rules, constraints, and referential integrity do not capture all of the possible inconsistencies that may appear. Harvest data collected as numbers of animals were converted to pounds usable weight using standard conversion factors.

Alaska Department of Fish and Game staff also used SPSS for analyzing the survey information. Analysis included review of raw data frequencies, cross tabulations, table generation, estimation of population parameters, and calculation of confidence intervals for the estimates. Missing information was dealt with on a case-by-case basis according to standardized practices, such as minimal value substitution or using an averaged response for similarly-characterized households. Typically, missing data are an uncommon, randomly-occurring phenomenon in household surveys conducted by the division. In unusual cases where

[3]. Product names are given because they are established standards for the State of Alaska or for scientific completeness; they do not constitute product endorsement.

a substantial amount of survey information was missing, the household survey was treated as a $\bar{h}_i = \frac{h_i}{n_i}$ "non-response" and not included in community estimates. ADF&G researchers documented all adjustments.

Harvest estimates and responses to all questions were calculated based upon the application of weighted means (Cochran 1977). These calculations are standard methods for extrapolating sampled data. As an example, the formula for harvest expansion is

$$H_i = \bar{h}_i S_i \tag{1}$$

where:

$$\bar{h}_i = \frac{\bar{h}_i}{n_i} \tag{2}$$

$\bar{h}_i$ = the mean harvest per returned survey

H_i = the total harvest (numbers of resource or pounds) for the community *I*,

h_i = the total harvest reported in returned surveys,

n_i = the number of returned surveys, and

S_i = the number of households in a community.

As an interim step, the standard deviation (SD), or variance (V; which is the SD squared), was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean was also calculated for each community. This was used to estimate the relative precision of the mean, or the likelihood that an unknown value would fall within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percentage. Once the standard error was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The constant for 95% confidence limits is 1.96. Though there are numerous ways to express the formula below, it contains the components of an SD, V, and SE.

Relative precision of the mean (CL%):

$$CL\%(\pm) = \frac{t_{\alpha/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{x}} \tag{2}$$

where:

s = sample standard deviation,

n = sample size,

N = population size,

$\bar{x}$ = sample mean, and

$t_{\alpha/2}$ = Student's *t* statistic for alpha level (α=.95) with n–1 degrees of freedom.

Small CL percentages indicate that an estimate is likely to be very close to the actual mean of the sample. Larger percentages mean that estimates could be further from the mean of the sample.

The corrected final data from the household survey will be added to the Division of Subsistence Community Subsistence Information System (CSIS).[4] This publicly-accessible database includes community-level study findings.

COMMUNITY APPROVAL AND DATA REVIEW

In December 2011, ADF&G subsistence resource specialists attended meetings of the Bethel City Council and the Orutsararmiut Native Council (ONC) Executive Board in Bethel. Researchers presented the proposed household survey project to document harvest and use of land mammals in Bethel, and requested from the councils their approval of the department's intention to complete the project in the community. Both councils gave their approval of the proposed research. In July 2012, after completion of the survey field work and data analysis, ADF&G researchers attended meetings of the same councils at which time they reviewed the project results. The purpose of these data-review presentations was to present study findings to the councils, give their members the opportunity to review the results, and to make their recommendations for the final project report.

4. ADF&G Division of Subsistence, Community Subsistence Information System (CSIS): http://www.adfg.alaska.gov/sb/CSIS.

RESULTS

BETHEL DEMOGRAPHICS

The demographic characteristics of Bethel that were estimated in this survey are presented in Table 1. Division researchers sampled 473 Bethel households, a 25% sample of 1,883 estimated eligible households. The total estimated population of Bethel in 2011 was 6,139 individuals, with an estimated total female population of 3,061 (50%) and an estimated total male population of 3,030 (49%) (Table 1). Survey data included 0.8% of all responses wherein respondents refused to identify sex for one or more of the members of their household, resulting in an expanded number of 48 Bethel residents for whom sex was not determined by analysis. The mean Bethel household size in 2011 was 3 residents, with 11 members residing in the largest household (Table 1). The mean age was 31 years, and the median 28 years (Table 1). The eldest person sampled was 88 years of age. There was an estimated number of 1,206 households (64%) wherein respondents identified at least one household head as Alaska Native, with an estimated total population of 4,208 Alaska Natives (69%) in Bethel in 2011 (Table 1). There was an estimated number of 669 households (36%) for which respondents identified no household heads as Alaska Native. Expansion of these responses indicated an estimated total population of 1,732 Bethel residents (28%) in 2011 who were not of Alaska Native origin. There were also 8 households representing an estimated 40 residents in 2011 who were of unknown status in regard to Alaska Native origin.

In 2011, the U.S. Census Bureau American Community Survey (ACS) estimated 1,679 households in Bethel from 2007 through 2011, and estimated a total population of 6,219 persons. This included an estimated total female population of 2,991 (48%) and an estimated total male population of 2,985 (48%), with 3.9% of the population unidentified by sex[5]. The U.S. Census Bureau also estimated the mean Bethel household size in 2011 to be 3 residents, with 11 members residing in the largest household (U.S. Census 2013). The mean age was 31 years, and the median 28 years. The 2010 U.S. Census estimated the Alaska Native population in Bethel to be 3,952 (65%) (U.S. Census 2013). The similarities between results of the American Community Survey and this study suggest that the 25% simple random sample was representative of the Bethel population.

5. U.S. Census Bureau. 2013. 2010 Decennial Census and American Community Survey Data. American Fact Finder. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml Hereinafter referred to as (U.S. Census 2013).

Table 1.–Demographic characteristics of sampled households, Bethel, 2011.

Characteristics	Community
	Bethel
Sampled households	473
Eligible households	1,883
Percentage sampled	25.1%
Estimated population	6,138.7
Household size	
Mean	3.3
Minimum	1
Maximum	11
Age	
Mean	30.6
Minimum[a]	0
Maximum	88
Median	28
Percentage of age missing	5.5%
Sex	
Estimated male	
Number	3,030
Percentage	49.4%
Estimated female	
Number	3,061
Percentage	49.9%
Sex not answered	47.8
Unknown percentage	0.8%
Alaska Native	
Estimated households[b]	
Number	1,206
Percentage	64.1%
Estimated population	
Number	4,208
Percentage	68.5%

Source Alaska Department of Fish and Game, Division of Subsistence, household survey, 2012.

a. A minimum age of 0 (zero) is used for infants that are less than 1 year of age.

b. The estimated number of households in which at least one head of household is Alaska Native.

HARVEST AND USE OF LAND MAMMALS

Large land mammals constituted the largest portion of Bethel residents' land mammal harvest in 2011, composing an estimated 217,811 lb (98%) of the total land mammal harvest of 221,778 lb (Table 2; Figure 1). In 2011, 72% of Bethel households used large land mammals, with 38% attempting to harvest and 25% harvesting big game. In 2011, 27% of Bethel households harvested land mammals (Table 2). In addition, 25% of Bethel households harvested large land mammals (Table 2). Bethel residents harvested an estimated 279 moose or 150,481 lb in 2011, representing the largest portion of all land mammal harvests by weight at 68%. Survey results indicated that 61% of Bethel households used moose. Of all Bethel households using moose, 28% attempted to harvest, 13% harvested moose, 22% gave moose to another household, and 50% received moose from another household. The estimated weight of moose harvested by Bethel residents in 2011 was 79.9 lb per household and 24.5 lb per capita.

In 2011, Bethel residents harvested an estimated 446 caribou, with a total community harvest of 57,963 lb, 26% of the total land mammal harvest by weight (Table 2). This study estimated that 55% of Bethel households used caribou in 2011. Survey results indicated that 16% of Bethel households harvested caribou, 22% gave caribou to another household, and 41% received caribou. The estimated weight of caribou harvested by Bethel residents in 2011 was 30.8 lb per household and 9.4 lb per capita. A small number of households reported harvesting animals they identified as feral reindeer, which expanded to an estimation of 8 feral reindeer harvested by residents of the community in 2011.[6]

Approximately 4% of total land mammal harvest by Bethel residents in 2011 was composed of 4 species of large game other than moose or caribou. Bethel hunters harvested 2,389 lb of black bear, 2,807 lb of brown bear, 2,349 lb of muskox, and 788 lb of Dall sheep (Table 2). The total harvest weights of these species were estimated to be used at rates of 1.3 lb of black bear, 1.5 lb of brown bear, 1.2 lb of muskox, and less than 1 lb of Dall sheep per household. Harvests of black bears and brown bears occurred among 1% of Bethel households, with 2% of households attempting to harvest these species. Attempted harvests and successful harvests of muskoxen and Dall sheep occurred among less than 1% of Bethel households. Bethel households reported sharing black bears, brown bears, and muskoxen between households, with 1% of households reporting either giving or receiving black bears and brown bears and 4% reporting receiving muskoxen. Respondents reported that all black bear harvests occurred in UCUs within the Kuskokwim River drainage (*see* Appendix C, Table 1); however, respondents did not report brown bear harvest locations (*see* Appendix C, Table 2). Respondents reported that they harvested all muskoxen on Nunivak Island (*see* Appendix C, Table 3), and Dall sheep in GMU 20E (*see* Appendix C, Table 4).[7]

In 2011, Bethel households harvested an estimated 1,656 individual furbearers, including 541 red foxes, 319 beavers, 243 lynx, 112 wolves, 84 mink, 76 wolverines, 60 Arctic foxes, 36 river otters, and 12 muskrats (Table 2). There were also an estimated number of 24 martens *Martes americana* and 16 snowshoe hares *Lepus americanus* harvested in Bethel in 2011. Field researchers did not ask respondents to report their household's harvests of marten or snowshoe hares; however, several households did report harvesting these species. The survey also did not include questions regarding harvests of Alaska hare *Lepus othus*, commonly known as *jackrabbit* to many Bethel residents. No Bethel respondents reported harvests of Alaska hares in 2011.

Harvests of furbearers composed 2% of the total weight of edible pounds from harvests of land mammal resources by Bethel residents in 2011. Bethel residents reported using 6 species of furbearers as a food source. These included beaver, snowshoe hare, river otter, lynx, mink, and muskrat. Bethel households harvested 3,583 lb of beaver, which represented the largest portion (90%) of the total edible pounds of

6. A complete representation of harvest and use of animals identified by respondents as feral reindeer is presented in Table 2.
7. The BOG has made a negative customary and traditional use finding for the population of Dall sheep within the Tok Management Area and the Delta Management Area in GMU 20 (5 AAC 99.025).

furbearers. Furbearer harvests also included 319 lb of lynx, 40 lb of snowshoe hare, 12 lb of river otter, 8 lb of mink, and 6 lb of muskrat (Table 2).

Table 2.–Estimated harvest and use of land mammals, Bethel, 2011.

