

**STAFF ANALYSIS
TEMPORARY SPECIAL ACTION
WSA21-01**

ISSUES

Temporary Wildlife Special Action WSA21-01, submitted by the Northwest Arctic Subsistence Regional Advisory Council (Council), requests closing Federal public lands in Units 23 and 26A to caribou and moose hunting by non-Federally qualified users from August 1 to September 30, 2021.

DISCUSSION

The proponent expresses concern about the late migration of caribou into and through Unit 23. The caribou migration has been delayed in recent years, and the proponent anticipates another delay in fall of 2021. In 2020, Unit 23 communities (with the exception of Noatak) were unable to conduct their fall caribou harvest, because caribou had not yet migrated into the area. The proponent states that winter harvests are uncertain, and the lack of fall harvest has resulted in empty freezers and stressed communities. Of particular concern to the proponent is the effect that transporters and non-local hunters may be having on caribou migration through both Unit 23 and Unit 26A contributing to its delay. The proponent hopes that a closure will reduce activity and traffic, creating an easier path for migrating caribou. The proponent is requesting a closure to moose hunting by non-Federally qualified users in Units 23 and 26A because of declining moose populations.

The applicable Federal regulations are found in 36 CFR 242.19(b) and 50 CFR 100.19(b) (Temporary Special Actions) and state that:

. . . After adequate notice and public hearing, the Board may temporarily close or open public lands for the taking of fish and wildlife for subsistence uses, or modify the requirements for subsistence take, or close public lands for the taking of fish and wildlife for nonsubsistence uses, or restrict take for nonsubsistence uses.

Existing Federal Regulation

Unit 23–Caribou

Unit 23—that portion which includes all drainages north and west of, and including, the Singoalik River drainage—5 caribou per day by State registration permit as follows:

Bulls may be harvested

July 1–June 30

Cows may be harvested. However, cows accompanied by calves may not be taken July 15–Oct. 14.

July 15–Apr. 30

Unit 23, remainder—5 caribou per day by State registration permit as follows:

Bulls may be harvested

July 1–June 30

Cows may be harvested. However, cows accompanied by calves may not be taken July 31–Oct. 14.

July 31–Mar. 31

Federal public lands within a 10-mile-wide corridor (5 miles either side) along the Noatak River from the western boundary of Noatak National Preserve upstream to the confluence with the Cutler River; within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively; and within the Squirrel River drainage are closed to caribou hunting except by federally qualified subsistence users hunting under these regulations

Unit 23–Moose

Unit 23—that portion north and west of and including the Singoalik River drainage, and all lands draining into the Kukpuk and Ipewik Rivers—1 antlered bull. No person may take a calf.

July 1–Dec. 31.

Unit 23, remainder—1 antlered bull. No person may take a calf.

Aug. 1–Dec. 31.

Unit 26A–Caribou

Unit 26A—that portion of the Colville River drainage upstream from the Anaktuvuk River, and drainages of the Chukchi Sea south and west of, and including the Utukok River drainage—5 caribou per day by State registration permit as follows:

Calves may not be taken

Bulls may be harvested

*July 1–Oct. 14.
Dec. 6–June 30.*

Cows may be harvested; however, cows accompanied by calves may not be taken July 16-Oct. 15 July 16-Mar. 15.

Unit 26A remainder—5 caribou per day by State registration permit as follows:

Calves may not be taken

Bulls may be harvested July 1-Oct. 15.
Dec. 6-June 30.

Up to 3 cows per day may be harvested; however, cows accompanied by calves may not be taken July 16-Oct. 15 July 16-Mar. 15.

Unit 26A—Moose

Unit 26A—that portion of the Colville River drainage upstream from and including the Anaktuvuk River drainage—1 bull Aug. 1-Sep. 14

Unit 26A—that portion of the Colville River drainage upstream from and including the Anaktuvuk River drainage—1 moose; however, you may not take a calf or a cow accompanied by a calf Feb. 15-Apr. 15.

Unit 26A—that portion west of 156°00' W longitude excluding the Colville River drainage—1 moose, however, you may not take a calf or a cow accompanied by a calf July 1-Sep. 14.

Unit 26A, remainder—1 bull Aug. 1-Sep. 14.

Proposed Federal Regulation

Unit 23—Caribou

Unit 23—that portion which includes all drainages north and west of, and including, the Singoalik River drainage—5 caribou per day by State registration permit as follows:

Bulls may be harvested

July 1–June 30

Cows may be harvested. However, cows accompanied by calves may not be taken July 15–Oct. 14.

July 15–Apr. 30

Federal public lands are closed to caribou hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 23, remainder—5 caribou per day by State registration permit as follows:

Bulls may be harvested

July 1–June 30

Cows may be harvested. However, cows accompanied by calves may not be taken July 31–Oct. 14.

July 31–Mar. 31

Federal public lands within a 10-mile-wide corridor (5 miles either side) along the Noatak River from the western boundary of Noatak National Preserve upstream to the confluence with the Cutler River; within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively; and within the Squirrel River drainage are closed to caribou hunting except by federally qualified subsistence users hunting under these regulations.

Federal public lands are closed to caribou hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 23–Moose

Unit 23—that portion north and west of and including the Singoalik River drainage, and all lands draining into the Kukpuk and Ipewik Rivers—1 antlered bull. No person may take a calf.

July 1-Dec. 31.

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 23, remainder—1 antlered bull. No person may take a calf.

Aug. 1-Dec. 31.

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A—Caribou

Unit 26A—that portion of the Colville River drainage upstream from the Anaktuvuk River, and drainages of the Chukchi Sea south and west of, and including the Utukok River drainage—5 caribou per day by State registration permit as follows:

Calves may not be taken

Bulls may be harvested

*July 1-Oct. 14.
Dec. 6-June 30.*

Cows may be harvested; however, cows accompanied by calves may not be taken July 16-Oct. 15

July 16-Mar. 15.

Federal public lands are closed to caribou hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A remainder—5 caribou per day by State registration permit as follows:

Calves may not be taken

Bulls may be harvested

*July 1-Oct. 15.
Dec. 6-June 30.*

Up to 3 cows per day may be harvested; however, cows accompanied by calves may not be taken July 16-Oct. 15.

July 16-Mar. 15.

Federal public lands are closed to caribou hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A—Moose

Unit 26A—that portion of the Colville River drainage upstream from and including the Anaktuvuk River drainage—1 bull Aug. 1-Sep. 14

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A—that portion of the Colville River drainage upstream from and including the Anaktuvuk River drainage—1 moose; however, you may not take a calf or a cow accompanied by a calf Feb. 15-Apr. 15.

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A—that portion west of 156°00' W longitude excluding the Colville River drainage—1 moose, however, you may not take a calf or a cow accompanied by a calf July 1-Sep. 14.

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Unit 26A, remainder—1 bull Aug. 1-Sep. 14.

Federal public lands are closed to moose hunting from Aug. 1-Sep. 30, 2021 except by Federally qualified subsistence users hunting under these regulations.

