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Revised Options for Amounts Reasonably Necessary for Subsistence Uses of the Teshekpuk Caribou Herd

Prepared by

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for the January 2017 Bethel Board of Game meeting

January 2017

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the reports by the Division of Subsistence. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

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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REVISED OPTIONS FOR AMOUNTS REASONABLY NECESSARY FOR SUBSISTENCE USES OF THE TESHEKPUK CARIBOU HERD

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ABSTRACT

This report provides revised options for amounts reasonably necessary for subsistence (ANS) for consideration by the Alaska Board of Game for the Teshekpuk caribou herd (TCH).

Key words: Subsistence hunting, amount necessary for subsistence, customary and traditional uses, North Slope, Teshekpuk caribou herd, Board of Game.

INTRODUCTION

Proposal 1 for the January 2017 Alaska Board of Game (board) meeting in Bethel requests an evaluation of a separate amount reasonably necessary for subsistence (ANS) for the Teshekpuk caribou herds. This report updates information presented in Special Publication No. BOG 2013-03 (Braem 2013). That publication presented information relevant to a customary and traditional use finding for the TCH and information relevant to an ANS.

A positive customary and traditional use finding was made for the Western Arctic caribou herd (WAH) in 1987 and reconfirmed in November 1992. At that board meeting, the board established an ANS of 8,000–12,000 caribou for the WAH.

No customary and traditional use finding specific to the TCH was made until January 2014.[1] At the Kotzebue meeting, the board made a positive customary and traditional use finding for the Teshekpuk herd; after reviewing options for ANS (Braem 2013) the board determined that the ANS for both herds was that set for the WAH in 1992. At the time of its finding, the record of deliberations at the 1992 BOG meeting was very limited. Thus, material presented in 2014 by the department describing the 1992 deliberations stated, "While the administrative record of that meeting is limited at best, it may be that the board set the WAH ANS with TCH animals in mind, in effect, creating a combined ANS for both herds." (Braem 2013:43).

In August 2016, department staff reviewed the audio recordings of the 1992 board meeting at which the WAH ANS was set. Staff found that the board did not discuss the Teshekpuk herd relative to the WAH customary and traditional use finding or ANS. Customary and traditional use findings and ANS for the TCH were not discussed at all. Given that the board took up WAH ANS in 1992 in deliberating on the data provided, this report will confine itself to providing information specific to Teshekpuk caribou.

Caribou are present on the North Slope year-round. Four caribou herds intermingle at various times of the year (Figure 1): the WAH, Central Arctic caribou herd (CAH), the Porcupine caribou herd (PCH), and the TCH. The TCH was first recognized as a distinct herd in 1978. The herd has demonstrated high fidelity to calving areas surrounding Teshekpuk Lake, extensive use of coastal habitat for insect relief, and broad use of the coastal plain west of the Colville River drainage in late summer. Its use of winter ranges is highly variable; overlap of the TCH with WAH and CAH animals can be extensive during fall and summer (Parrett 2013).[2] Between 1984

1. The board was first presented a C&T worksheet for the Teshekpuk caribou herd in 1990 (Appendix A). The administrative record does not capture if a C&T determination was made at the 1990 meeting. The same C&T worksheet was revised for the 1993 meeting (Appendix B); a review of audio recordings shows the board did not take up the question of C&T or ANS for the Teshekpuk herd at that time.
2. "The TCH is unique among Arctic coastal plain calving caribou in that a substantial proportion of caribou remain on the coastal plain through the winter in most years. Even with that relative consistency, the only times of year when caribou are predictably distributed is during the insect season and late summer" (Parrett 2013, 256).

and 2008, biologists estimate the herd grew from 11,822 to more than 68,000 animals. The department estimated a herd size of 55,704 caribou in 2011; the most recent estimate, for 2016, is 41,542 caribou[3].

The annual take of caribou from each herd by residents of North Slope communities varies. Hunting pressure (and harvest) is tied to a variety of factors, including community size, its location in relation to the herds' ranges, and where caribou happen to migrate in a given year. Residents of the predominately Iñupiat communities of Utqiaġvik (Barrow), Atqasuk, and Nuiqsut are the primary users of the Teshekpuk caribou herd. Residents of 2 other North Slope villages, Wainwright in Game Management Unit (GMU) 26A, and Anaktuvuk Pass in GMU 24B, also harvest from this herd—each year, their caribou harvests are a variable mixture of WAH and TCH caribou.