Resource	Percentage of households					Harvest weight (lb)[a]			Harvest quantity (individual)		95% CI (±%)
	Use	Attempt	Harvest	Give	Receive	Total	Per household	Per capita	Total	Per household	
Land mammals	**72.5%**	**37.6%**	**27.3%**	**34.7%**	**62.2%**	**221,778.0**	**117.4**	**36.1**	**2444.3**	**1.30**	**17%**
Large land mammals	**72.3%**	**37.6%**	**25.4%**	**33.6%**	**61.7%**	**217,810.9**	**115.7**	**35.5**	**788.2**	**0.42**	**17%**
Black bear	2.1%	2.1%	1.3%	0.6%	0.8%	2,388.6	1.3	0.4	23.9	0.01	69%
Brown bear	1.9%	2.1%	1.1%	0.8%	0.8%	2,806.6	1.5	0.5	19.9	0.01	76%
Caribou	54.5%	22.0%	16.3%	22.2%	41.0%	57,963.0	30.8	9.4	445.9	0.24	20%
Moose	61.3%	27.9%	13.3%	21.8%	50.3%	150,480.8	79.9	24.5	278.7	0.15	21%
Muskox	4.7%	0.4%	0.4%	1.3%	4.2%	2,348.8	1.2	0.4	8.0	0.00	120%
Dall sheep	0.6%	0.2%	0.2%	0.2%	0.4%	788.2	0.4	0.1	4.0	0.00	170%
Feral reindeer	3.0%	0.6%	0.4%	0.8%	2.5%	1,035.1	0.5	0.2	8.0	0.00	120%
Small land mammals/furbearers	**8.0%**	**7.0%**	**5.9%**	**3.8%**	**4.2%**	**3,967.0**	**2.1**	**0.6**	**1656.1**	**0.879**	**85%**
Beaver	6.8%	4.9%	4.7%	3.0%	3.8%	3,582.9	1.9	0.6	318.5	0.169	88%
Arctic fox	0.4%	0.6%	0.2%	0.0%	0.2%	0.0	0.0	0.0	59.7	0.032	0%
Red fox	2.7%	3.6%	2.7%	1.1%	0.4%	0.0	0.0	0.0	541.4	0.288	0%
Snowshoe hare [b]	0.2%	0.2%	0.2%	0.2%	0.0%	39.8	0.0	0.0	15.9	4.000	0%
River (land) otter	1.5%	1.7%	1.1%	0.4%	0.4%	11.9	0.0	0.0	35.8	0.019	170%
Lynx	1.1%	1.9%	0.8%	0.4%	0.2%	318.5	0.2	0.1	242.8	0.129	118%
Marten [b]	0.2%	0.2%	0.2%	0.0%	0.0%	0.0	0.0	0.0	23.9	6.000	0%
Mink	1.1%	1.3%	0.8%	0.0%	0.2%	8.0	0.0	0.0	83.6	0.044	170%
Muskrat	0.8%	1.1%	0.6%	0.2%	0.4%	6.0	0.0	0.0	11.9	0.006	120%
Wolf	1.3%	1.5%	1.1%	0.4%	0.2%	0.0	0.0	0.0	111.5	0.059	0%
Wolverine	0.8%	1.1%	0.6%	0.2%	0.2%	0.0	0.0	0.0	75.6	0.040	0%

Source ADF&G Division of Subsistence household surveys, 2012.

a. Furbearer harvest weights represent the number of reported pounds harvested for food.

b. Snowshoe hare and marten were not included in the survey, but were reported as harvests by a limited number of households.

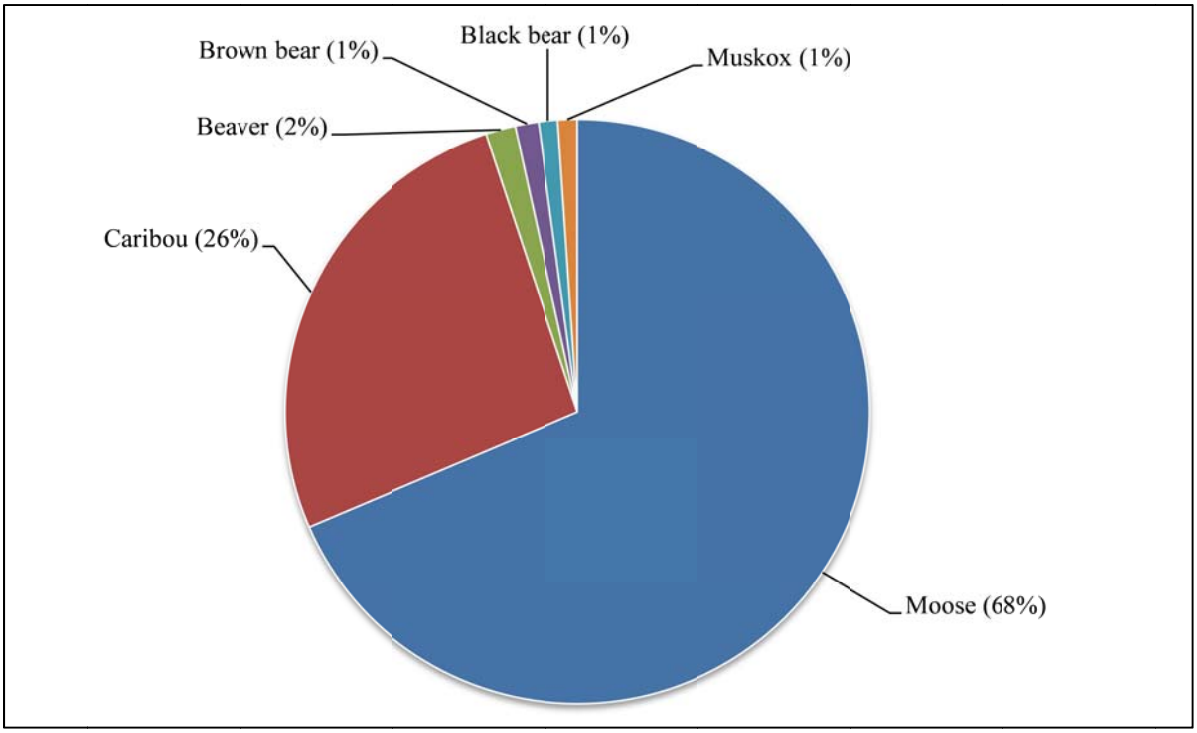

Figure 1.–Top land mammals harvested in Bethel, 2011.

CARIBOU HUNTING EFFORT, TIMING, SEX, AND HARVEST LOCATION

In 2011, members of an estimated 414 Bethel households hunted caribou, with 541 caribou hunters residing in those households or an average of 1.3 caribou hunters per hunting household (Table 3). Among all caribou hunting households, individuals who attempted to harvest caribou hunted for an estimated total of 1,048 days with an average of 1.9 hunting days per caribou hunter. An estimated 299 Bethel households successfully harvested at least one caribou with an average harvest rate of 1.5 caribou per successful household. Among all caribou hunters, 346 successfully harvested caribou and spent approximately 732 days hunting caribou. Each hunter who successfully harvested caribou hunted with an average effort of 2.1 days (Table 4) and an average harvest of 1.3 caribou per successful hunter (Table 3). In Bethel 2011, the rate of success for all hunters was 0.8 caribou per hunter (Table 3) with an average total of 2.4 days hunted for each caribou harvested by Bethel residents (Table 4).

Hunters harvested an estimated 378 caribou from January through March and September through December 2011 and an estimated number of 68 caribou harvested in unknown months (Table 5). The principal caribou-hunting period was the months between freeze-up and break-up, with hunters harvesting the majority of animals during late winter and early spring. In February and March 2011, hunters killed an estimated 263 caribou. Hunters harvested fewer animals in late fall and early to mid-winter months, killing an estimated 40 caribou in January and 64 animals in November and December. Hunters killed 12 caribou in September and October. Bulls comprised approximately 51% of caribou (227 bulls), and cows 33% (147 cows) (Table 6). Not all respondents reported the sex of harvested caribou for their households, resulting in an estimated harvest of 72 animals of unknown sex.

Bethel survey respondents were asked to report the UCUs where hunters harvested caribou. The majority of Bethel's caribou harvest occurred in the lower Kuskokwim River region, with 382 caribou killed in

UCUs 18ZW001301 and 18ZW001501[8] (Figure 3). These UCUs are located in an area to the southwest of the south bank of the lower Kuskokwim River, extending from the Kisaralik River drainage in the north to the Eek River drainage in the south. Hunters harvested an estimated 267 caribou in UCU 18ZW001501, and an estimated 115 caribou in UCU 18ZW001301. Hunters harvested the remaining animals (24 caribou) in the adjacent UCUs of 18ZW001201, 18ZW001202, and 18ZW001601, and in UCU 21EY000201 in the lower Yukon River drainage. Hunters harvested an estimated 40 caribou (9%) in UCUs unknown to respondents (Table 6).

8. Many respondents who reported harvesting caribou in UCU 18ZW001501 indicated that they killed caribou near Three-Step Mountain, a landmark well-known to residents of the area that is situated within the Kwethluk river drainage (Appendix B).

Table 3.–Moose and caribou hunter effort and participation, Bethel, 2011.

Description	Caribou	Moose
Community households		
Total number of hunters	541.4	784.8
Number of hunters per household	0.3	0.4
Estimated total days hunted	1,048.4	4,402.8
Estimated total harvest	445.9	278.7
Hunting households		
Number of households that hunted	414.0	525.5
Number of hunters per household	1.3	1.5
Number of days hunted	1,048.4	4,402.8
Number of harvests per all hunters	0.8	0.4
Number of days hunted per hunter	1.9	5.6
Successful hunting households		
Number of successful households	298.6	250.8
Number of successful hunters	346.3	266.7
Number of harvests per successful household	1.5	1.1
Number of days hunted	731.5	2,391.3
Number of hunters per successful household	1.8	3.1
Number of days hunted per successful hunter	2.1	9.0
Number of harvests per successful hunter	1.3	1.0

Source ADF&G Division of Subsistence household surveys, 2012.

Table 4.–Estimates of caribou and moose hunting effort by hunters, Bethel, 2011.

	All hunters				Successful (harvesting) households			
Species	Estimated total harvest	Number of hunters	Estimated days hunted	Hunting days per hunter	Number of hunters[a]	Estimated days hunted	Hunting days per hunter	Hunting days per animal harvest (all households)
Caribou	445.9	541.4	1048.4	1.9	346.3	731.5	2.1	2.4
Moose	278.7	784.8	4402.8	5.6	266.7	2391.3	9.0	15.8

Source ADF&G Division of Subsistence household surveys, 2012.

a. A maximum of one hunter is counted per moose or caribou harvested.

Table 5.–Estimated harvests of caribou by sex and month of harvest, Bethel, 2011.

		2011													
Community	Sex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
Bethel	Male	19.9	31.8	79.6	0.0	0.0	0.0	0.0	0.0	4.0	8.0	15.9	31.8	35.8	**226.9**
	Female	11.9	23.9	95.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	8.0	**147.3**
	Unknown	8.0	19.9	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	23.9	**71.7**

Source ADF&G Division of Subsistence household surveys, 2012.

Table 6.–Estimated harvests of caribou by month and location of harvest, Bethel, 2011.

Polygon			2011													
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
18Z	W001201	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W001202	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W001301	Male	19.9	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	**71.7**
		Female	4.0	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	**23.9**
		Unknown	0.0	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	**19.9**
	W001501	Male	0.0	19.9	67.7	0.0	0.0	0.0	0.0	0.0	0.0	8.0	4.0	8.0	15.9	**123.4**
		Female	8.0	11.9	79.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	**107.5**
		Unknown	8.0	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	**35.8**
	W001601	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
21E	Y000201	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Unknown	Unknown	Male	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	**11.9**
	Unknown	Female	0.0	4.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	**15.9**
	Unknown	Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	**11.9**

Source ADF&G Division of Subsistence household surveys, 2012.