Existing State Regulation

Unit 23—Caribou

<i>23, north of and including Singoalik River drainage</i>	<i>Residents—Five caribou per day by permit available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>Bulls</i>	<i>RC907</i>	<i>No closed season</i>
		<i>Cows</i>	<i>RC907</i>	<i>Jul. 15-Apr. 30</i>

	<i>Nonresidents—One bull</i>		<i>HT</i>	<i>Aug. 1-Sept. 30</i>
<i>23 remainder</i>	<i>Residents— Five caribou per day by permit available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>Bulls</i>	<i>RC907</i>	<i>No closed season</i>
		<i>Cows</i>	<i>RC907</i>	<i>Sept. 1-Mar. 31</i>

	<i>Nonresidents—One bull</i>		<i>HT</i>	<i>Aug. 1-Sept. 30</i>
--	------------------------------	--	-----------	------------------------

Unit 23—Moose

<i>23, north of and including Singoalik River drainage</i>	<i>Residents— One antlered bull by permit available in person at license vendors within Unit 23 villages June 1-July 15</i>		<i>RM880</i>	<i>July 1-Dec. 31</i>
	<i>or</i>			
	<i>Residents— One bull with 50-inch antlers or antlers with 4 or more brow tines on at least one side</i>		<i>HT</i>	<i>Sept. 1-Sept. 20</i>

<i>Nonresidents</i>				<i>No open season</i>
---------------------	--	--	--	-----------------------

<i>23 remainder</i>	<i>Residents— One antlered bull by permit available in person at license vendors within Unit 23 villages June 1-July 15</i>		<i>RM880</i>	<i>Aug. 1-Dec. 31</i>
	<i>or</i>			
	<i>Residents— One bull with 50-inch antlers or antlers with 4 or more brow tines on at least one side</i>		<i>HT</i>	<i>Sept. 1-Sept. 20</i>

<i>Nonresidents</i>				<i>No open season</i>
---------------------	--	--	--	-----------------------

Unit 26A—Caribou

<i>26A, the Colville River drainage upstream from the Anaktuvuk River, and drainages of the Chukchi Sea south and west of, and including</i>	<i>Residents—Five caribou per day by permit available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>Bulls</i>	<i>RC907</i>	<i>July 1-Oct. 14</i> <i>Feb. 1-June 30</i>
		<i>Cows</i>	<i>RC907</i>	<i>Jul. 15-Apr. 30</i>
	<i>Nonresidents—One bull</i>		<i>HT</i>	<i>July 15-Sept. 30</i>

*the Utukok River
drainage*

<i>26A remainder</i>	<i>Residents—Five bulls per day by permit available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>RC907</i>	<i>July 1-July 15 Mar. 16-Jun 30</i>
	<i>Residents—Five caribou per day, three of which may be cows; cows with calves may not be taken. Permits available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>RC907</i>	<i>July 16-Oct. 15</i>
	<i>Residents—Three cows per day by permit available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>RC907</i>	<i>Oct. 16-Dec. 31</i>
	<i>Residents—Five caribou per day, three of which may be cows. Permits available online at http://hunt.alaska.gov or in person in Kotzebue, Utqiagvik, and at license vendors in Units 23 and 26A beginning June 22.</i>	<i>RC907</i>	<i>Jan. 1-Mar. 15</i>
	<i>Nonresidents—One bull</i>	<i>HT</i>	<i>July 15-Sept. 30</i>

Unit 26A—Moose

<i>26A, west of 156° 00' W. long. excluding the Colville River drainage</i>	<i>Residents— One moose. However, a person may not take a calf or a cow accompanied by a calf</i>	<i>HT</i>	<i>July 1-Sept. 14</i>
	<i>Nonresidents</i>		<i>No open season</i>
<i>26A, the Colville River drainage above and including the Anaktuvuk River drainage</i>	<i>Residents— One bull</i>	<i>HT</i>	<i>Aug. 1-Sept. 30</i>
	<i>Nonresidents</i>		<i>No open season</i>
<i>26A remainder</i>	<i>Residents— One bull</i>	<i>HT</i>	<i>Aug. 1-Sept. 30</i>
	<i>Nonresidents</i>		<i>No open season</i>

Extent of Federal Public Lands

Unit 23

Federal public lands comprise approximately 71% of Unit 23 and consist of 40% National Park Service (NPS) managed lands, 22% Bureau of Land Management (BLM) managed lands, and 9% U.S. Fish and Wildlife Service (USFWS) managed lands.

Unit 26A

Federal public lands comprise approximately 73% of Unit 26A and consist of 66% BLM managed lands and 7% NPS managed lands.

Customary and Traditional Use Determinations

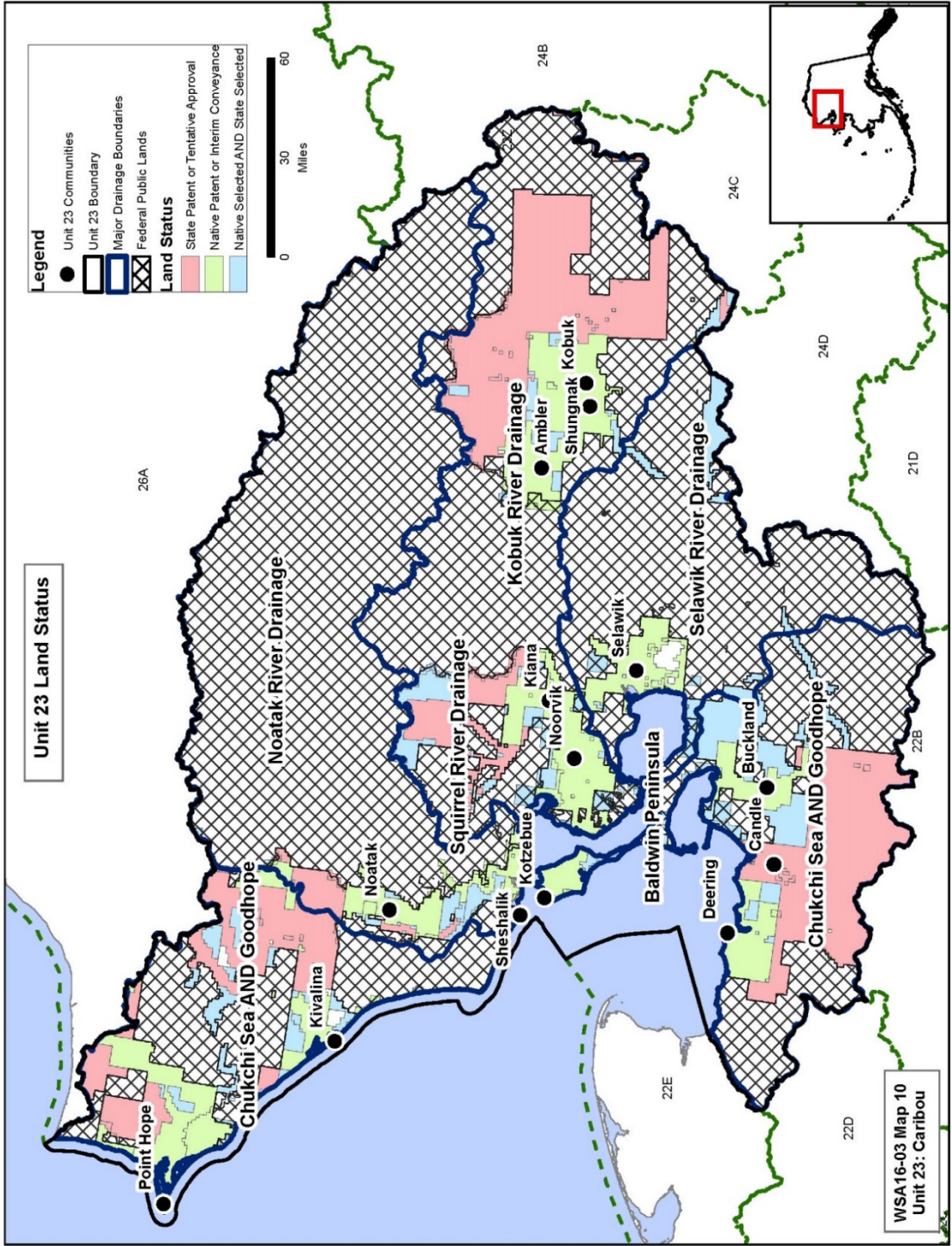
Residents of Units 21D west of the Koyukuk and Yukon Rivers, Galena, 22, 23, 24 including residents of Wiseman but not including other residents of the Dalton Highway Corridor Management Area, and 26A have a customary and traditional use determination for caribou in Unit 23 (**Map 2**).