Residents of other communities in GMU 26A, such as Point Lay and Point Hope, occasionally harvest caribou from the TCH. This is also the case in other villages in units 22, 23, southern GMU 24, and GMU 25A. In most cases, use is infrequent and rare because of the overwhelming presence of the WAH, CAH, and PCH on the periphery of the TCH range. Take of caribou by non-local hunters and nonresidents is minimal.

Paired with biologists' increased understanding of the seasonal distribution of the herd, it is possible in some years to estimate what portion of community harvest (from survey data), and non-local Alaskan and nonresident harvest (from the harvest ticket reporting system) is from the TCH, WAH, CAH, and the PCH.

3. Lincoln Parrett, Caribou Biologist to Peter Bente, RV Management Coordinator, "Memorandum: Summary of Teshekpuk Caribou Herd Photocensus Conducted July 6, 2015," December 31, 2015.

Table 1.–Estimated total and per capita caribou harvests, select GMU 26A and 24B communities.

Community	Year/ period	Estimated caribou harvest	Number caribou per capita	Pounds per capita	Source/notes
Anaktuvuk	1990–1991	592	2.2	223.2	ADF&G CSIS
Pass	1991–1992	545	2.0	245.3	ADF&G CSIS
	1992	600	2.2	260.0	Fuller and George 1999rev.
	1993–1994	574	1.8	219.4	ADF&G CSIS
	1994–1995	322	1.1	135.7	Brower and Opie 1996
	1996–1997	210	0.7	80.4	Bacon et al. 2011rev.
	1998–1999	500	1.6	189.3	Bacon et al. 2011rev.
	1999–2000	329	1.0	122.7	Bacon et al. 2011rev.
	2000–2001	732	2.6	303.8	Bacon et al. 2011rev.
	2001–2002	271	0.9	106.2	Bacon et al. 2011rev.
	2002–2003	436	1.4	169.0	Bacon et al. 2011rev.
	2006–2007	696	2.3	298.8	ADF&G CSIS
	2011	616	2.0	250.8	Holen, Hazell, and Koster 2012
	2014	770	2.4	329.6	Brown et al. 2016
Atqasuk	1994–1995	262	1.2	136.8	Brower and Opie 1996
	1996–1997	398	1.8	207.2	Bacon et al. 2011rev.
	1997–1998	266	1.1	130.8	Bacon et al. 2011rev.
	2002–2003	221	1.0	113.0	Braem et al. 2011
	2003–2004	352	1.4	167.4	Braem et al. 2011
	2004–2005	207	0.8	95.0	Braem et al. 2011
	2005–2006	174	0.7	87.4	Braem et al. 2011
	2006–2007	157	0.7	82.7	Braem et al. 2011
Utqiaġvik	1987–1988	1595	0.6	61.9	Braund, Brewster, et al. 1993
	1988–1989	1533	0.6	59.5	Braund, Brewster, et al. 1993
	1989–1990	1656	0.6	64.2	Braund, Brewster, et al. 1993
	1992	1993	0.5	60.0	Fuller and George 1999rev.
	1995–1996	2155	0.5	60.4	Bacon et al. 2011rev.
	1996–1997	1158	0.3	31.8	Bacon et al. 2011rev.
	2000	3359	0.7	88.6	Bacon et al. 2011rev.
	2001	1820	0.4	46.5	Bacon et al. 2011rev.
	2002–2003[a]	5641	1.1	123.1	Braem et al. 2011; *overestimate*
	2003	2092	0.5	55.2	Bacon et al. 2011rev.
	2003–2004[a]	3548	0.7	87.7	Braem et al. 2011; *overestimate*
	2004–2005[a]	4338	0.8	94.4	Braem et al. 2011; *overestimate*
	2005–2006[a]	4535	0.9	103.3	Braem et al. 2011; *overestimate*
	2006–2007[a]	5380	1.0	111.3	Braem et al. 2011; *overestimate*
	2014	4323	0.8	110.6	Brown et al. 2016

–continued–

Table 1.–Page 2 of 3.