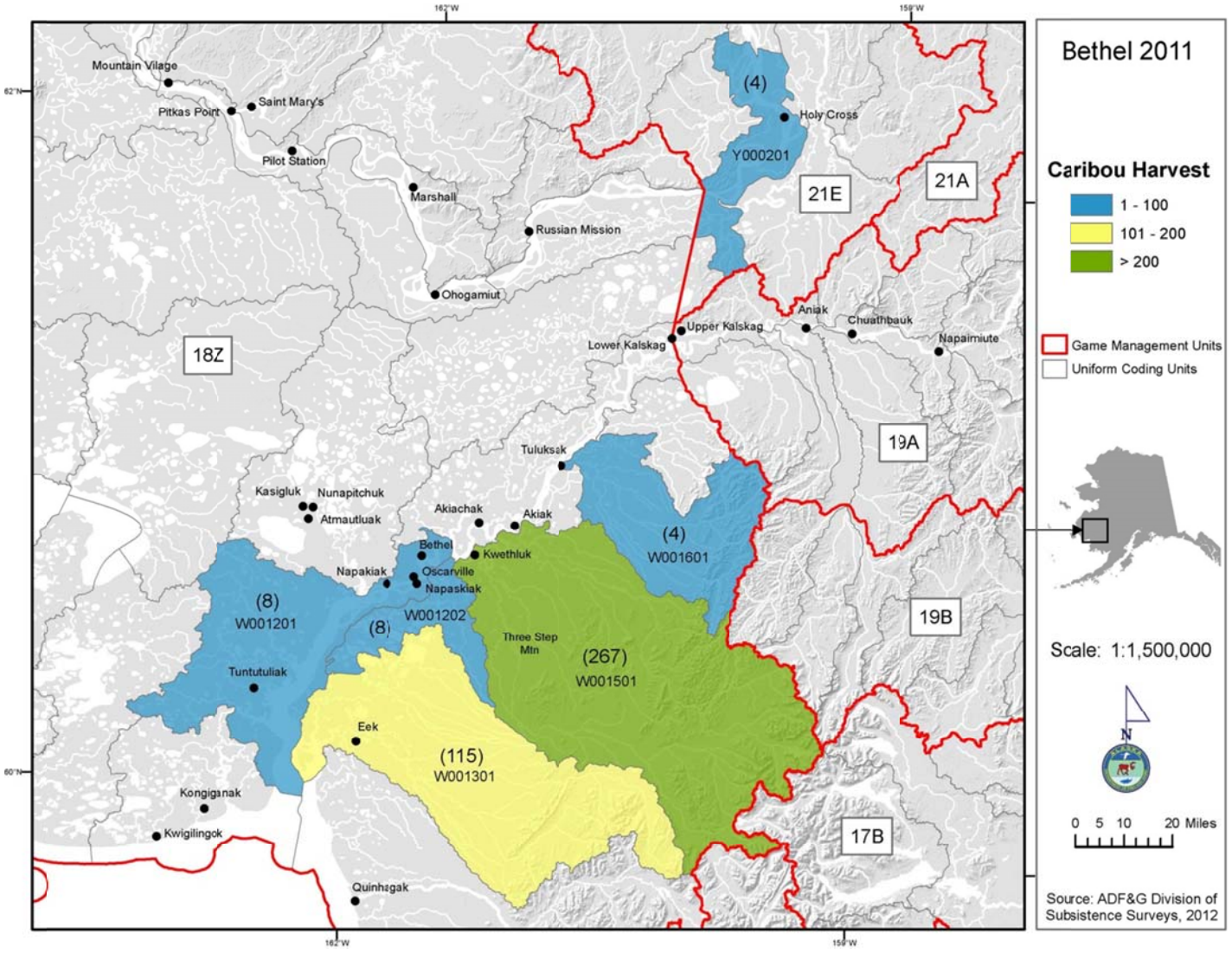

Figure 2.–Caribou harvest areas, Bethel, 2011. Values appearing in parentheses indicate the estimated total number of animals harvested in each respective UCU by Bethel hunters.

MOOSE HUNTING EFFORT, TIMING, SEX, AND HARVEST LOCATION

In 2011, members of an estimated 526 Bethel households hunted moose, with 785 moose hunters residing in those households or an average of 1.5 moose hunters per hunting household (Table 3). Among all hunting households, individuals who attempted to harvest moose hunted for an estimated total of 4,403 days with an average of 5.6 hunting days per moose hunter (Table 3). An estimated 251 Bethel households successfully harvested at least one moose with an average harvest rate of 1.1 moose per successful household (Table 3). Among all moose hunters, 267 successfully harvested moose and spent approximately 2,391 days hunting moose (Table 3). Each moose hunter who successfully harvested moose hunted with an average effort of 9.0 days and an average harvest of 1 moose per hunter (Table 4). In Bethel 2011, the rate of success for all moose hunters was 0.4 moose per hunter (Table 3) with an average total of 15.8 days hunted for each moose harvested by Bethel residents (Table 4).

Respondents reported harvesting the majority of moose in September, with hunters taking an estimated 215 animals in that month (Table 7). Hunters also harvested moose in August (12 moose), January (28 moose), and February (24 moose). Bull moose comprised approximately 84% (235 bulls) of the total moose harvest, with cow moose comprising approximately 13% (36 cows). Hunters harvested the majority of bull moose (207 bulls) in September 2011, and the majority of cows in February (24 cows). An estimated 8 moose of unknown sex were harvested in the months of January and September 2011.

Survey respondents reported that Bethel hunters harvested moose in UCUs throughout the lower Kuskokwim, lower Yukon, and Innoko rivers, and in various drainages throughout the central and upper Kuskokwim River regions. These harvests occurred in GMUs 18, 19A, 19B, 19D, and 21E (Figures 4, 5, and 6). During September 2011 Bethel hunters harvested an estimated 80 moose in UCUs within the lower Kuskokwim River region (Table 8; Figure 4). In 2011, Bethel hunters harvested an estimated 28 moose in UCU 18ZW001203, the portion of the lower Kuskokwim River drainage that is adjacent to the river from Lower Kalskag downstream to approximately 10 miles upstream of Bethel. Hunters also harvested an estimated 12 moose in UCU 18ZW001201 and 8 moose in UCU 18ZW001202, which encompass an area surrounding the Kuskokwim River from approximately 10 miles upstream of Bethel to approximately 5 miles downstream of the mouth of Eek Channel, but not including the Eek River drainage. Hunters harvested an estimated 12 moose in UCU 18ZW001501, which includes the drainages of the Kisaralik and Kwethluk rivers. Elsewhere within the lower Kuskokwim River region in 2011, Bethel hunters also harvested moose in UCUs 18ZW111401 (8 moose) and 18ZW111402 (4 moose), which encompass the lower Johnson and upper Johnson River drainages, respectively. In addition, Bethel hunters harvested an estimated 4 moose in UCU 18ZW001601, the Tuluksak River drainage, and an estimated 4 moose in UCU 18ZW001204, the Bogus creek drainage.

Table 7.–Harvests of moose by sex and month of harvest, Bethel, 2011.

		2011													
Community	Sex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
Bethel	Male	15.9	0.0	0.0	0.0	0.0	0.0	0.0	11.9	211.0	0.0	0.0	0.0	0.0	**238.9**
	Female	8.0	23.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**31.8**
	Unknown	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**8.0**

Source ADF&G Division of Subsistence household surveys, 2012.

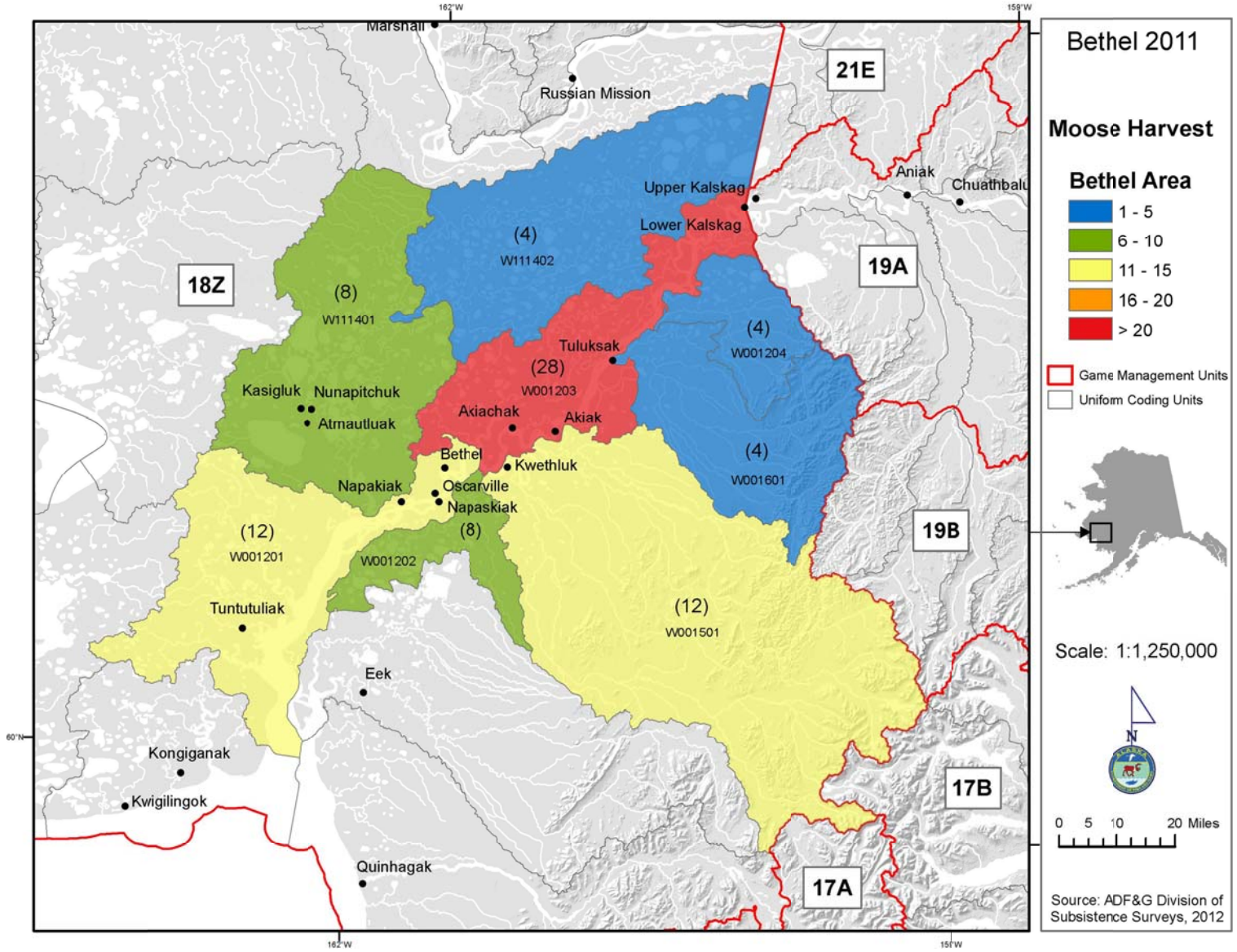

Figure 3.–Moose harvest areas, Bethel, 2011. Values appearing in parentheses indicate the estimated total number of animals harvested in each respective UCU by Bethel hunters.