Residents of Unit 23 have a customary and traditional use determination for moose in Unit 23.

Residents of Unit 26, Anaktuvuk Pass, and Point Hope have a customary and traditional use determination for caribou in Unit 26A.

Residents of Unit 26 (excluding the Prudhoe Bay-Deadhorse Industrial Complex), Point Hope, and Anaktuvuk Pass have a customary and traditional use determination for moose in Unit 26A.

Only resident zone communities can hunt in National Parks and Monuments. The resident zone communities for Kobuk Valley National Park and Cape Krusenstern National Monument include all NANA regional corporation communities (all Unit 23 communities except Point Hope). Resident zone communities for Gates of the Arctic National Park include Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles/Evansville, Hughes, Kobuk, Nuiqsut, Shungnak, and Wiseman.



Map 1. Land status within Unit 23 as per data obtained from the Bureau of Land Management on July 27, 2016.

Regulatory History

Unit 23 and 26A Caribou

In 1990, the caribou hunting season in Unit 23 and 26A was open year round with a five caribou per day harvest limit and a restriction on the harvest of cows May 16-Jun. 30.

In 1994 the Federal Subsistence Board (Board) adopted Proposal P94-82 with modification to allow motor-driven boats and snowmachines to be used to take caribou in Unit 26 and to allow swimming caribou to be taken with a firearm using rimfire cartridges in Unit 26. (Swimming caribou could be taken with a firearm using rimfire cartridges in Unit 23 since 1990).

In 1995, the Board adopted Proposal P95-51 to increase the caribou harvest limit from five to 15 caribou per day in Unit 23 so that subsistence hunters could maximize their hunting efforts when caribou were available. The Board also adopted Proposal P95-64 to increase the harvest limit from 5 caribou per day to 10 caribou per day in Unit 26 to increase harvest opportunity for subsistence hunters.

In 1995 the Board also adopted Proposal P95-62 which closed the area east of the Killik River and south of the Colville River to caribou hunting by non-Federally qualified users from Aug.1-Sep. 30. This closure was enacted to prevent non-Federally qualified users from harvesting lead animals, which may have caused the migration to move away from the area that local subsistence users hunted in Unit 26A. The justification was to allow for caribou migrations to take their normal route into Anaktuvuk Pass.

In 1997, the Board adopted Proposal P97-66 with modification to provide a customary and traditional use determination for caribou in Unit 23 for rural residents of Unit 21D west of the Koyukuk and Yukon rivers, Galena, Units 22, 23, 24 including residents of Wiseman, but not other residents of the Dalton Highway Corridor Management Area and Unit 26A (**Map 2**).

In 2000, the Board adopted Proposal WP00-53 with modification, allowing the use of snowmachines to position a hunter to select individual caribou for harvest in Units 22 and 23. This was done to recognize a customary and traditional practice in the region.

In 2006, the Board adopted Proposal WP06-65 which opened the area east of the Killik River and south of the Colville River to non-Federally qualified users. The 1995 closure was lifted for several reasons. First, due to changes in land status, lands formerly managed by BLM were transferred to Alaska Native corporations or the State pursuant to the Alaska Native Claims Settlement Act or the Statehood Act, respectively. After these land transfers, only lands east of Anaktuvuk Pass were affected by the closure, making the closure less effective. Second, the population was at a point where it could support both subsistence and non-subsistence uses.

In 2013, an aerial photo census indicated significant declines in the Teshekpuk Caribou Herd (TCH), WACH, and possibly the Central Arctic Caribou Herd (CACH) populations (Caribou Trails 2014). In response, the Alaska Board of Game (BOG) adopted modified Proposal 202 (RC76) in March 2015 to

reduce harvest opportunities for both Alaska residents and nonresidents within the range of the WACH and the TCH. These regulation changes – which included lowering bag limits for nonresidents from two caribou to one bull, reductions in bull and cow season lengths, the establishment of new hunt areas, and prohibiting calf harvest – were adopted to slow or reverse the population decline. The regulatory changes took effect on July 1, 2015.

In 2015, four special actions, WSA15-03/04/05/06, requesting changes to caribou regulations in Units 23, 24, and 26, were submitted by the North Slope Council and approved with modification by the Board, effective July 1, 2015. Temporary Special Action WSA15-03 requested designation of a new hunt area for caribou in the northwest corner of Unit 23 where the harvest limit would be reduced from 15 to five caribou per day, the harvest season would be shortened for bulls and cows, and the harvest of calves would be prohibited. The Board did not establish a new hunt area, instead applying the restrictions to all of Unit 23 and also prohibited the harvest of cows with calves. These State and Federal regulatory changes were the first time that harvest restrictions had been implemented for the WACH in over 30 years.

Temporary Special Action WSA15-05 requested that the bull caribou harvest limit in Unit 26A be reduced from 10 caribou per day to 5 caribou per day, the cow harvest limit be reduced to 3 per day, the harvest seasons for bulls and cows be reduced, and the take of calves and cows with calves be prohibited. Compared to the new State caribou regulations, it requested 3 additional weeks to the bull harvest season (Dec. 6-31). These special actions took effect on July 1, 2015.

In 2015, the Northwest Arctic Council submitted a temporary special action request (WSA16-01) to close caribou hunting on Federal public lands in Unit 23 to non-Federally qualified users for the 2016/17 regulatory year. The Council stated that their request was necessary for conservation purposes but also needed because nonlocal hunting activities were negatively affecting subsistence harvests. In April 2016, the Board approved WSA16-01, basing its decision on the strong support of the Northwest Arctic and North Slope Councils, public testimony in favor of the request, as well as concerns over conservation and continuation of subsistence uses.

Six proposals (WP16-37, WP16-48, WP16-49/52, WP16-61, and WP16-63) concerning caribou regulations in Units 23 and 26A were submitted to the Board for the 2016-2018 wildlife regulatory cycle. The Board adopted WP16-48 with modification to allow the positioning of a caribou, wolf, or wolverine for harvest in Unit 23 on BLM lands only. Proposal WP16-37 requested that Federal caribou regulations mirror the new State regulations across the ranges of the WACH and TCH (Units 21D, 22, 23, 24, 26A, and 26B). The Board adopted Proposal WP16-37 with modification to reduce the harvest limit to five caribou per day, restrict bull harvest during rut and cow harvest around calving, prohibit the harvest of calves and the harvest of cows with calves before weaning (mid-October), and to create a new hunt area in the northwest corner of Unit 23. The Board took no action on the remaining proposals (WP16-49/52, and WP16-61, and WP16-63) due to action taken on WP16-37.

In June 2016, the State submitted a special action request (WSA16-03) to reopen caribou hunting on Federal public lands in Unit 23 to non-Federally qualified users, providing new biological information

(e.g. calf recruitment, weight, body condition) on the WACH. The State specified that there was no biological reason for the closure and that it could increase user conflicts. In January 2017, the Board rejected WSA16-03 due to the position of all four affected Councils (Northwest Arctic, North Slope, Seward Peninsula, and Western Interior) as well as public testimony and Tribal consultation comments opposing the request. Additionally, the Board found the new information provided by the State to be insufficient to rescind the closure.

In January 2017, the BOG adopted Proposal 2, requiring registration permits for residents hunting caribou within the range of the Western Arctic and Teshekpuk herds in Units 21, 23, 24, and 26 (a similar proposal was passed for Unit 22 in 2016). The Alaska Department of Fish and Game (ADF&G) submitted the proposal in order to better monitor harvest and improve management flexibility. The BOG also rejected Proposal 3 (deferred Proposal 85 from 2016), which would have removed the caribou harvest ticket and report exception for residents living north of the Yukon River in Units 23 and 26A). Also in January 2017, the BOG rejected Proposal 45, which proposed requiring big game hunting camps to be spaced at least three miles apart along the Noatak, Agashashok, Eli, and Squirrel Rivers. The proposal failed as it would be difficult to enforce.