Community	Year/ period	Estimated caribou harvest	Number caribou per capita	Pounds per capita	Source/notes
Nuiqsut	1985–1986	513		149.7	ADF&G unpublished data
	1992	278	0.7	78.0	Fuller and George 1999rev.
	1993	672	1.9	361.0	Pedersen 1995
	1994–1995	258	0.6	73.1	Brower and Opie 1998
	1995–1996	362	0.9	103.1	Bacon et al. 2011rev.
	1999–2000	413	0.8	111.6	Pedersen 2000, unpublished.[b]
	2000–2001	496	1.1	133.9	Bacon et al. 2011rev.
	2002–2003	397	1.0	118.4	Braem et al. 2011
	2003–2004	564	1.3	156.8	Braem et al. 2011
	2004–2005	546	1.3	147.2	Braem et al. 2011
	2005–2006	363	0.9	102.1	Braem et al. 2011
	2006–2007	475	1.2	142.5	Braem et al. 2011
	2010	562	1.4		Braund and Associates 2015
	2011	437	1.0		Braund and Associates 2015
	2012	501	1.3		Braund and Associates 2015
	2014	773	1.9	253.4	Brown et al. 2016
Wainwright	1988–1989	505	1.0	117.0	Braund, Loring, et al. 1993
	1989–1990	711	1.4	177.8	Braund, Loring, et al. 1993
	1992	748	1.4	150.0	Fuller and George 1999rev.
	2002–2003	866	1.6	189.0	Bacon et al. 2011rev.
	2009	1231	2.1	283.7	Kofinas, Burnsilver, and Magdanz In prep.[c]
Alatna/Allakaket	1973	300		224.1	Nelson, Mautner, and Bane 1978
	1982	6		4.7	Marcotte and Haynes 1985
	1983	0		0.0	Marcotte and Haynes 1985
	1984	4		2.6	Marcotte and Haynes 1985
Alatna	1997–1998	21		109.2	Andersen, Utermohle, and Brown 1998
	1998–1999	11		53.0	Andersen, Utermohle, and Brown 2000
	1999–2000	0		0.0	Andersen, Utermohle, and Jennings 2001
	2001–2002	0		0.0	Andersen et al. 2004
	2002–2003	34		122.8	(Brown, Walker, and Vanek 2004)
	2011	28		117.6	Holen, Hazell, and Koster 2012
Allakaket	1997–1998	11		7.8	Andersen, Utermohle, and Brown 1998
	1998–1999	43		29.5	Andersen, Utermohle, and Brown 2000

–continued–

Table 1.–Page 3 of 3.

Community	Year/ period	Estimated caribou harvest	Number caribou per capita	Pounds per capita	Source/notes
	1999–2000	13		10.2	Andersen, Utermohle, and Jennings 2001
	2001–2002	9		6.8	Andersen et al. 2004
	2002–2003	106		52.6	Brown, Walker, and Vanek 2004
	2011	95		84.3	Holen, Hazell, and Koster 2012
Bettles/Evansville	1973	50		114.0	Nelson, Mautner, and Bane 1978
	1982	14		27.5	Marcotte and Haynes 1985
	1983	5		8.1	Marcotte and Haynes 1985
	1984	3		5.3	Marcotte and Haynes 1985
	2002–2003	0		0.0	(Brown, Walker, and Vanek 2004)
Bettles	1997–1998	0		0.0	Andersen, Utermohle, and Brown 1998
	1998–1999	25		107.1	Andersen, Utermohle, and Brown 2000
	1999–2000	21		52.0	Andersen, Utermohle, and Jennings 2001
	2011	6		65.0	Holen, Hazell, and Koster 2012
Evansville	1997–1998	3		7.7	Andersen, Utermohle, and Brown 1998
	1998–1999	4		16.3	Andersen, Utermohle, and Brown 2000
	1999–2000	2		10.0	Andersen, Utermohle, and Jennings 2001
Wiseman	2011	4		40.0	Holen, Hazell, and Koster 2012

a. Utqiaġvik estimates published in Braem et al. (2011) are overestimates due to sampling issues that resulted in a bias toward Inupiat households. That and the small sample size resulted in gross overestimate of annual harvests. However, the patterns of use (timing, locations, etc.) are representative.