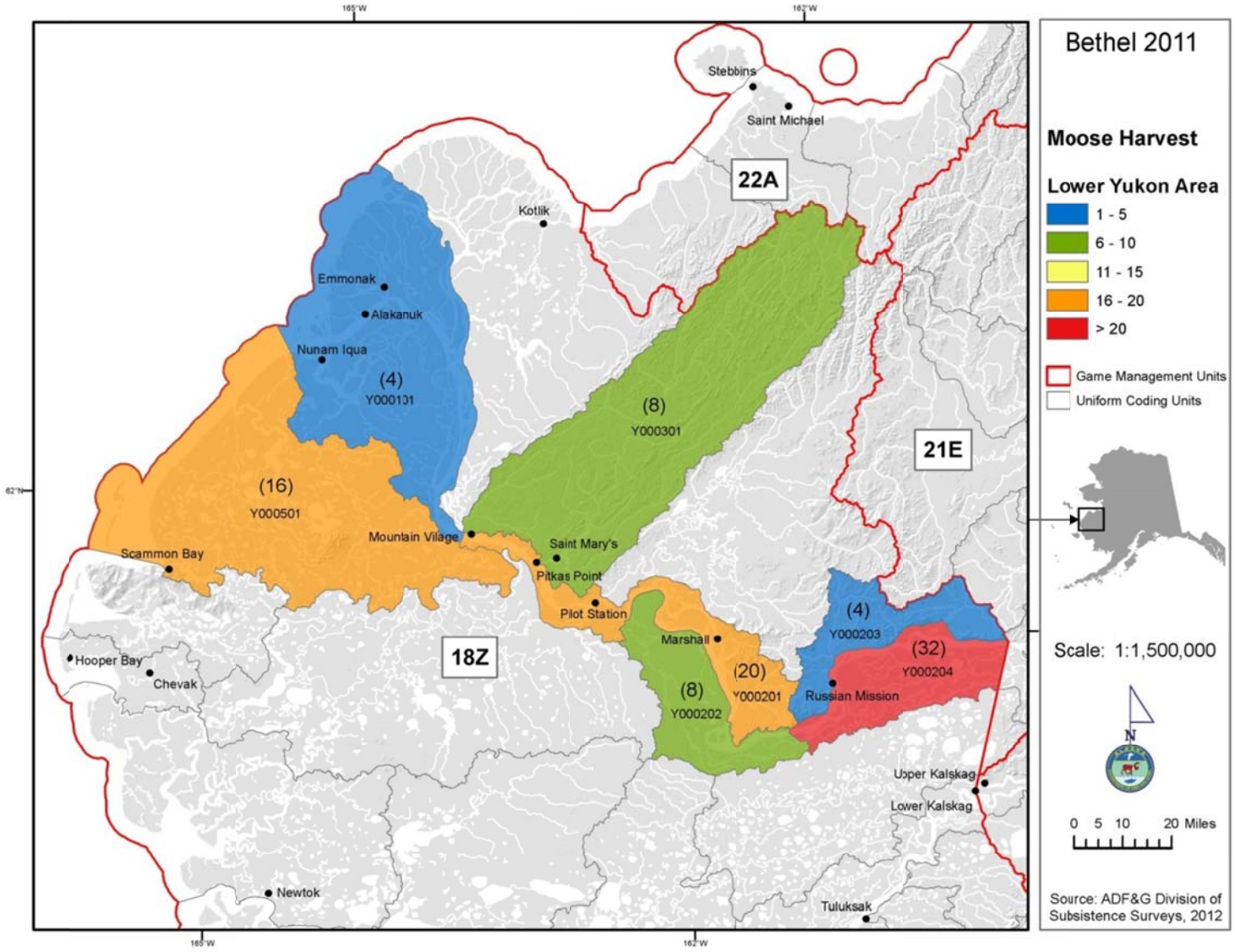

Figure 4.–Moose harvest areas, Lower Yukon Area, 2011. Values appearing in parentheses indicate the estimated total number of animals harvested in each respective UCU by Bethel hunters.

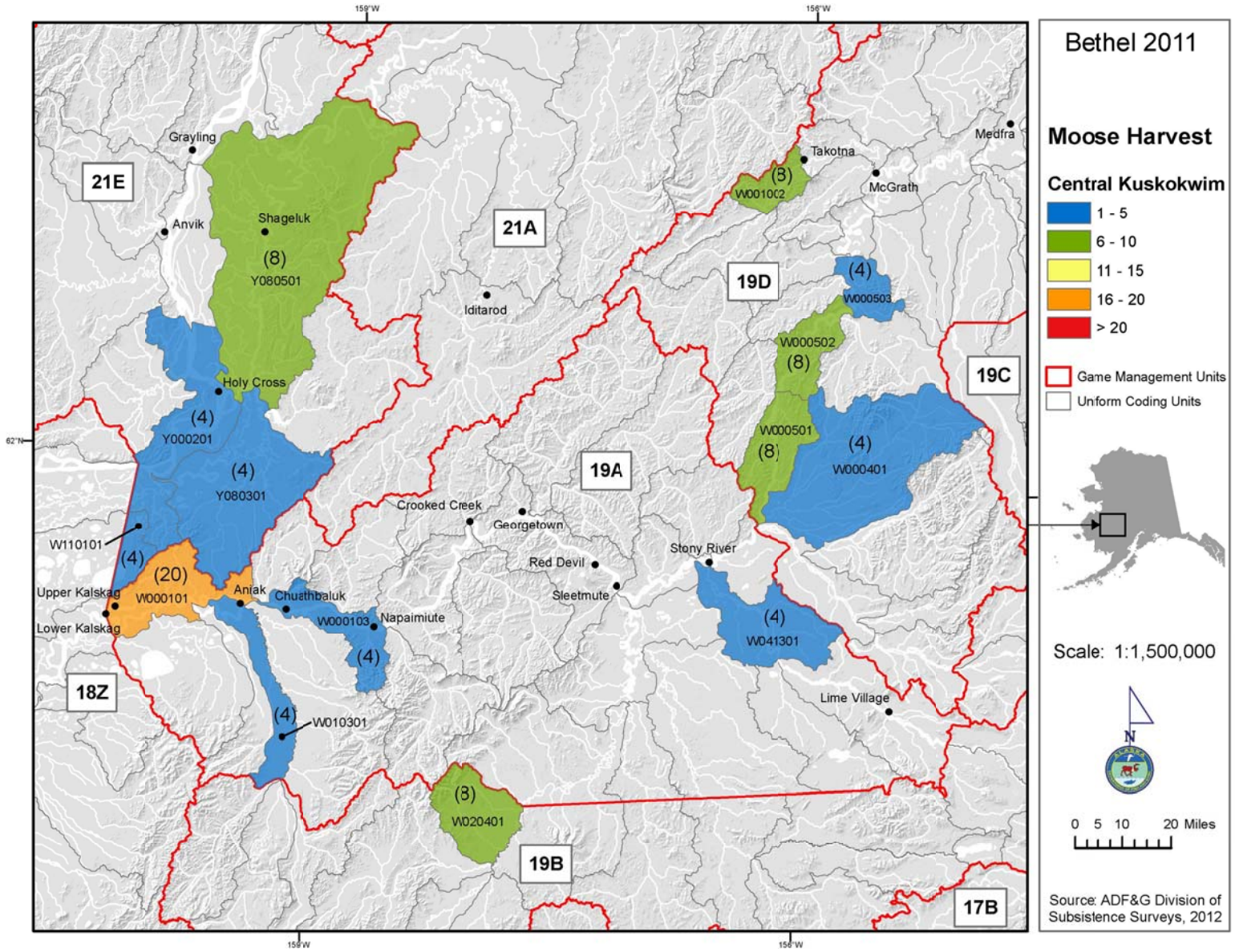

Figure 5.–Moose harvest areas, Central Kuskokwim, 2011. Values appearing in parentheses indicate the estimated total number of animals harvested in each respective UCU by Bethel hunters.

Bethel hunters in 2011 harvested 92 moose in UCUs within the lower Yukon and lowest Yukon river drainage (Table 8; Figure 5). The area with the highest estimated moose harvest by Bethel hunters in 2011 was UCU 18ZY000204, in the Twelvemile Slough drainage (Figure 5). Here hunters harvested an estimated 32 moose and an additional 4 moose in the adjacent UCU north of the Yukon River (18ZY000203). Hunters also harvested moose in several Yukon UCUs adjacent to the Yukon River downstream of the community of Russian Mission. These included UCU 18ZY000201 (20 moose), 18ZY000202 (8 moose), 18ZY000301 (8 moose), 18ZY000101 (4 moose), and 18ZY000501 (16 moose). Of these moose, Bethel hunters harvested an estimated 24 in January 2011, 24 in February, 8 in August, and 36 in September (Table 8). Bethel hunters also harvested moose in GMU 21E in UCUs 21EW110101 (4 moose), 21EY000201 (4 moose), 21EY080301 (4 moose), and 21EY080501 (8 moose) (Figure 6). Each of these moose was harvested in September 2011 (Table 8).

Bethel hunters in 2011 also harvested moose within the central and upper Kuskokwim river drainages in GMUs 19A, 19B, and 19D (Table 8; Figure 6). In GMU 19A, Bethel hunters harvested an estimated 20 moose in UCU 19AW000101, in an area surrounding the Kuskokwim River from approximately 3 miles upstream of the community of Aniak downstream to the community of Lower Kalskag. Hunters also harvested an estimated 4 moose in UCU 19AW010301 in the Aniak River drainage, an estimated 4 moose upstream of Aniak to the community of Napaimute in UCU 19AW000103, and an estimated 4 moose in the lower Stony River drainage in UCU 19AW041301. In GMU 19B, Bethel hunters harvested an estimated 8 moose in UCU 19BW020401 in the upper Holitna River drainage. In GMU 19D, Bethel hunters harvested moose in several UCUs adjacent to the Kuskokwim River, including UCU 19DW000401 (4 moose), 19DW000501 (8 moose), 19DW000502 (8 moose), and 19DW000503 (4 moose). Also, hunters killed an estimated 8 moose UCU 19DW001002 in the upper Takotna River drainage (Figure 4). Hunters in GMU 19 harvested each of these moose in September 2011 (Table 8).

Table 8.–Estimated harvests of moose by month and location of harvest, Bethel, 2011.

			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
	W001201	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	0.0	0.0	0.0	0.0	**11.9**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001202	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001203	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.9	0.0	0.0	0.0	0.0	**27.9**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001204	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001501	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	0.0	0.0	0.0	0.0	**11.9**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001601	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W111401	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W111402	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
18Z	Y000101	Male	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	Y000201	Male	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	8.0	0.0	0.0	0.0	0.0	**15.9**
		Female	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Y000202	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Female	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**8.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**

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			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
	Y000203	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	Y000204	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	4.0	15.9	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**19.9**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
	Y000301	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	Y000501	Male	8.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	**15.9**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
19A	W000101	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0.0	0.0	0.0	0.0	**19.9**
		Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W010301	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W041301	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W020401	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
19D	W000401	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
19D	W000501	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W000502	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**

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			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
	W000503	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W001002	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W110101	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
21E	Y000201	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Y080301	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Y080501	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Unknown	Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Unknown	Unknown	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Male	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**

Source ADF&G Division of Subsistence household surveys, 2012.

DISCUSSION

CARIBOU

Caribou harvests by Bethel residents are influenced by caribou herds' geographic distribution and population size. Skoog (1968:239) summarized historical information of caribou in the lower Kuskokwim region, describing that in general caribou in this area have fluctuated considerably in population and distribution. Raymond (1900:32) reported that caribou in the Yukon–Kuskokwim Delta were abundant in the middle 1800s but diminished greatly thereafter with the introduction of firearms to the region. Caribou were virtually absent from the area by 1890 and remained so throughout the lower Kuskokwim River region through the first half of the 20th century (Skoog 1968:230–232).