In March 2017, the Northwest Arctic and North Slope Councils submitted temporary special action requests (WSA17-03 and -04, respectively) to close caribou hunting on Federal public lands in Unit 23 and in Units 26A and 26B, respectively, to non-Federally qualified users for the 2017/18 regulatory year. Both Councils stated that the intent of the proposed closures was to ensure subsistence use in the 2017/18 regulatory year, to protect declining caribou populations, and to reduce user conflicts. The Board voted to approve WSA17-03 with modification to close all Federal public lands within a 10 mile wide corridor (5 miles either side) along the Noatak River from the western boundary of Noatak National Preserve upstream to the confluence with the Cutler River; within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively; and within the Squirrel River drainage, to caribou hunting except by Federally qualified subsistence users for the 2017/18 regulatory year. The Board considered the modification a reasonable compromise for all users, and that closure of the specified area was warranted in order to continue subsistence use. The Board rejected WSA17-04 due to recent changes to State regulations that should reduce caribou harvest.

In April 2018, the Board adopted Proposals WP18-46 with modification and WP18-48 (effective July 1, 2018). Proposal WP18-46 requested closing caribou hunting on Federal public lands in Unit 23 to non-Federally qualified users (similar to WSA16-01 and WSA17-03). The Board adopted WP18-46 with the same modification as WSA17-03 (see above) as the Northwest Arctic, Western Interior, and Seward Peninsula Councils as well as the village of Noatak supported this modification and viewed the targeted closure as effectively addressing user conflicts and the continuation of subsistence uses. The Board also adopted WP18-48 to require State registration permits for caribou hunting in Units 22, 23, and 26A to improve harvest reporting and herd management, and to align with State regulations.

Also in 2018, the Board considered proposal WP18-57, which requested that caribou hunting on Federal public lands in Units 26A and 26B be closed to non-Federally qualified users. This proposal was submitted by the North Slope Council to ensure continuation of subsistence, protect the caribou

herds, and reduce user conflicts. The Board rejected WP18-57, choosing to allow time to evaluate the effects of recently implemented harvest restrictions. In addition, the Board expressed concern that closing Federal lands would shift users to State lands, increasing conflict.

In January 2020, the BOG adopted Proposal 20 to open a year-round resident season for caribou bull harvest in Unit 23 under State regulations. The BOG also adopted Proposal 24 as amended to remove the restriction on caribou calf harvest in Units 22, 23, and 26A. Proposal 28, which would have eliminated the caribou registration permit in Units 23 and 26A for North Slope resident hunters, was not adopted by the BOG, due to an ongoing need for harvest data.

In April 2020, the Board adopted Proposal WP20-46 to open a year-round bull season and permit calf harvest for caribou in Unit 23. Creating a year-round season for bulls was intended to allow for harvest of bulls when caribou migration had been delayed, alleviating harvest pressure on cows. The prohibition on calf harvest was lifted in order to permit taking of calves that had been orphaned or injured.

In summary, since 2013, restrictions have been placed on caribou hunting in Units 23 and 26A under both State and Federal subsistence regulations. Recent relevant changes include:

Federal Subsistence regulatory changes:

- Reduction in cow and bull season length in 26A (2015)
- Reduction of caribou harvest limit to 5 per day in both Units 23 (2015) and 26A (2016)
- Requirement for FQSUs hunting caribou under Federal regulations to have a State registration permit (RC907) in both Units 23 and 26A in order to improve monitoring (2018)
- Closure of limited areas in Unit 23 centered on the Noatak River to caribou hunting by non-Federally qualified users in order to reduce user conflict (2017)
- Opening a year-round bull season in Unit 23 to allow for harvest of younger bulls when caribou migration has been delayed, and to alleviate harvest pressure on cows (2020)

State regulatory changes:

- Reduction in cow and bull season length in both Units 23 and 26A (2013)
- Reduction of caribou harvest limit to 5 caribou per day in both Units 23 and 26A (2015)
- Requirement for registration permit under State regulations throughout the range of the WACH and TCH (2017)
- Opening a year-round harvest for bulls in Unit 23 (2020)

A non-resident caribou hunt remains open in both Units 23 and 26A under State regulations, although the bag limits for nonresidents was reduced from two caribou to one bull in 2013. The results of closure requests for caribou in Units 23 and 26 made to the Board since 2016 are documented in **Table 1** and **Table 2**, below.

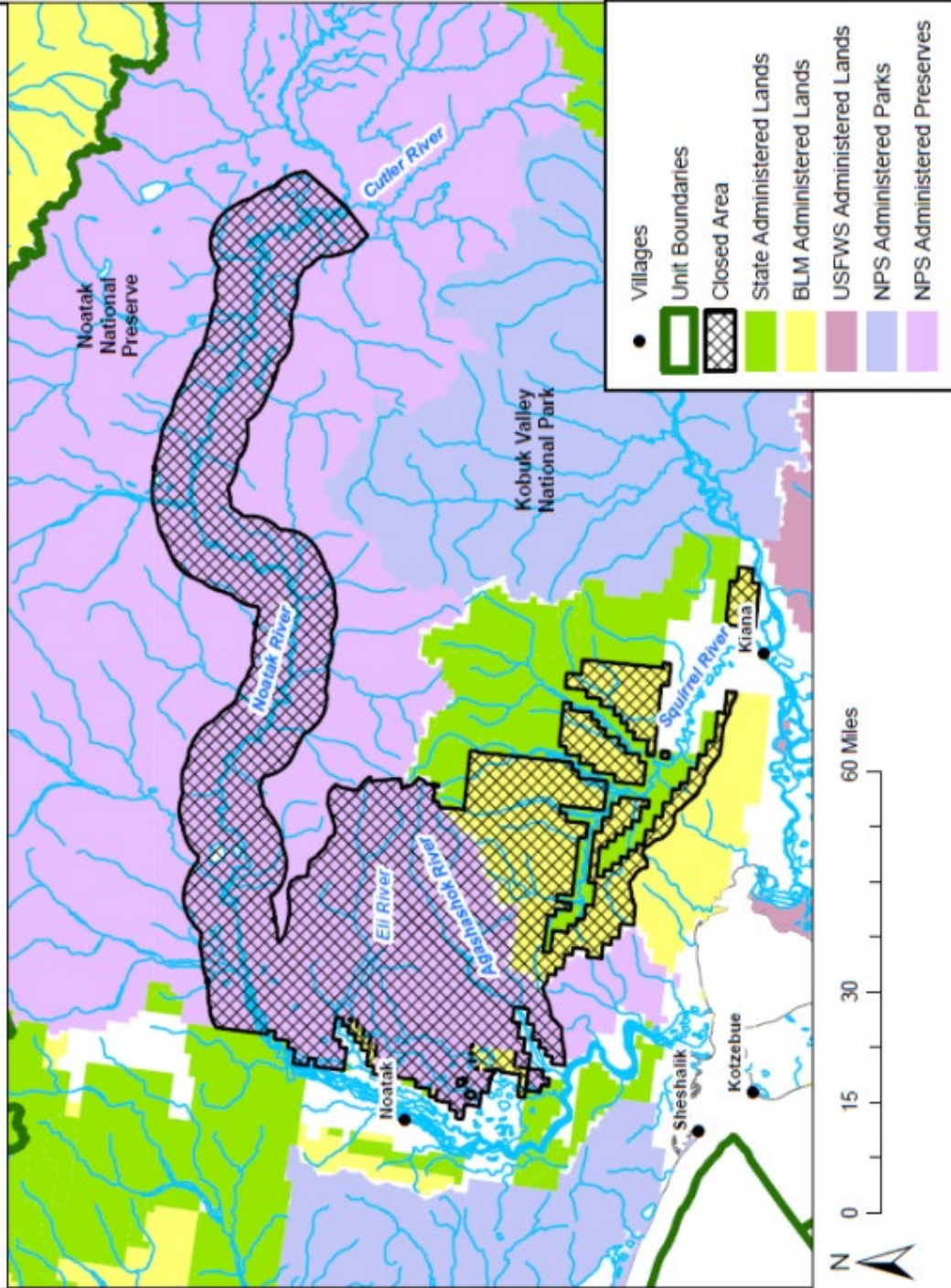
Table 1. History and outcomes of closure requests for caribou on Federal public lands in Unit 23 since 2016. All three requests were submitted by the Northwest Arctic Council. FQSUs = Federally Qualified Subsistence Users; NFQUs = non-Federally qualified users.