b. Sverre Pedersen. 2000. *Documentation of Large Mammal Harvest Levels in Nuiqsut, June 1999 through May 2000–Draft Summary*. Alaska Department of Fish and Game Division of Subsistence, Fairbanks.

c. Gary Kofinas, B. Burnsilver, and James S. Magdanz. *In prep.* "The Study of Sharing Networks to Assess the Vulnerabilities of Local Communities to Oil and Gas Development Impacts in Arctic Alaska." U.S. Department of the Interior, Bureau of Ocean Energy Management, Minerals Management Services.

OPTIONS FOR AMOUNTS REASONABLY NECESSARY FOR SUBSISTENCE, TESHEKPUK CARIBOU HERD

This section of the report provides options for amounts reasonably necessary for subsistence (ANS) for consideration by the board as it discusses Proposal 1 during its January 2017 meeting.

HARVEST ATTRIBUTED BY HERD

As mentioned earlier, 4 caribou herds are seasonally present on the North Slope: the Western Arctic (WAH), Central Arctic (WAH), Porcupine (PCH), and Teshekpuk. The communities of Utqiaġvik, Atqasuk, and Nuiqsut are the primary harvesters of TCH animals, although Wainwright and Anaktuvuk Pass also take caribou from the herd.

Use of TCH caribou by other communities is infrequent and rare due to the overwhelming presence of the WAH, CAH, and PCH on the periphery of the TCH range. While collaring data show that TCH caribou are occasionally present in GMU 23—for example, near Noatak and the upper Kobuk drainage—there are so few relative to WAH animals that any harvest is likely neglible and impossible to identify. Harvests of TCH caribou by non-local Alaskans and nonresident hunters in GMU 26A (as documented in the harvest ticket database) are minimal.

In the early 1990s, little quantitative information existed on subsistence caribou harvests by residents of GMUs 26A and 24B. Since then, subsistence harvest surveys conducted by ADF&G Division of Subsistence, the North Slope Borough Wildlife Management Department, and various contractors have documented substantial caribou harvests by North Slope residents (Table 1.) Harvests by non-local Alaska residents and nonresident hunters in GMU 26A have been tracked through the harvest ticket reporting system. Paired with biologists' increased understanding of the seasonal distribution of the herd, it is possible to estimate, in some data years, what portion of community harvest (from survey data), and non-local Alaskan and nonresident harvest (from the harvest ticket reporting system) is from the TCH, WAH, CAH, and the PCH.

As noted earlier, harvest data and options will describe harvests of TCH animals specifically, where such information is available.

Only recently have researchers been able to use satellite collar-data (coupled with geographic information system [GIS] software) to attribute harvests to specific herds; as a result, while community harvest estimates exist going back to the 1980s, this approach can only be applied to the most recent datasets. Therefore, the data presented in this section are confined to the time period 2002 to 2014 (last 13 years). In addition, it is an important caveat that these apportionments only apply for identified years because harvests from any specific herd can vary year to year subject to harvest timing and caribou migratory patterns (Table 2). They should not be considered applicable to earlier or later harvest estimates.

The variability in the percentage of annual harvest from a given herd is seen in Table 2, where in the 2 recent years, nearly all Atqasuk and Utqiaġvik harvests (98% and 97%) likely came from the TCH.

For caribou harvests documented in the state harvest ticket database, analysis by ADF&G Division of Wildlife Conservation estimates that over the time period 2002–2014, 90% of harvest was from the WAH and 10% was from the TCH.

Table 2.–Apportionment of harvest by herd, based on community harvest estimates, 2002–2014.