Large herds of domestic reindeer were also present in Alaska during much of the 20th century. The U.S. federal government, under the direction of Dr. Sheldon Jackson, Presbyterian missionary and U.S. General Agent of Education in Alaska, introduced reindeer to Northwest Alaska in the late 19th century (Calista Professional Services 1984:5; J. J. K. Simon 1998:93). By 1903, reindeer herding expanded into the Yukon–Kuskokwim Delta region, including a herd of approximately 1,000 animals near Bethel (McAtee 2010). During a 1927 reindeer count, a total of 51,369 reindeer were present in Western Alaska, broadly corresponding to the Yukon–Kuskokwim Delta and surrounding areas (Alaska Governor 1928). Herders in the community of Akiak, approximately 18 air miles from Bethel, maintained a reindeer herd that reached a peak of 30,000 animals until the decline of the industry throughout the region beginning in the 1930s (Alaska Governor 1928; McAtee 2010). The sale and consumption of reindeer meat for personal use represented a substantial portion of the local economy and diet for some lower Kuskokwim River communities; however, the industry was dependent upon supplying large amounts of meat to distant markets outside of Alaska. The Alaska reindeer industry was not viable without demand from those markets, and production declined when demand decreased as a result of competition with the beef industry. There were a number of other factors which contributed to the decline and disappearance of reindeer herds in the Yukon–Kuskokwim Delta, including difficulty managing numerous small herds, overgrazing, predation, disease, and inconsistent government management and regulation (VanStone 1967:87; Calista Professional Services 1984:7–8; J. J. K. Simon 1998). Following a reindeer population crash that began in the late-1930s, reindeer herding and reindeer became virtually absent from the Yukon–Kuskokwim Delta region by 1960 (Calista Professional Services 1984:9).

In the early to mid-20th century, large reindeer herds ranged throughout the tundra of the lower Kuskokwim River and the Kuskokwim and Kilbuck mountains (Calista Professional Services 1984:6; McAtee 2010). Possibly due to competition with these reindeer, caribou were scarce in the Yukon–Kuskokwim Delta region following the decline of the reindeer industry (Perry 2009a). Skoog (1968:300–301) estimated a population of 5,000 adults in the Mulchatna caribou herd in 1964 and reported that the herd ranged the mountainous territory east of and distant from the lower Kuskokwim River region. While information about the herd's distribution and movement was limited, Skoog (1968:300–301) listed Whitefish Lake in the Hoholitna River headwaters, Lake Clark, and the Taylor Mountains as places where large numbers of the herd had been observed in the 1960s.

A small group of caribou (Kilbuck caribou herd) was present in the Kilbuck Mountains east of Bethel and was hunted beginning at the latest in the mid-1980s (Spaeder 2005). The Mulchatna caribou herd increased in population and geographic distribution beginning in the 1980s, reaching a peak population of 200,000 caribou by 2000 (Woolington 2011). It is assumed that this expanding caribou herd eventually absorbed the smaller Kilbuck Mountains caribou herd (Perry 2009a), and since the mid-1990s until 2010, harvests of caribou by lower Kuskokwim River communities have primarily come from the Mulchatna herd. Between 2000 and 2008, the Mulchatna herd population decreased by 85% to an estimated population of 30,000 caribou in 2008 (Woolington 2011), possibly due to lower recruitment, higher mortality influenced by disease, and low calf to cow ratios (Valkenburg et al. 2003).

State of Alaska caribou hunting regulations for Game Management Unit 18 have varied considerably since 1960. The first Alaska regulations permitting caribou hunting in GMU 18 occurred in the 1964–1965 regulatory year, at which time the bag limit was 4 caribou. Bag limits ranged from 3 to 5 caribou per year in GMU 18 for the area south of the Yukon River, until the 1977–1978 regulatory year when the bag limit was 1 caribou. In the 1985–1986 regulatory year, the caribou hunting season was closed in GMU 18 south of the Yukon River and remained closed until 1992–1993 when hunters were permitted to take 1 bull per year south of the Kuskokwim River in GMU 18. During the 1995–1996 and 1996–1997 regulatory years, ADF&G established a registration permit hunt in GMU 18 south of the Yukon River with a bag limit of 2 caribou. From the 1997–1998 through the 2005–2006 regulatory years, ADF&G ended the registration permit hunt and allowed hunters to harvest 5 caribou per year in GMU 18 south of the Yukon River under general harvest regulations. The caribou bag limit for all of GMU 18 was decreased to 3 caribou per year in the 2006–2007 regulatory year, and to 2 caribou per year the following season where it remained through the 2011–2012 regulatory year. The federal subsistence hunting regulations on federal public lands in GMU 18 are the same as State of Alaska hunting regulations for the region; however, only federally qualified subsistence hunters are permitted to hunt caribou under these regulations on federal public lands in GMU 18. Federally recognized subsistence hunters residing in the lower Kuskokwim River area, which include residents of Bethel, likely represent the majority of caribou hunters in the region and harvest a significant portion of the Mulchatna caribou herd, particularly during winter (Perry 2009a). Therefore, hunter success is often dependent upon snow conditions and the proximity of caribou to hunters' communities when travel by snowmachine is possible (Perry 2009a).

From 1971 through 1997, the total reported harvest from GMU 18 for the community of Bethel was an average of approximately 2 caribou per year (WinfoNet).[9] Following these decades of very low harvest, Bethel hunters reported a harvest of 212 caribou from GMU 18 in 1998 (WinfoNet). This was coincident with the approximate peaking of the Mulchatna herd's population (Woolington 2011) and the sudden appearance of a portion of the herd in the lower Kuskokwim River region during the winter of 1997–1998 (P. Jones, Assistant Area Management Biologist, ADF&G Division of Wildlife Conservation, Bethel, personal communication). Harvests of Mulchatna herd caribou by Bethel hunters remained at similar levels, with a reported average annual harvest of 160 caribou from 1998 through 2011 (WinfoNet).

MOOSE

Moose have historically occurred at low densities in the lower Kuskokwim River region, and were virtually absent from the region prior to 1940 (Andrews 1989:329; Charnley 1983:3; Perry 2010a). Moose gradually colonized the region throughout the latter 20th century and became a major component of subsistence harvests. Relatively low local abundance of moose has resulted in a history of extensive travel outside of the region by Bethel residents to hunt moose, as well as intensive hunting and corresponding management challenges within the region. During the early 1940s, some lower Kuskokwim River residents began traveling by boat up the mainstem Kuskokwim River to hunt relatively abundant moose in tributaries of the central and upper Kuskokwim (Coffing 1991:145). This practice became increasingly important to Bethel residents' moose hunting patterns as hunters obtained larger boats with larger horsepower motors throughout the 1980s and 1990s.

While hunters harvested some moose within the lower Kuskokwim River region, studies conducted by the Division of Subsistence in the 1980s documented hunters travelling extensively outside of this area to harvest moose. Division of Subsistence researchers recorded that residents of lower Kuskokwim River

9. The Alaska Department of Fish and Game maintains a record of hunters' and trappers' reported wildlife harvests and related information in a database known as the Wildlife Information Network (WinfoNet). Data in WinfoNet are accessed through an ADF&G intranet website. Some harvests of large land mammals and furbearers are required by regulation to be reported to the Division of Wildlife Conservation in the form of a general hunt harvest ticket or a harvest report from a registration, drawing, Tier I, or Tier II hunt permit, or by having furs of certain species sealed by ADF&G or a certified fur sealer (5 AAC 92.010; 5 AAC 92.170).

communities commonly traveled in excess of 100 miles to hunt moose (Andrews 1989:327–329; Coffing 1991:146–147). In the late 20th century, user conflicts among hunters began to develop as residents of communities in both the lower and central Kuskokwim River regions accessed tributaries of the central Kuskokwim River in GMU 19 for moose hunting. This was exemplified by the extensive use of the Holitna and Hoholitna river drainages during the fall moose season by residents of the lower Kuskokwim River communities including Bethel, hunters who typically did not have familial or other social ties with residents of local communities (Charnley 1983:20). Beginning in the 1992–1993 regulatory year as a response to growing user conflicts, particularly within the Holitna and Hoholitna river drainages, the BOG established the Holitna-Hoholitna Controlled Use Area which became closed to big game hunting with use of any boat equipped with a motor that exceeded 40 horsepower.

Due to declining moose populations in GMU 19A and following the development of the Central Kuskokwim Moose Management Plan, the BOG adopted an extremely conservative regulatory regime for moose hunting in the central Kuskokwim River region. Beginning in the 2006–2007 regulatory year, the BOG established a Tier II moose hunt in western GMU 19A, from the George River drainage and downstream to the community of Upper Kalskag. In the same regulatory year the BOG closed moose hunting in the remainder of 19A. These regulations were in place during the 2011–2012 regulatory year. Because lower Kuskokwim River residents have historically travelled into GMU 19A to hunt moose, these regulatory changes affected many hunters residing in GMU 18. Currently, the Tier II permit requirements allow hunting only by a limited number of hunters who complete an application ranking their customary use of and direct dependence on moose within western GMU 19A. Furthermore, eastern GMU 19A, particularly the Holitna and Hoholitna river drainages, has historically been very popular among Bethel moose hunters. Its closure to moose hunting has further restricted access to an important subsistence resource for members of the community.[10]

The history of moose hunting regulations throughout GMU 18 has been dynamic, and often restrictive, largely due to variability in the abundance and distribution of the region's moose population. From 1960 through the 2003–2004 regulatory year, hunters were permitted to harvest 1 bull moose under general hunt provisions throughout most of GMU 18 including the lower Kuskokwim River area.[11] During this period, heavy hunting pressure from residents of lower Kuskokwim River communities limited moose population growth in the area (Perry 2010a). By 2003, ADF&G identified moose population growth in the lower Kuskokwim River area as a primary management goal (Perry 2010a). Therefore, beginning in the 2004–2005 regulatory year, the BOG established a moratorium on moose hunting in the lower Kuskokwim River drainage roughly extending from the boundary with GMU 19 south to the Eek River and west to a line from the Ishkowik River and north into the upper Johnson River drainage. This moratorium continued until the 2009–2010 regulatory year, when ADF&G administered a registration permit hunt for the same area with a quota of 75 bull moose, which was to be closed by emergency order once hunters reached the quota. In the 2011–2012 regulatory year, ADF&G increased this quota to 100 bull moose. These restrictions have resulted in a very competitive moose hunt, with approximately 1,450 registration permits issued to hunters in 2011. Of those, 1,171 hunters reported hunting for moose under the registration permit, resulting in a 10% success rate with 117 moose harvested by the emergency closure of the hunt (WinfoNet). Hunters have typically reached the harvest quota within 1 week to 10 days. While there are other opportunities for residents to harvest moose in GMU 18, including a winter hunt for any moose in the lower Yukon River region, accessing these areas from communities of the lower Kuskokwim River area often requires long-distance travel by snowmachine. In this study, Bethel residents reported hunting moose in locations that required long-distance travel from Bethel by boat,

10. See Brown et al. (2012:355-359) for a more detailed discussion of these regulatory changes.
11. In the lowest Yukon river region, the BOG established a moose hunting moratorium from the 1988–1989 regulatory year through the 1993–1994 regulatory year. The purpose of the moratorium was to allow for recovery of the moose population in the area.

snowmachine, or airplane indicating the relative importance of moose to subsistence hunters in Bethel despite the substantial cost incurred.