Proposal or Special Action Request	Proposed Action	Proponent Rationale	Board Action
WSA16-01	Close Unit 23 to NFQUs for 2016/2017 regulatory year	Conservation, impact of nonlocal hunting	Approved
WSA17-03	Close Unit 23 to NFQUs for 2017/18 regulatory year	Ensure subsistence use, protect declining caribou, reduce conflict	Approved with geographical limitation/modification (Noatak, Eli, Agashashok, and Squirrel rivers closures)
WP18-46	Close Unit 23 to NFQUs	Ensure subsistence use, protect declining caribou, reduce conflict	Approved with geographical limitation/modification (Noatak, Eli, Agashashok, and Squirrel rivers closures); closure is still in place

Table 2. History and outcomes of recent closure requests for caribou on Federal public lands in Unit 26A since 2017. Both requests were submitted by the North Slope Council. NFQUs = non-Federally qualified users.

Proposal or Special Action Request	Proposed Action	Proponent Rationale	Board Action
WSA17-04	Close 26A (and 26B) to NFQUs	Continuation of subsistence, protect declining caribou populations, and reduce user conflicts	Reject
WP18-57	Close 26A (and 26B) to NFQUs	Continuation of subsistence, protect declining caribou populations, and reduce user conflicts	Reject

All Federal public lands within a 10 mile wide corridor (5 miles either side) along the Noatak River from the western boundary of Noatak National Preserve upstream to the confluence with the Cutler River; within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively; and within the Squirrel River drainage are closed to caribou hunting except by Federally qualified subsistence users.



Map 3. Current closure to caribou hunting by non-Federally qualified subsistence users in Unit 23.

Unit 23 Moose

In 1994, the Federal subsistence moose hunt in Unit 23 consisted of three hunt areas: Unit 23 north and west of and including the Singoalik River drainage, and all lands draining into the Kukpuk and Ipewik rivers (Unit 23 NW), Unit 23 within the Noatak River drainage, and Unit 23 remainder. The harvest limit in each hunt area was one moose with a prohibition on the take of cows accompanied by calves. The season in the Unit 23 NW hunt area was Jul. 1-Mar. 31; the season in the Noatak River drainage hunt area was Aug. 1-Sep. 15 and Oct. 1-Mar. 31, although antlerless moose could only be taken Nov. 1-Mar. 31; the season in Unit 23 remainder was Aug. 1-Mar. 31.

State moose regulations became more restrictive in 2003 when BOG approved amended Proposal 15 (effective starting with the 2004/05 regulatory year), making it more difficult for nonlocal residents to hunt moose, creating four registration hunts in the unit with permits (RM880) only available in person at licensed vendors in Unit 23 villages from Jun. 1-Jul. 15. This early availability of permits occurred before most of the seasons opened, requiring nonlocal hunters to make a special trip to a Unit 23 village in order to receive a permit. These permits also allowed for better tracking of harvest.

In 2005, Proposal WP05-18, submitted by the Northwest Arctic Council, requested prohibiting the harvest of calves, shortening the season for moose in most of Unit 23 from Jul. 1 (or Aug. 1)-Mar. 31 to Aug. 1-Dec. 31, combining the Noatak drainage and remainder hunt areas, and allowing antlerless moose to be harvested only in November and December. The Board tabled this proposal in response to a Northwest Arctic Council recommendation to provide time for residents of local villages to review the proposal and provide their input due to differing viewpoints related to the moose population and local subsistence needs.

In 2006, Proposal WP06-54 was submitted by the Council to replace WP05-18, requesting that the harvest of moose calves be prohibited and that the two week seasonal closure (Sep. 16-30) in the Noatak River drainage hunt area be rescinded. The Board adopted WP06-54 under its consensus agenda.

In January 2017, the BOG adopted amended Proposal 36, changing the antlerless moose season in Unit 23 to one antlered bull due to conservation concerns. Of note, nonresident drawing permits had been reduced from 50 permits in 2016/17 to 34 permits in 2017/18 and, later in 2017, ADF&G cancelled the 2017/18 nonresident moose hunt in Unit 23, voiding all issued permits (ADF&G 2017a, 2017b, Saito 2017 pers. comm.).

In April 2017, the Board rejected Temporary Special Action WSA17-02, which requested that Federal public lands in Unit 23 be closed to moose harvest by non-Federally qualified users during the 2017/18 regulatory year. The Board stated that they wanted to allow time to assess the effects of recent State actions prior to considering a unit-wide closure.

During the 2018/20 regulatory cycle, the Council (WP18-41) and Louis Cusack (WP18-42) submitted similar proposals requesting changes to the Unit 23 moose season, including shortening the cow and overall moose seasons and aligning Federal and State hunt areas. Specifically, WP18-41 requested

combining the Noatak River drainage and remainder hunt areas, changing the closing date of the bull season from Mar. 31-Dec.31, and restricting cow harvest to Nov. 1–Dec. 31. The Board adopted Proposal WP18-41 to protect the declining moose population and took no action on WP18-42.

In 2018, Emergency Special Action WSA18-04, which requested closing the cow moose season in Unit 23 to Federally qualified subsistence users for the 2018/2019 regulatory year, was submitted to the Board. The Board approved with modification to close the Federal winter cow moose season and close moose hunting in Unit 23 except by Federally qualified subsistence users for the 2018/19 regulatory year. Board justification was based on declining moose population and low calf: cow ratios; the action was found to be necessary to maintain a healthy moose population.

In 2018, ADF&G also closed the non-resident moose season in Unit 23 and planned to continue the nonresident closure until moose populations rebound (NWARAC 2018a).

In 2019, the Northwest Arctic Council submitted a wildlife special action request (WSA19-04) to close the cow moose harvest on Federal public lands in Unit 23 for the 2019/20 regulatory year to Federally qualified subsistence users in order to ensure that the cow harvest in the unit remained closed until the Board could take permanent action through a regulatory proposal. The Council justification for closing to Federally qualified subsistence users— rather than non-Federally qualified subsistence users—was to avoid concentrating non-local hunters around communities. The Board approved WSA19-04 with modification to also delegate authority to the in-season manager to close moose hunting on Federal public lands in Unit 23 to non-Federally qualified users during the 2019/20 regulatory year, if warranted.

In 2020, the Northwest Arctic Council submitted Proposal WP20-47, which requested closure of the cow moose season in Unit 23 to Federally qualified subsistence users and requiring the use of a State registration permit (RM880) by Federally qualified subsistence users under Federal regulations. The RM880 permit can only be obtained within Unit 23 from June 1 to July 15. The Board adopted WP20-47 with modification to change the Unit 23 moose harvest limit from one moose to one antlered bull, closing the cow moose season because of conservation concerns. The Board did not adopt the State registration permit requirement because it would burden Federally qualified subsistence users.