	% of harvest from herd, 2002–2007				2009		2011–2012	2014			
Community	WAH	TCH	CAH	Unknown	WAH	TCH	TCH	WAH	TCH	CAH	PCH
Atqasuk	2%	84%		14%			98%	16%	86%	0%	0%
Utqiaġvik	1%	66%		33%			97%	6%	93%	1%	0%
Nuiqsut	1%	77%	11%	11%			77%	0%	45%	41%	13%
Wainwright[a]	[a]	[a]	[a]	[a]	80%	20%	60%				
Anaktuvuk P.[b]	80%	20%					30%	57%	38%	2%	3%

[a]It is not possible to apportion Wainwright harvest between 2002–2007

[b]Between 2002 and 2007,Anaktuvuk Pass harvest can only be apportioned for the 2006–2007 study year

INTRODUCTION TO DATA SETS AND ANS OPTIONS

The following section will provide the board with information relevant to consideration of revisions to the ANS:

1. Harvest datasets to use in setting the numerical range of the ANS, and
2. Options to structure the ANS.

This report will first present relevant data. A set of options in structuring the ANS will follow.

The limited dataset for community harvests limits the numerical approaches available for proposing a range for an ANS. It is not possible, for example, to calculate a standard deviation of mean harvests or provide a range of values based on low or high harvest years; therefore, all options will use a mean value bounded by (±) 25%.

Data: Mean of Known Harvests, 2002–2014

Multiple annual harvest estimates are available for 2 communities considered the primary users of Teshekpuk caribou (Atqasuk and Nuiqsut) (Table 3) for 2002–2014. For Utqiaġvik, such information is only available for 2003 and 2014[4]. There are 2 harvest estimates for Wainwright and 4 for Anaktuvuk Pass. Harvest ticket data are available for the entire time period. Table 3 shows available GMU 26A and 24B caribou harvest information based on both sources of data.

4. Additionally, the 2014 estimate of Utqiaġvik harvest appears to be high relative to other study year based on per capita values. The 2014 per capita, 0.8 caribou, is the highest ever. In previous studies, that value has ranged from 0.3 to 0.7 caribou per capita. Including the 2014 estimate increases the long term per capita slightly, but over all study periods that value is 0.5 caribou per person.

Table 3.–Available community survey data, GMUs 26A and 24B, and harvest ticket information, GMU 26A, all caribou.

Community	2002–2003	2003	2003–2004	2004–2005	2005–2006	2006–2007	2008	2009	2010	2011	2012	2013	2014[a]	Mean
Atqasuk	221		352	207	174	157								222.0
Utqiaġvik		2,092											2,851	2,471.2
Nuiqsut	397		564	546	363	475			562	437	501		773	513.2
Wainwright	866							1,231						1,048.2
Anaktuvuk P.	436					696				616			770	629.4
Total														**4,884.0**

Source Bacon et al. 2009, Braem et al. 2011, Pedersen and Nageak 2008

Note Blank cells indicate data not available.

a. Utqiagvik 2014 value is lower bounds of range of the 95% confidence interval of estimate harvest

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Mean
Other Alaskan	33	52	65	46	46	65	50	58	39	37	44	35	36	46.6
Nonresident	42	48	48	39	44	42	40	19	29	50	38	61	80	44.6
Total														**91.2**

Source WINFONET

Based on harvest survey and harvest ticket database information, where available, annual harvests from the TCH herd are shown in Table 4. However, use of these summed means of known values, given lack of reliable harvest estimates for Utqiagvik, may not reflect actual harvest because of Utqiagvik's size and the possibility that, in certain years, nearly all of its harvest and that of Atqasuk may come from the TCH (Table 2).

Table 4.–Harvest of TCH caribou, community survey and harvest ticket database information, 2002–2012.

Community	2002–2003	2003	2003–2004	2004–2005	2005–2006	2006–2007	2008	2009	2010	2011	2012	2013	2014*	Mean
Atqasuk	186		295	173	146	132								186.5
Utqiaġvik		1,380											2,651	2,015.8
Nuiqsut	306		434	420	280	365							348	359.0
Wainwright[a]								246						246.1
Anaktuvuk Pass[b]						139				185			292	205.5
Total														**3,012.9**

Note Blank cells indicate data not available.