FURBEARERS AND SMALL LAND MAMMALS

During most of the previous approximately 150 years, furbearers have been an important component of the economy in the lower Kuskokwim River region (Schroeder et al. 1987). Harvests of furbearers in the Yukon–Kuskokwim Delta historically made up approximately one-third of total annual fur harvests for the entire state of Alaska and provided winter cash income for many lower Kuskokwim River residents (Seavoy 2004:229). Presently in the region, trapping occurs on a much smaller scale than in the past and probably did not represent a substantial source of cash income for many Bethel residents in 2011. This is also indicated by the small number of survey respondents who reported harvests in 2011 to ADF&G Division of Wildlife Conservation through the fur sealing harvest reporting program. In that year, 14 trappers claimed residency in Bethel and sealed furs with the department (WinfoNet).

Harvests of some furbearer species that historically were especially important in this region have virtually ceased. Hunters and trappers formerly harvested muskrats often during spring camping activities. In recent years, most muskrat hunting and trapping has been incidental to spring waterfowl hunting, and muskrat harvests have declined (Perry 2010b). Mink were also formerly harvested in large quantities throughout the Yukon–Kuskokwim Delta region, with an average annual harvest in the 1940s of 16,000 mink across the region (Seavoy 2004:237). In spite of their reduced monetary importance, furbearers are widely used in handicrafts and articles of clothing such as fur hats and parka ruffs, and some furbearer species—including beaver, lynx, muskrat, river otter, and mink—are valued as food resources in the area. Recent harvests of wolves in the lower Kuskokwim River region are very likely affected by caribou and moose populations. The location of wolves and their abundance in the area are typically correlated to the location of caribou and moose throughout the territory (Perry 2009b). In years when caribou are more accessible to hunters in the area, wolf harvests are often high. Although trapping has decreased in recent decades, many hunters harvest wolves opportunistically when they encounter them during caribou hunts. From 2005 through 2008, hunters and trappers in GMU 18 reported harvesting an average of 65 wolves per year. Survey data for Bethel alone in 2011 indicated a harvest of 111 wolves, much higher than total harvests for GMU 18 in recent years and a marked increase since the 1980s when hunters and trappers harvested from 7 to 17 wolves per year in GMU 18 (Perry 2009b).

COMPARISON TO OTHER HARVEST REPORTS

Results from comprehensive surveys in 8 lower Kuskokwim River communities in 2009, 2010, and 2011 indicated that from 86% to 98% of households used land mammals, with an annual amount used that ranged from 38.6 to 67.2 lb per capita (Brown et al. 2012; Brown et al. 2013; Ikuta et al *In prep*). In Bethel 2011, relatively fewer households (73%) reported using land mammal resources with an average harvest of 36 lb per capita. Distribution of harvests of land mammals among Bethel households may demonstrate a pattern unlike that found in smaller communities of rural Alaska where on average, 30% of households are responsible for 70% of harvests of all resources within communities (Wolfe et al. 2009). A much smaller portion (25%) of Bethel households was responsible for 100% of land mammal harvests in 2011; however, this study does not account for all fish and wildlife harvests in Bethel. Therefore, comparing these results to comprehensive harvest studies may be inconclusive. Still, it is apparent that, on average, a smaller portion of Bethel households harvest land mammal resources in comparison to other nearby communities in the lower Kuskokwim River region. Results of recent—2009–2011—comprehensive harvest surveys conducted in 8 communities in the lower Kuskokwim River region indicated that households reporting harvest of land mammals ranged from 44% to 66% (Brown et al. 2012; Brown et al. 2013; Ikuta et al *In prep*). Although Bethel has a corps of active subsistence land mammal harvesters, with approximately 10% of households harvesting

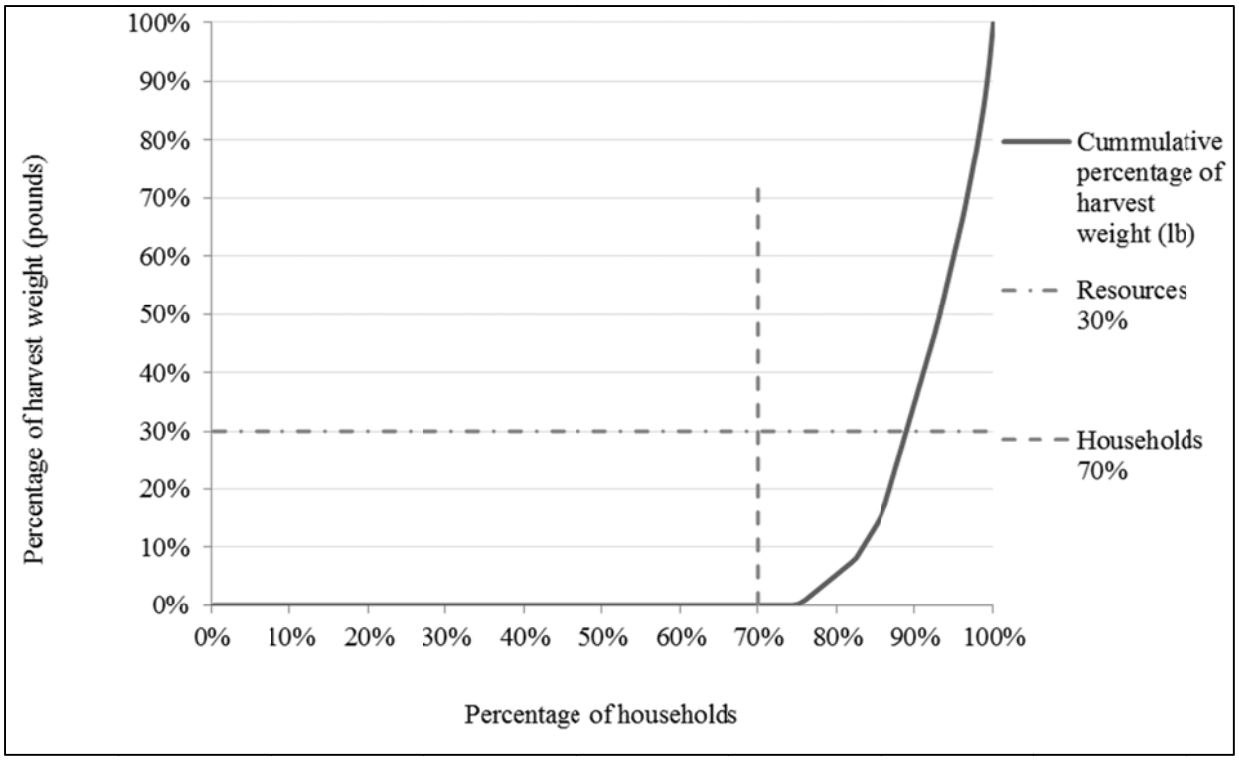

Figure 6.–Household specialization, Bethel, 2011.

30% of all land mammals (Figure 2), a large portion of the total population (62% of households) reported that they did not hunt land mammals at all in 2011. Additional research may describe factors that would explain, or at least elucidate,

the differences in harvest patterns that have been observed in Bethel in comparison with surrounding communities and how resource availability or socioeconomic and cultural factors affect these patterns.

In 2011, Bethel hunters reported harvesting 223 caribou when they returned their harvest tickets to the department (WinfoNet). Bethel residents reported caribou harvests in this study that indicated a total harvest (446 caribou) double that recorded from harvest ticket returns (Table 2). This was also true for moose harvests in 2011, where Bethel hunters returned harvest tickets for 158 moose harvested in 2011 (WinfoNet) but reported estimated harvests of 279 moose in the survey (Table 2). Hunters residing in rural Alaska communities typically return harvest tickets to the department at a rate significantly lower than that of hunters residing in urban centers and on the Alaska road system. This tends to result in underreporting of big game harvests in rural areas of the state. For example, Andersen and Alexander (1992:11) reported that results from household surveys in 8 communities (Fort Yukon, Galena, Hughes, Huslia, McGrath, Nulato, Tanana, and Tok) showed moose harvests that differed by factors ranging from 1.3 to 12.7 times greater than harvest ticket returns. In addition, where hunters in 2 study communities returned no harvest tickets, household surveys indicated harvests of 11 (Tetlin) and 13 (Tanacross) moose. Department wildlife managers consider factors such as this when estimating annual hunting mortality of big game species; however, harvest data from household surveys can greatly improve the accuracy of these estimates.

Comparing furbearer harvest data from other sources to results from this study is challenging. For example, trapper harvest reports in GMU 18 show a distinct decrease in beaver harvests from 1991 when there were over 1,400 harvests reported to 2011 when trappers reported no harvest (WinfoNet). Respondents in this study reported much higher beaver harvests in 2011; however, data from this survey

do not reveal how many beavers were trapped and how many were hunted. Bethel lynx harvests in 2011 were very likely similar to historic harvests for the area; however, this study showed that river otter, wolf, and wolverine harvests were much higher in 2011 than harvest amounts reported by trappers each year since the early 2000s (WinfoNet). It is possible that most furbearer harvests go unreported, either because not all trappers comply with fur sealing requirements or because hunters are not required to report harvests of non-big game species. Perry (Perry 2010b) reported that for most species, furbearer populations in the lower Kuskokwim River region have been abundant and underexploited in recent years.

CONCLUSIONS

Household surveys conducted in Bethel showed the widespread use of land mammals for subsistence by residents of the community in 2011. Bethel hunters and trappers harvested a total of 221,778 edible pounds of land mammal resources in 2011, with an average harvest of 36.1 lb per capita. Within the top three resources there was an estimated harvest of 150,481 lb of moose, 57,963 lb of caribou, and 3,583 lb of beaver. An estimated 73% of households reported using large land mammals for subsistence, with 61% of households using moose and 55% using caribou. Of all Bethel households, an estimated 13% harvested moose and 16% harvested caribou. Moose and caribou harvests represented the largest portion of land mammal harvests by weight, with estimated harvests of 24.5 lb per capita for moose and 9.4 lb per capita for caribou. Sharing of resources was also an important part of subsistence use of land mammal resources, an estimated 35% of households gave land mammal resources away to other households and 62% received land mammals from another source. Hunters harvested moose throughout much of GMU 18 as well as in significant portions of GMU 19 and GMU 21E. The majority of caribou harvests by Bethel households occurred in portions of GMU 18 in the lower Kuskokwim River region. Results from this study demonstrated the importance of moose hunting to many households within the community, not only by the amount of moose harvested but also by the great distances hunters were willing to travel to harvest this large game species. Caribou harvests, while smaller by weight than moose harvests, were also important in that these animals are relatively easy to access in cold months and they provided a source of fresh meat in a season when other food sources may become limited for some households. This research represents the first systematic study of subsistence land mammal harvests by Bethel households. Data from this study will improve overall harvest estimates of moose, caribou, and other land mammal species throughout GMU 18 and elsewhere in Western Alaska. It will also provide insight into the nature of the subsistence economy in a unique rural Alaska community with a large and diverse population that utilizes a variety of natural resources.