In summary, changes implemented in both State and Federal subsistence regulations since 2017 have placed restrictions on moose hunting in Unit 23:

Federal Subsistence regulatory changes:

- Combined Noatak River drainage and remainder hunt areas, effectively reducing harvest (2018)
- Shortened bull and cow seasons (2018)
- Closure to non-Federally qualified subsistence users (2018/2019 regulatory year only)
- Closure of cow moose season for Federally qualified subsistence users for the 2019/2020 regulatory year
- Changed the harvest limit to one antlered bull (2020)

State regulatory changes:

- Changed antlerless moose season to one antlered bull (2017)
- Closure of the non-resident moose season (2018)

The results of closure requests for moose in Units 23 made to the Board since 2017 are documented in **Table 3**, below.

Table 3. Recent history of closure requests for moose on Federal public lands in Unit 23. FQSUs = Federally Qualified Subsistence Users; NFQUs = non-Federally qualified users.

Proposal	Proposed Action	Proponent Rationale	Board Action
WSA17-02 (Northwest Arctic Council)	Close to NFQUs for 2017/18 regulatory year	Decline in moose population	Reject
WSA18-04 (Louis Cusack)	Close the cow moose season to FQSUs for the 2018/2019 regulatory year	Decline in moose population	Approve with modification to close the Federal winter cow moose season and close moose hunting in Unit 23 except by Federally qualified subsistence users for the 2018/19 regulatory year.
WSA19-04 (Northwest Arctic Council)	Close the cow moose harvest to FQSUs users for the 2019/20 regulatory year	Decline in moose population; to ensure that the cow harvest in the unit remained closed until the Board could take permanent action through a regulatory proposal. Closure to NFQUs may concentrate users around communities.	Approved with modification to also delegate authority to the in-season manager to close moose hunting in Unit 23 to non-Federally qualified users during the 2019/20 regulatory year, if warranted.
WP20-47 (Northwest Arctic Council)	Close the cow moose harvest to FQSUs	Decline in moose population	Adopted with modification to change the Unit 23 moose harvest limit from one moose to one antlered bull, closing the cow moose season because of conservation concerns.

Unit 26A Moose

A 75% moose population decline from 1991 to 1996 prompted season restrictions in State regulations in 1995 and in both the Federal and State moose harvest regulations in 1996. Prior and leading up to the May 1996 Federal Subsistence Board action, the moose population in Unit 26A—the Colville River drainage in particular—was in serious decline. To address this issue, the Board adopted the State’s aircraft use restrictions for Unit 26A in 1994.

In 1996, the Board adopted regulatory proposal P96-66, which closed moose hunting on all Federal public lands in Unit 26A except in that portion of the Colville River drainage downstream from the mouth of the Anaktuvuk River due to population declines. At that time, the only segment of the population that was considered stable was the small population of moose downstream from the mouth of Anaktuvuk River. That area remained open only to Federally qualified subsistence users from Aug. 1–Aug. 31, and the harvest was limited to 1 moose per hunter, as long as it was not a cow accompanied by a calf. The Board’s justification for adopting the closure to non-Federally qualified users to harvest moose was to address conservation concerns.

In 2002, the Board adopted Proposal WP02-45 that expanded the Federal subsistence moose harvest area in Unit 26A from that portion of the Colville River drainage downstream from the mouth of the Anaktuvuk River to that portion of the Colville River drainage downstream from and including the Chandler River and also extended the season by two weeks, from Aug. 1–Aug. 31 to Aug. 1–Sep. 14. The Board’s rationale for adopting Proposal WP02-45 included: population increases since 1998, especially in the core areas of the Colville River drainage; spreading out the harvest pressure to other areas with higher moose density; aligning State and Federal regulations; and providing additional subsistence hunting opportunity later in the fall when the temperatures are colder, which could reduce the chance of meat spoilage.

In 2004, the Board adopted Proposal WP04-85 which established the eastern boundary of the proposed harvest area in Unit 26A to 156°00’W longitude to match the new State regulation and also aligned the season and harvest limits with those made by the BOG.

In 2005, the Office of Subsistence Management conducted closure review WCR05-23 and recommended that the closure of that portion of the Colville River drainage downstream from and including the Chandler River to non-Federally qualified moose hunters should continue to remain in effect. However, when WCR05-23 was discussed during the North Slope Council’s fall 2005 meeting, new winter moose census information provided by the ADF&G suggested the closure was no longer necessary since the moose population had reached at least 1,000 animals. Although the Council recommended maintaining the closure to nonsubsistence uses, the new information indicated such a closure may no longer be needed to conserve a healthy moose population.

In May 2006, the Board adopted Proposal WP06-66, which resulted in reopening remaining Federal public lands on that portion of the Colville River drainage downstream from and including the Chandler River to hunting by all Alaska residents.

In 2007, the BOG opened a non-resident drawing hunt for moose in Unit 26A. In 2014, the BOG extended the resident bull moose season in Unit 26A from Aug. 1-Sep. 14 to Aug. 1 to Sep. 30 in order to accommodate a shifting moose season in two hunt areas: the Colville River drainage above and including the Anaktuvuk River drainage, and in Unit 26A Remainder. The BOG also aligned the Unit 26A Controlled Use Area dates with this season at this time. However, later in 2014, the season was reduced to its original length and the non-resident drawing hunt closed through Emergency Order due to moose population decline. There has not been a non-resident moose hunt in Unit 26A since 2013.

Table 4. Summary of moose and caribou hunts in the months of August and September in Units 23 and 26A. Y = Yes; N = No; FQSUs = Federally qualified subsistence users; NFQUs = non-Federally qualified users.

	FQSUs (rural residents with C&T) hunting under Federal regulations	Residents of Alaska (includes both FQSUs and NFQUs) hunting under State regulations	Nonresidents of Alaska (NFQUs) hunting under State regulations
Unit 23 caribou	Y	Y	Y
Unit 23 moose	Y	Y	N
Unit 26A caribou	Y	Y	Y
Unit 26A moose	Y, but hunt ends Sep. 14 everywhere except Nuiqsut area	Y, but ends Sep. 14 in Western portion of the Unit	N

Controlled Use Areas in Unit 23

Noatak Controlled Use Area

In 1988, the Traditional Council of Noatak submitted a proposal to the BOG to create the Noatak Controlled Use Area (CUA) in order to restrict the use of aircraft in any manner for big game hunting Aug. 15-Sep. 20 due to user conflicts (Fall 1990). The proposed Controlled Use Area extended five miles on either side of the Noatak River, from the mouth of the Eli River upstream to the mouth of the Nimiuktuk River, including the north side of Kivivik Creek (ADF&G 1988). The BOG adopted the proposal with modification to close a much smaller area extending from the Kugururok River to Sapun Creek from Aug. 20-Sep. 20.

The Controlled Use Area was expanded in 1994 and modified in 2017 (Betchkal 2015, Halas 2015, ADF&G 2017a). From 1994-2016, the Noatak Controlled Use Area consisted of a 10-mile wide corridor (5 miles either side) along the Noatak River from its mouth to Sapun Creek with approximately 80 miles of the Controlled Use Area within Noatak National Preserve (NP) (**Map 5**, Betchkal 2015). The closure dates from 1994-2009 were Aug. 25-Sep. 15. In 2009 (effective 2010), the

BOG adopted Proposal 22 to expand the closure dates to Aug. 15-Sep. 30 in response to the timing of caribou migration becoming less predictable (ADF&G 2009). During the 2016/17 BOG regulatory cycle, the Noatak/Kivalina & Kotzebue AC proposed (Proposal 44) extending the upriver boundary of the Noatak Controlled Use Area to the Cutler River, citing increased user conflicts as their rationale (ADF&G 2017b). In January 2017, the BOG approved amended Proposal 44 to shift the boundaries of the Noatak Controlled Use Area to start at the mouth of the Agashashok River and end at the mouth of the Nimiuktuk River with approximately 105 miles within Noatak NP (**Map 5**, ADF&G 2017a).