* Utqiagvik 2014 value is lower bounds of range of the 95% confidence interval of harvest estimate

[a]It is not possible to apportion Wainwright harvest between 2002–2007

[b]Anaktuvuk Pass harvest can only be apportioned for the 2006–2007 and 2011 study year

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012			Mean
Other Alaskan	3.3	5.2	6.5	4.6	4.6	6.5	5	5.8	3.9	3.7	4.4	3.5	3.6	4.7
Nonresident	4.2	4.8	4.8	3.9	4.4	4.2	4	1.9	2.9	5	3.8	6.1	8	4.5
Total														**9.1**

Source WINFONET

ANS STRUCTURAL OPTIONS

With an awareness of the seasonal intermixing of the WAH and TCH, 2 options are presented in structuring the TCH ANS. A third option, to set no ANS at this time, is also offered.

Option 1: One Combined ANS for both the WAH and TCH Herds

These options would find a new TCH ANS and add it to the existing WAH ANS, resulting in 1 single value.

Option 1: One ANS for WAH and TCH combined = 10,200-15,800 caribou

Mean harvests of Teshekpuk caribou		Mean ± 25%			ANS Range option	
	Bounded by	Low	High	*Equals*	Low	High
3,018		2,264	3,773		2,200	3,800

Thus, 8,000–12,000 WAH caribou + 2,200–3,800 TCH caribou = 10,200–15,800 caribou

It should be noted that in 1992, when the Board of Game established the WAH ANS of 8,000–12,000 caribou, limited data existed for communities considered the primary users of the TCH. Two data points for Utqiaġvik (1987 and 1988) and 1 data point for Nuiqsut (1985) were presented; no data for Atqasuk existed at the time. Caribou harvest data were also available for Wainwright (1988) and Anaktuvuk Pass (1991).

Several potential management issues arise in the case of a combined ANS. For example, hunting regulations could be too liberal with respect to 1 herd, even though the combined harvestable

surplus is high enough to provide for a combined ANS. Specifically, if the harvestable surplus for the TCH was very low, but the WAH harvestable surplus was high, there would need to be area-specific regulations that allowed harvest to be controlled within the core of the TCH range.

A second management scenario might occur if the harvestable surplus from both herds, or just the WAH in particular, was relatively low with respect to the ANS. In that case, specific regulations would be needed to ensure that early season harvest (July–August) in GMU 26A did not consume such a large portion of the harvestable surplus that little or no harvestable surplus remained to provide reasonable opportunity for users who hunt later in the fall or winter. Although these scenarios do not necessarily demand herd- or area-specific ANS values, they do require some guidance regarding seasonal allocation of harvest, perhaps through a harvest management plan.

Option 2: Separate ANS for TCH

This option would create a separate ANS for the TCH.

Option 2: Separate ANS for TCH = 2,200 - 3,800 caribou

Mean harvests of Teshekpuk caribou		Mean ± 25%			ANS Range option	
	Bounded by	Low	High	*Equals*	Low	High
3,018		2,264	3,773		2,200	3,800

Thus, 2,200–3,800 TCH caribou

Option 2 deals with the TCH herd exclusively. While it simplifies the approach to an ANS, it does not take into account the extensive overlap of the WAH and TCH ranges and the intermixing of 2 herds. Should either herd's population size decline so that its harvestable surplus falls below the lower bounds of its ANS, the department may need a harvest management plan to provide reasonable opportunities for subsistence uses that are spread across a broad geographic area. The ranges of both the WAH and TCH encompass multiple GMUs with subsistence users that have access to caribou in different times of the year.

Option 3: No change to ANS

The board may wish to forego making revisions to ANS for the TCH at this time. When the WAH ANS was set in 1992, very limited community harvest information existed; data from communities that are today considered the primary users of the TCH (Utqiaġvik Wainwright, Nuiqsut, and Anaktuvuk Pass) were included in the information reviewed by the Board of Game in 1992 when the WAH ANS of 8,000–12,000 caribou was established.

Another consideration in not revising ANS at this time would be the potential availability of better data in the future, although this is not guaranteed.

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APPENDIX A: CALCULATED PER CAPITA CARIBOU HARVESTS, GMU 26A COMMUNITIES, 1988–2011

Appendix A.– Per capita caribou calculations based on previous survey and estimated values used in Dataset B, GMU 26A communities, 1988–2011.