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APPENDIX A
SURVEY INSTRUMENT

LOWER KUSKOKWIM BIG GAME SURVEY

BETHEL, ALASKA

January 2011 through December 2011

COOPERATING ORGANIZATIONS

Alaska Department of Fish and Game	Orutsararmiut Native Council	Association of Village	City of Bethel
Division of Subsistence	P.O. Box 927	Council Presidents	P.O. Box 1388
1300 College Road	Bethel, AK 99559	P.O. Box 219	Bethel, AK 99559
Fairbanks, AK 99701		Bethel, AK 99559	
(907) 459-7320	(907) 543-2608	(907) 543-7300	(907) 543-2087

We are conducting this survey to learn about harvests of big game and furbearers in Bethel. Our goal is to get a better understanding of subsistence in Alaska. Similar surveys have been completed in more than 100 Alaska communities, including several villages on the Kuskokwim River. This survey will help the Department of Fish and Game estimate subsistence harvests of big game animals by Bethel households.

The survey asks about the animals your household harvested in 2011, where the animals were harvested, and how much time members of your household spent hunting. It aso asks about who lived in your household and their ages.

Data from this survey will be analyzed and described in a written report that the Department of Fish and Game will publish in 2013. Your household's information will remain confidential. We will NOT use this information for enforcement purposes. Participation in this survey is voluntary. If you start a survey, you may stop at any time. The survey should take less than ten minutes to complete.

HOUSEHOLD ID:		
COMMUNITY ID:	BETHEL	059
RESPONDENT ID:		
INTERVIEWER:		
INTERVIEW DATE:		
START TIME:		
STOP TIME:		
DATA CODED BY:		
DATA ENTERED BY:		
SUPERVISOR:		

HOUSEHOLD MEMBERS — HOUSEHOLD ID

First, I will ask about the people living in your household. Please give information only about permanent members of your household, including college or high school students who return home every summer, or anyone else who stayed with you for at least three months during 2011. We will begin with the head of the household.

Between January 2011 and December 2011
...who lived in your household?

ID#	How is this person related to HEAD 1? *relation*	Is this person MALE or FEMALE? *circle*	How old is this person? *age*	Is this person Alaska Native? *circle*	Is this person answering questions on this survey? *circle*	In 2011, did this person hunt for CARIBOU? *circle*	How many days did this person hunt for CARIBOU in 2011? *number days*	In 2011, did this person hunt for MOOSE? *circle*	How many days did this person hunt for MOOSE in 2011? *number days*
HEAD	SELF	M F		Y N	Y N	Y N		Y N	
1									
NEXT, enter spouse or partner. If household has a SINGLE HEAD, leave HEAD 2 blank.									
HEAD		M F		Y N	Y N	Y N		Y N	
2									
BELOW, enter children (oldest to youngest), grandchildren, grandparents, brothers, sisters, and other household members.									
PERSON 3		M F		Y N	Y N	Y N		Y N	
3									
PERSON 4		M F		Y N	Y N	Y N		Y N	
4									
PERSON 5		M F		Y N	Y N	Y N		Y N	
5									
PERSON 6		M F		Y N	Y N	Y N		Y N	
6									
PERSON 7		M F		Y N	Y N	Y N		Y N	
7									
PERSON 8		M F		Y N	Y N	Y N		Y N	
8									
PERSON 9		M F		Y N	Y N	Y N		Y N	
9									
PERSON 10		M F		Y N	Y N	Y N		Y N	
10									
PERSON 11		M F		Y N	Y N	Y N		Y N	
11									
PERSON 12		M F		Y N	Y N	Y N		Y N	
12									
PERSON 13		M F		Y N	Y N	Y N		Y N	
13									
PERSON 14		M F		Y N	Y N	Y N		Y N	
14									
PERSON 15		M F		Y N	Y N	Y N		Y N	
15									

PERMANENT HH MEMBERS: 01 — **BETHEL: 059**

HARVESTS: LARGE LAND MAMMALS

HOUSEHOLD ID

Now I am going to ask about large land mammals such as caribou, moose, and bear.
Do members of your household USUALLY hunt large land mammals for subsistence?..... Y N

Between January 2011 and December 2011
...Did members of your household USE or TRY TO CATCH large land mammals?..... Y N

IF NO, go to the next harvest page.
If YES, continue on this page...

In the following questions, tell me about large land mammals that ALL MEMBERS OF YOUR HOUSEHOLD USED for subsistence last year. INCLUDE large land mammals that you caught, gave away, ate fresh, fed to dogs, lost to spoilage, or got from someone outside your household.

Each line is for 1 area, 1 sex, 1 amount, and 1 month. Four bulls killed in the same area in September should be on the same line. A cow killed in the same area would be on a new line. If the respondent does not know the sex of an animal circle "?". Do not enter the same animal in two lines.

If "YES" to "HARVEST?", then ask:

	In 2011 did your household...					If you hunted with people from other households, report ONLY YOUR HOUSEHOLD'S share of the catch.			
	Use?	Receive?	Give Away?	Try to harvest?	Harvest?	WHERE were these animals killed?	Were these animals MALE or FEMALE?	HOW MANY animals were killed?	In which MONTH in 2011 were these animals killed?
	circle one					*enter UCU*	*circle one*	*number*	*enter one month*
CARIBOU	Y N	Y N	Y N	Y N	Y N		M F ?		
211000000							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
							M F ?		
REINDEER *(FERAL REINDEER)*	Y N	Y N	Y N	Y N	Y N		M F ?		
230800000							M F ?		
							M F ?		
							M F ?		

LAND MAMMALS: 10

HARVESTS: LARGE LAND MAMMALS *(continued)*

HOUSEHOLD ID

	In 2011 did your household…					*Each line is for 1 area, 1 sex, 1 amount, and 1 month. Four bulls killed in the same area in September should be on the same line. A cow killed in the same area would be on a new line. If the respondent does not know the sex of an animal circle "?". Do not enter the same animal in two lines* *If "YES" to "HARVEST?", then ask:*			
	Use?	Receive?	Give Away?	Try to Harvest?	Harvest?	WHERE were these animals killed	Were these animals MALE or FEMALE?	HOW MANY animals were killed?	In which MONTH in 2011 were these animals killed?
	circle one					*enter UCU*	*circle one*	*enter number*	*enter one month*
MOOSE	Y N	Y N	Y N	Y N	Y N		M F ?		
211800000									
							M F ?		
							M F ?		
							M F ?		
BROWN BEAR	Y N	Y N	Y N	Y N	Y N		M F ?		
210800000									
							M F ?		
							M F ?		
BLACK BEAR	Y N	Y N	Y N	Y N	Y N		M F ?		
210600000									
							M F ?		
							M F ?		
DALL SHEEP	Y N	Y N	Y N	Y N	Y N		M F ?		
212200000									
							M F ?		
							M F ?		
MUSKOXEN	Y N	Y N	Y N	Y N	Y N		M F ?		
212000000									
							M F ?		

LAND MAMMALS: 10

BETHEL: 059

HARVESTS: FURBEARERS

HOUSEHOLD ID

This page asks about furbearers such as wolf, beaver, wolverine, and fox.
Do members of your household USUALLY hunt or trap furbearers for subsistence? ..... Y N

Between January 2011 and December 2011
...Did members of your household USE or TRY TO CATCH furbearers? ..... Y N

IF NO, go to the next page.
If YES, continue on this page...

In the following questions, tell me about furbearers that ALL MEMBERS OF YOUR HOUSEHOLD USED for subsistence last year. INCLUDE furbearers that you caught, gave away, ate fresh, fed to dogs, lost to spoilage, or got from someone in another household.

	In 2011 did your household...					*If "YES" to "HARVEST?", then ask:* If you hunted or trapped with people from other households, report ONLY YOUR HOUSEHOLD'S share of the catch.			
	Use?	Receive?	Give Away?	Try to Harvest?	Harvest?	In 2011, how many did your HH use for FUR ONLY?	In 2011, how many did your HH use for FOOD?	In 2011, what was your HH's TOTAL HARVEST?	Comments
	circle one					*enter number*	*enter number*	*enter number*	
WOLF	Y N	Y N	Y N	Y N	Y N				
223200000									
BEAVER	Y N	Y N	Y N	Y N	Y N				
220200000									
WOLVERINE	Y N	Y N	Y N	Y N	Y N				
223400000									
RIVER OTTER	Y N	Y N	Y N	Y N	Y N				
221200000									
LYNX	Y N	Y N	Y N	Y N	Y N				
221600000									
RED FOX	Y N	Y N	Y N	Y N	Y N				
220804000									
ARCTIC FOX	Y N	Y N	Y N	Y N	Y N				
220802000									
MINK	Y N	Y N	Y N	Y N	Y N				
222200000									
MUSKRAT	Y N	Y N	Y N	Y N	Y N				
222400000									

FURBEARERS: 14 BETHEL: 059

COMMENTS **HOUSEHOLD ID**

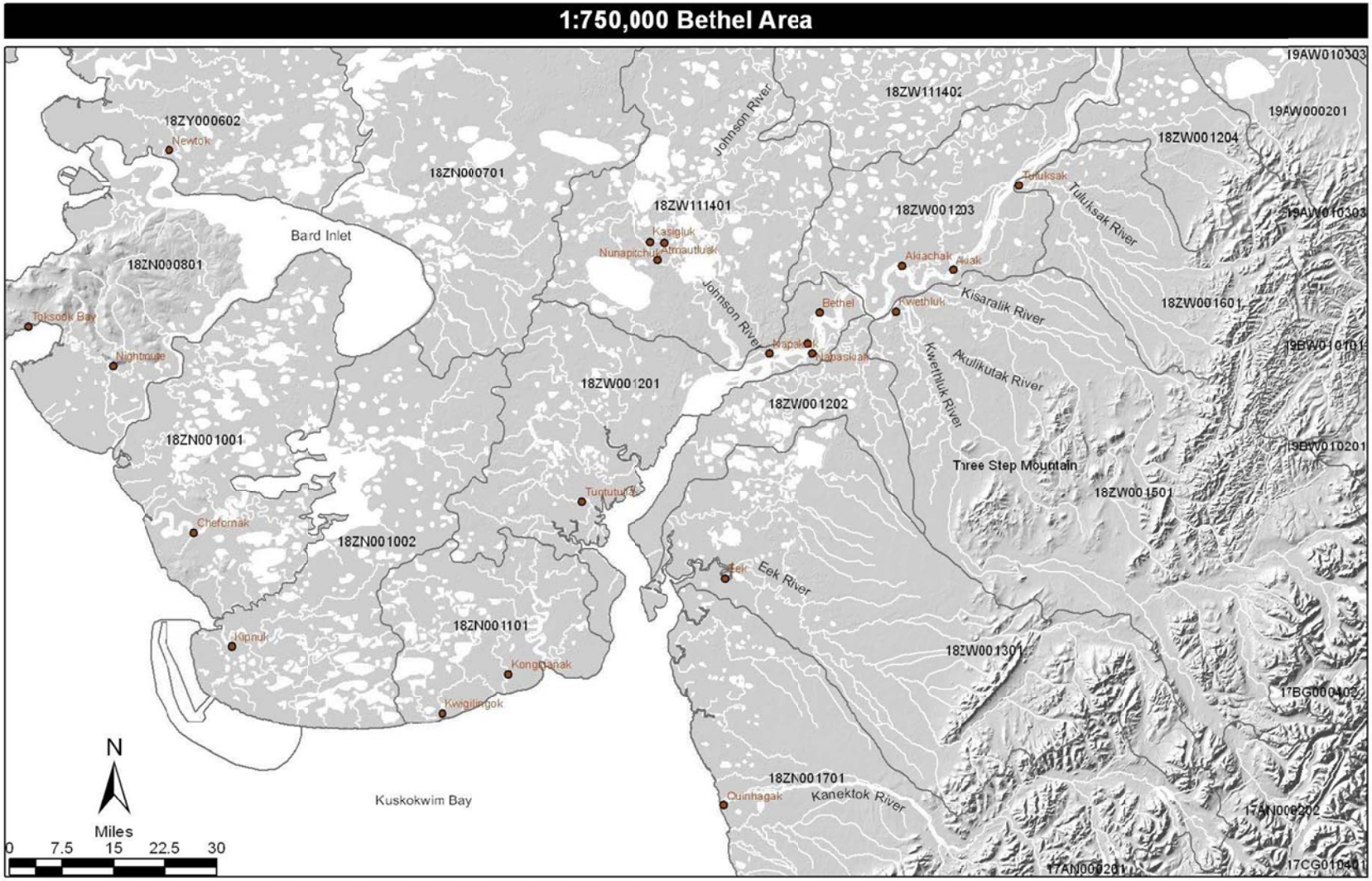
DO YOU HAVE ANY QUESTIONS, COMMENTS, OR CONCERNS?