In 1990, the Noatak Controlled Use Area was adopted under Federal regulations. In 1995, the Board adopted Proposal P95-50 to expand the time period and area of the Controlled Use Area to Aug. 25-Sep. 15 and the mouth of the Noatak River upstream to the mouth of Sapun Creek, respectively, which aligned with State regulations as they existed at that time.

In 2008, Proposals WP08-50 and 51 requested modifications to the Noatak Controlled Use Area dates. These proposals were submitted in response to caribou migration occurring later in the season, to improve caribou harvest for subsistence users, and to decrease conflicts between local and nonlocal hunters. The Board deferred these proposals to the next regulatory cycle. In 2010, Proposals WP10-82, 83, and 85 requested similar date changes. The Board adopted WP10-85 to expand the time period during which aircraft are restricted in the Noatak Controlled Use Area to Aug. 15-Sep. 30, which aligned with the current State regulations (**Table 5**).

Selawik National Wildlife Refuge: Area Not Authorized for Commercial Transporters and Guides

In 2011, Selawik National Wildlife Refuge (NWR) designated refuge lands in the northwest portion of the refuge as closed to big game hunting by commercial guides and transporters through their comprehensive conservation plan (**Table 5**, FWS 2011, 2014). These refuge lands are intermingled with private lands near the villages of Noorvik and Selawik (**Map 5**). The purpose of this closure was to minimize trespass on private lands and to reduce user conflicts (FWS 2011).

At the winter 2021 meeting of the Northwest Arctic Council, a representative of Selawik National Refuge reported that only two hunters were brought into the refuge by air taxis and transporters in 2021. Because caribou are no longer abundant in Selawik National Wildlife Refuge in September, and because the non-resident moose season is already closed in Unit 23, this area no longer receives many fly-in hunters (NWARAC 2021).

Noatak National Preserve Delayed Entry Controlled Use Area

In 2012, the NPS established a Special Commercial Use Area or “delayed entry zone” in the western portion of the Noatak NP (**Table 5**, Halas 2015, Fix and Ackerman 2015). Within this zone, transporters can only transport nonlocal caribou hunters after a pre-determined date unless otherwise specified by the Western Arctic Parklands (WEAR) superintendent in consultation with commercial operators, other agencies and local villages (Halas 2015). In 2020, the delayed entry date was changed from Sep. 15-Sep. 22 (NPS 2020) in response to requests from the Cape Krusenstern National

Monument and Kobuk Valley National Park SRCs and the Native Village of Noatak (Atkinson 2021, pers. comm.). The purpose of this zone is to allow a sufficient number of caribou to cross the Noatak River and establish migration routes, to limit interactions between local and nonlocal hunters, and to allow local hunters the first opportunity to harvest caribou in that area (**Map 5**, FWS 2014, Halas 2015).

Aircraft in National Parks and Monuments

National parks and monuments in Unit 23 include Cape Krusenstern National Monument, Kobuk Valley National Park, and Gates of the Arctic National Park. The use of aircraft for access to or from lands and waters within a national park or monument for purposes of taking fish or wildlife within the national park or monument is prohibited, except in the case of exempted communities and individuals for the purpose of subsistence access. However, aircraft are allowed to access lands and waters in national parks and monuments for the purposes of engaging in any activity allowed by law other than the taking of fish and wildlife.

Controlled Use Areas in Unit 26A

Anaktuvuk Pass Controlled Use Area

The BOG established the Anaktuvuk Pass Controlled Use Area in 2005 to reduce user conflicts during the caribou hunting season and to provide more opportunity for Anaktuvuk Pass residents to harvest caribou. The Anaktuvuk Controlled Use Area includes a portion of Unit 26A. This area is closed to the use of aircraft for hunting caribou, including the transportation of caribou hunters, their hunting gear, or parts of caribou from Aug. 15-Oct. 15; however, this provision does not apply to the transportation of caribou hunters, their hunting gear, or parts of caribou by aircraft between publicly owned airports (**Table 5**).

Unit 26A Controlled Use Area

Under State regulations, the Unit 26A Controlled Use Area (**Map 4**) is closed to the use of aircraft for hunting moose, including the transportation of moose hunters, their hunting gear, or parts of moose from Jul. 1-Sep. 30 and from Jan.-Mar. 31 (**Table 5**). This provision does not apply to the transportation of moose hunters, their hunting gear, or parts of moose by aircraft between publicly owned airports.



Map 4. Unit 26A Controlled Use Area.

Table 5. Comparative summary of Controlled Use Areas in Units 23 and 26A, with aircraft closure periods noted.

Controlled Use Area	Time Period	Aircraft closure
Unit 23		
Noatak Controlled Use Area (State and Federal regulations)	Aug. 15-Sep. 30	To transportation of hunters or harvested species .
Selawik National Wildlife Refuge Area Not Authorized for Commercial Transporters and Guides	Year-round	To big game hunting by commercial guides and transporters
Noatak National Preserve Delayed Entry Controlled Use Area (National Park Service regulations)	Until after Sep. 22	To transportation of nonlocal caribou hunters
Unit 26A		
Anaktuvuk Pass Controlled Use Area (State regulations)	Aug. 15-Oct. 15	To use of aircraft for hunting caribou , including the transportation of caribou hunters, their hunting gear, or parts of caribou.

Controlled Use Area	Time Period	Aircraft closure
Unit 26A Controlled Use Area (State regulations)	Jul. 1-Sep. 30, Jan. 1-Mar. 31	To the use of aircraft for hunting moose , including the transportation of moose hunters, their hunting gear, or parts of moose.

Current Events

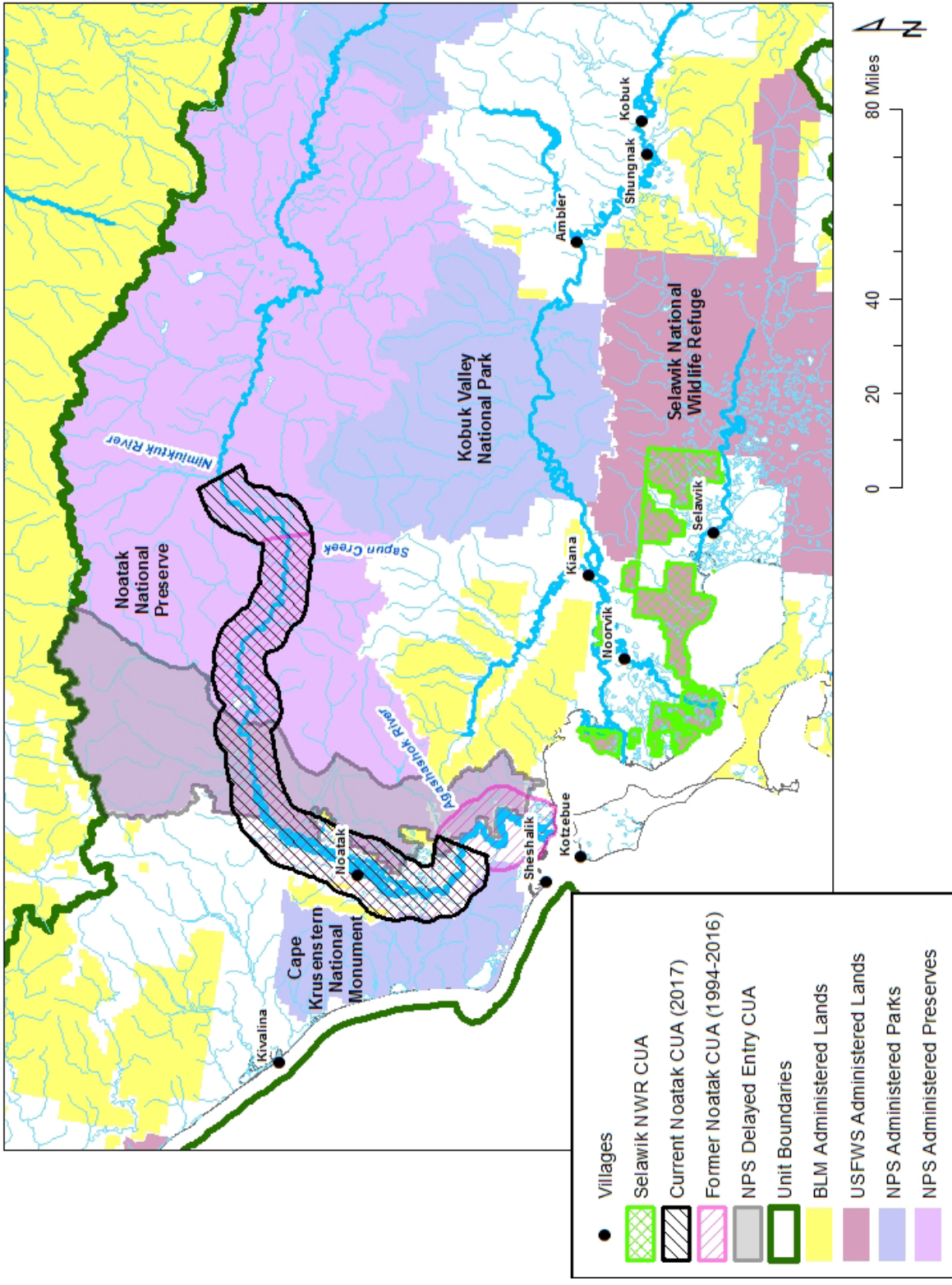
Tribal and ANCSA Corporation Consultations