Community	Year/period	Estimated caribou harvest	Estimated population	Pcap caribou	Source of population estimate
Atqasuk	1994–1995	262	224	1.17	Alaska DOL estimate 1994
	1996–1997	398	225	1.77	Alaska DOL estimate 1996
	1997–1998	266	238	1.12	Alaska DOL estimate 1997
	2002–2003	221	229	0.97	Survey results pop estimate
	2003–2004	352	246	1.43	Survey results pop estimate
	2004–2005	207	254	0.81	Survey results pop estimate
	2005–2006	174	233	0.75	Survey results pop estimate
	2006–2007	157	222	0.71	Survey results pop estimate
			pcap all study years	1.09	
	2011	266	244	1.09	Alaska DOL estimate 2011
	2012	256	235	1.09	Alaska DOL estimate 2012
Utqiaġvik	1987–1988	1595	2763	0.58	Census data for 1990
	1988–1989	1533	2763	0.55	Census data for 1990
	1989–1990	1656	2763	0.60	Census data for 1990
	1992	1993	3799	0.52	Alaska DOL estimate 1992
	1995–1996	2155	4178	0.52	Alaska DOL estimate 1995
	1996–1997	1158	4253	0.27	Alaska DOL estimate 1996
	2000	3359	4581	0.73	Alaska DOL estimate 2000
	2001	1820	4450	0.41	Alaska DOL estimate 2001
	2003	2092	4428	0.47	Alaska DOL estimate 2003
			pcap all study years	0.51	
	2011	2202	4309	0.51	Alaska DOL estimate 2011
	2012	2359	4617	0.51	Alaska DOL estimate 2012
Nuiqsut	1985–1986	513			ADF&G unpublished data
	1992	278	424	0.66	Alaska DOL estimate 1992
	1993	672	361	1.86	Survey results pop estimate
	1994–1995	258	413	0.62	Alaska DOL estimate 1994
	1995–1996	362	411	0.88	Alaska DOL estimate 1995
	1999–2000	413	486	0.85	Alaska DOL estimate 1999
	2000–2001	496	433	1.14	Alaska DOL estimate 2000
	2002–2003	397	392	1.01	Survey results pop estimate
	2003–2004	564	421	1.34	Survey results pop estimate
	2004–2005	546	434	1.26	Survey results pop estimate
	2005–2006	363	416	0.87	Alaska DOL estimate 2005
	2006–2007	475	389	1.22	Survey results pop estimate
			pcap from 1990s on	1.05	
	2011	457	434	1.05	Alaska DOL estimate 2011
	2012	451	428	1.05	Alaska DOL estimate 2012

–continued–

Community	Year/period	Estimated caribou harvest	Estimated population	Pcap caribou	Source of population estimate
Anaktuvuk	1990–1991	592	272	2.18	ADF&G CSIS
Pass	1991–1992	536	272	1.97	ADF&G CSIS
	1992	600	271	2.21	Alaska DOL estimate 1992
	1993–1994	574	318	1.81	Alaska DOL estimate 1993
	1994–1995	322	286	1.13	Alaska DOL estimate 1994
	1996–1997	210	306	0.69	Alaska DOL estimate 1996
	1998–1999	500	309	1.62	Alaska DOL estimate 1998
	1999–2000	329	314	1.05	Alaska DOL estimate 1999
	2000–2001	732	282	2.60	US Census 2000
	2001–2002	271	299	0.91	Alaska DOL estimate 2001
	2002–2003	436	302	1.44	Alaska DOL estimate 2002
	2006–2007	696	299	2.33	Alaska DOL estimate 2006
	2011	616	310	1.99	Survey results pop estimate
			pcap all study years	1.67	
	2012	543	325	1.67	Alaska DOL estimate 2012
Wainwright	1988–1989	505	492	1.03	US Census 1990
	1989–1990	711	492	1.45	US Census 1990
	1992	748	532	1.41	Alaska DOL estimate 1992
	2002–2003	866	532	1.63	Alaska DOL estimate 2002
	2009	1231	590	2.09	Survey results pop estimate
			pcap all study years	1.54	
	2011	880	572	1.54	Alaska DOL estimate 2011
	2012	870	565	1.54	Alaska DOL estimate 2012