INTERVIEW SUMMARY:

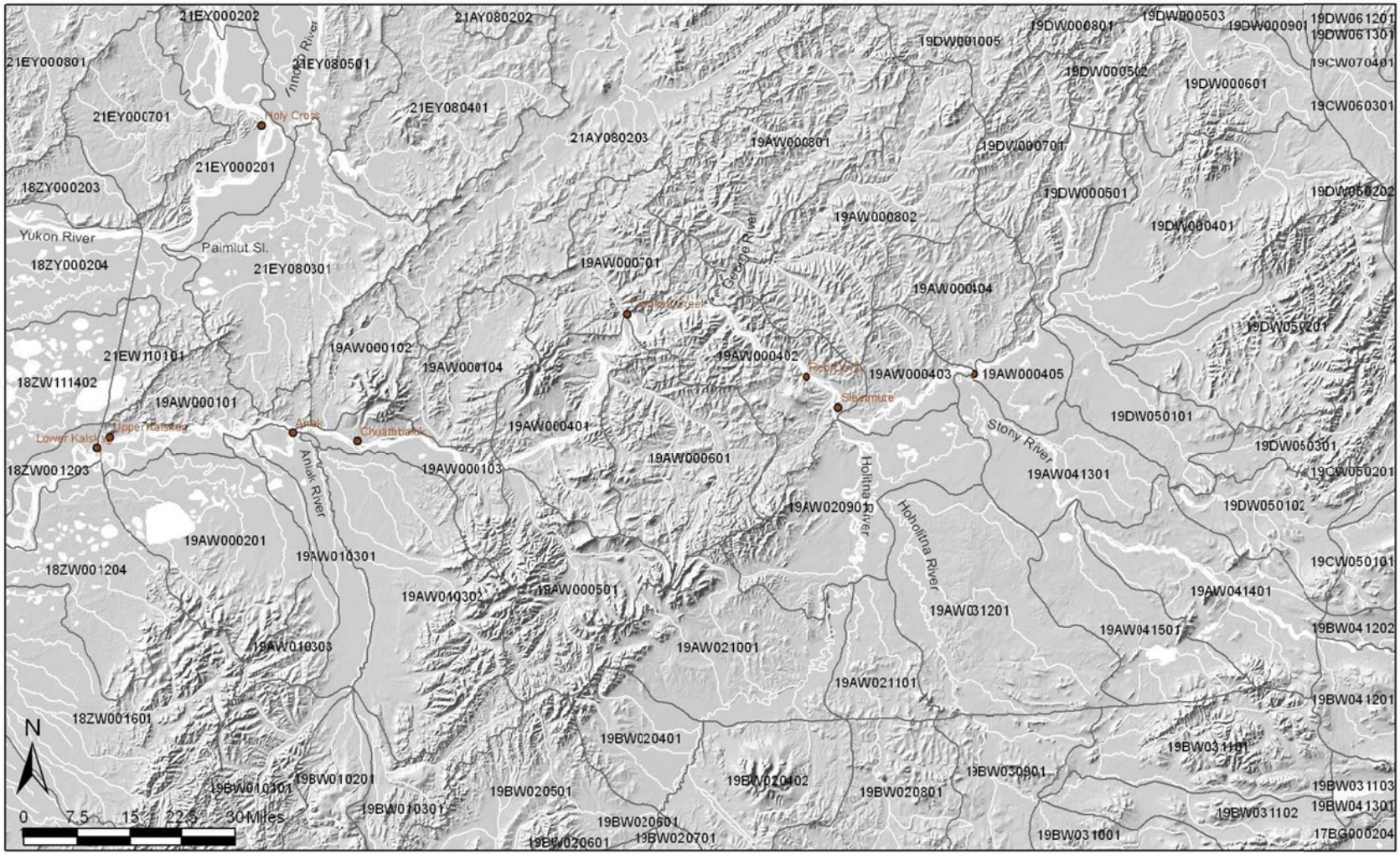
COMMENTS: 30 **BETHEL: 059**

BE SURE TO FILL IN THE STOP TIME ON THE FIRST PAGE.

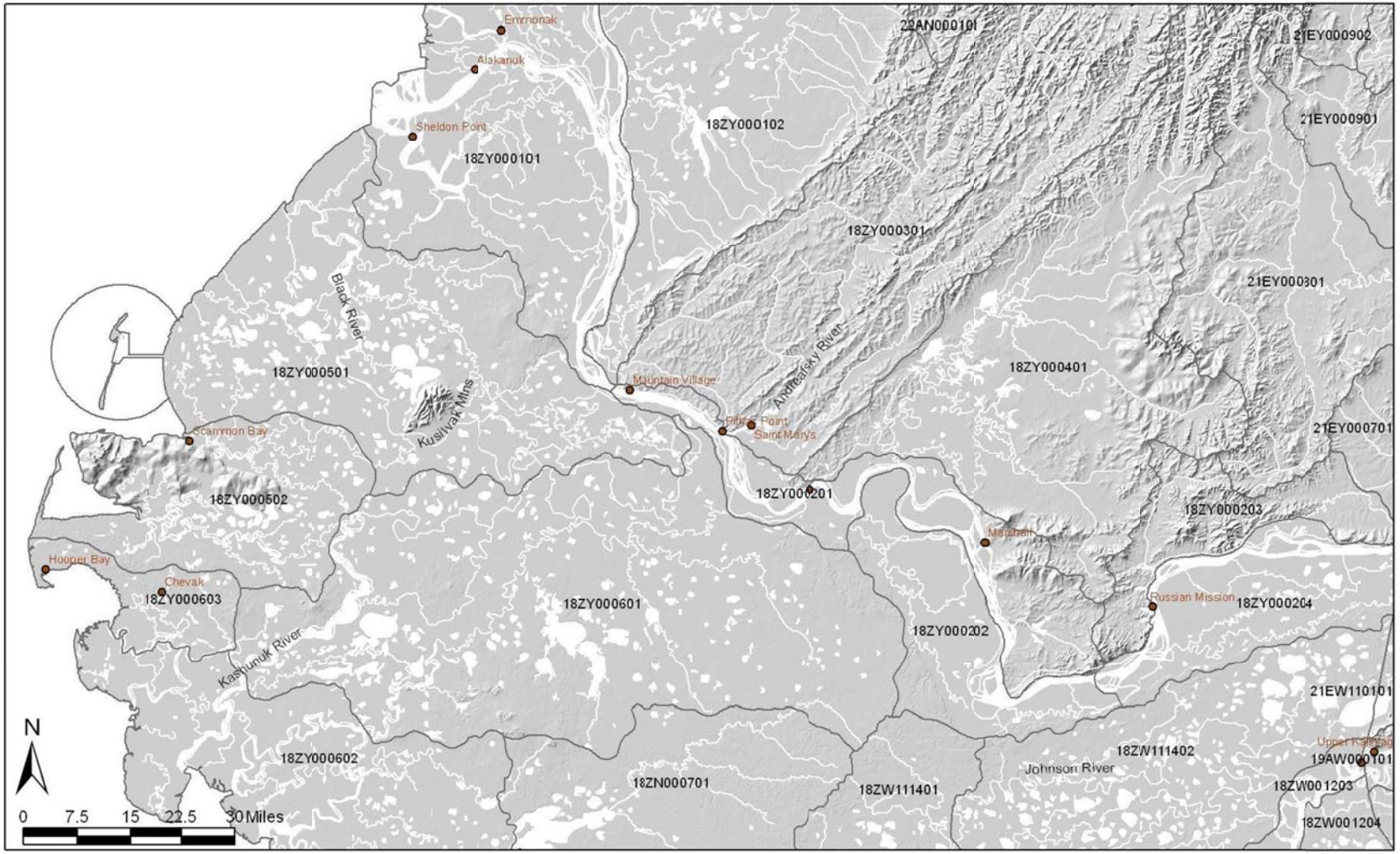
APPENDIX B
SURVEY MAPS


1:750,000 Bethel Area
18ZY000602
Newtok
18ZN000701
Bard Inlet
18ZN000801
Toksook Bay
Nightmute
18ZN001001
Chefornak
18ZN001002
Kipnuk
18ZN001101
Kongiganak
Kwigillingok
Kuskokwim Bay
18ZW111401
Kasigluk
Nunapitchuk
Atmautluak
Johnson River
18ZW001201
18ZW111402
18ZW001203
Tuluksak
Tuluksak River
Akiachak
Akiak
Bethel
Kwethluk
Kisaralik River
Johnson River
Napaskiak
Akulikutak River
Kwethluk River
18ZW001202
Three Step Mountain
18ZW001501
Tuntutuliak
Eek
Eek River
18ZW001301
18ZN001701
Quinhagak
Kanektok River
18ZW001204
19AW000201
19AW010303
19AW010303
18ZW001601
19BW010101
19BW010201
17BG000402
17AN000201
17CG010401
N
Miles
0 7.5 15 22.5 30

1:750,000 Central Kuskokwim Area



1:750,000 Lower Yukon River Area



APPENDIX C
ADDITIONAL HARVEST TIMING TABLES

Appendix C-1.–Estimated harvests of black bear by sex and month of harvest, Bethel, 2011.

Polygon			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
18Z	W001203	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
19A	W000201	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
19D	W000501	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
	W001002	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	**0.0**
Unknown	Unknown	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	**8.0**
	Unknown	Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Unknown	Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**

Source ADF&G Division of Subsistence household surveys, 2012.

Appendix C-2.–Estimated harvests of brown bear by sex and month of harvest, Bethel, 2011.

Polygon			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
18Z	N001801	Male	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W001204	Male	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	W001501	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	Y000301	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Unknown	Unknown	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**

Source ADF&G Division of Subsistence household surveys, 2012.

Appendix C-3.–Estimated harvests of muskoxen by sex and month of harvest, Bethel, 2011.

Polygon			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
18Z	N000801	Male	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**8.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**

Source ADF&G Division of Subsistence household surveys, 2012.

Appendix C-4.–Estimated harvests of Dall sheep by sex and month of harvest, Bethel, 2011.

Polygon			2011												
GMU	UCU	Sex	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Unknown	**Total**
20E	Y000903	Male	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	**4.0**
		Female	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**

Source ADF&G Division of Subsistence household surveys, 2012.