Tribal and Alaska Native Claims Settlement Act (ANCSA) corporation consultations were held on April 28 and May 26, 2021 by teleconference. Representatives of Alaska Native Corporations and tribes in the region expressed strong support for the closure in order to allow caribou migrations to return to their previous, typical route, and to support communities during a time when food security has been affected by Covid-19 and high fuel prices. Caribou have provided vital sustenance for Iñupiaq people in the Northwest Arctic since “time immemorial,” and the current lack of caribou during the traditional time of harvest has created great hardship for residents.

Participants clarified that they are concerned with the effects of low-flying, small aircraft on caribou, rather than the effects of commercial flights. When non-local hunters are dropped off right in front of caribou, this can create problems for subsistence hunters. One participant with experience as a reindeer herder and caribou hunter described the effects of human-caribou interaction as capable of diverting migration pathways. Disruption in migration was dated to 2017 by one tribal representative from the lower Kobuk River region. Caribou are not only coming later; they are also less abundant in the region overall. Participants expressed the need for scientists to share caribou tracking data with communities. One participant explained that when the caribou migration is delayed, transportation to harvest becomes difficult. The cost of going further to get caribou is often prohibitive due to the extremely high fuel prices in the region. Additionally, when the migration is delayed, locals are forced to hunt more cows, rather than bulls.

When caribou are not available, the few taken are given to elders. When non-Federally qualified users share meat with locals, this is appreciated, but does not replace successful subsistence activities, which encompass traditional practices and transmission of culture. Moose are not traditionally the favored subsistence food in Northwest Arctic and North Slope, and so cannot substitute adequately for lost caribou.

The fact that relatives living outside of the region would not be able to hunt on Federal public lands during a closure to non-Federally qualified users was discussed, but it was clarified that these individuals would still be able to hunt on Native Corporation land under State regulations.



Map 5. Federal and State Controlled Use Areas in Unit 23.

Public Hearing and Written Comments

The Office of Subsistence Management held a public hearing to solicit comments on WSA21-01 on April 23, 2021 from 3pm to 7:15pm by teleconference. Over 300 people called in, and approximately 120 people gave comments. Written public comments were also accepted between April 16 and April 20, 2021, and 1,221 written comments were submitted. The majority of public comments came from non-Federally qualified users or non-local hunters, guides, transporters, and regular citizens, and were in opposition to the requested closure.

The reasons most frequently given for opposition can be broken down into the following broad categories: (1) decisions regarding wildlife management should always be science-based, and this closure is not supported by available science; (2) the Western Arctic Herd is above management objective; (3) there is not evidence that air traffic has delayed caribou migration; (4) subsistence harvest of caribou has remained high; (5) public land should be open to all; (6) local businesses and guides will be negatively affected; (7) non-local hunters have already booked expensive trips; (8) once-in-a-lifetime experiences will be lost, often involving family members; (9) distinguishing between sport and subsistence hunting is not fair or valid; and (10) this action would represent Federal overreach.

A resident of Ambler testified in opposition, expressing concern that his nonrural relatives would not be able to hunt in the region, and asking for the views of all communities in the region to be considered in the decision-making. However, most residents of Units 23 and 26A who participated in public comment opportunities testified in support of the action for reasons that overlap with those described in the above section on tribal and ANCSA corporation consultation. Caribou were noted as being vital to the physical, spiritual, and mental well-being of people in the Northwest Arctic region, including the youngest generation. Local residents testified that non-locals do not follow the traditional practice of “letting the leader caribou pass,” which can result in herd diversion and a small number of hunters having a disproportionate impact on subsistence for entire communities. Speakers expressed frustration about having to fight for basic access to their traditional foods.

Western Arctic Caribou Herd Working Group

At the December 9, 2020 meeting of the Western Arctic Caribou Herd (WACH) Working Group, Steve Oomittuk of Point Hope made a motion to support the North Slope Subsistence Regional Advisory Council if the Council were to submit a proposal to close Federal public lands in Unit 26A to non-Federally qualified subsistence users; this motion passed (WACH Working Group 2020). While the North Slope Regional Advisory Council did not formally submit a request or proposal to close Federal lands in Unit 26A, the Council did support the Northwest Arctic Regional Advisory Council in the current request to close Units 23 and 26A to hunting of caribou and moose by non-Federally qualified users Aug. 1-Sep. 30, 2021.

Alaska Department of Fish and Game

Alaska Department of Fish and Game submitted a written memorandum opposing this special action request, stating that the proponent's objective of regulating the use of aircraft for caribou hunting would be more appropriately addressed by submitting a proposal to the Alaska Board of Game. Additionally, the State argued that this closure would have negative economic consequences and would prevent non-Federally qualified users with ties to the area from hunting on Federal public lands.

Biological Background

Caribou

The TCH, WACH, and CACH have ranges that overlap in Unit 26A (**Map 6**), and there can be considerable mixing of herds during the fall and winter. As the current request focuses on the migration of the WACH through Unit 23, this analysis will only consider the WACH as the ranges of the other herds do not include Unit 23 (Dau 2011, 2015, Lenart 2011, Parrett 2011, 2015c, 2015d).

Western Arctic Caribou Herd

Caribou abundance naturally fluctuates over decades (Gunn 2001, WACH Working Group 2011). Gunn (2001) reports the mean doubling rate for Alaskan caribou as 10 ± 2.3 years. Although the underlying mechanisms causing these fluctuations are uncertain, climatic oscillations (i.e. Arctic and Pacific Decadal Oscillations) may play an important role (Gunn 2001, Joly et al. 2011). Climatic oscillations can influence factors such as snow depth, icing, forage quality and growth, wildfire occurrence, insect levels, and predation, which all contribute to caribou population dynamics (Joly et al. 2011). Density-dependent reduction in forage availability, resulting in poorer body condition may exacerbate caribou population fluctuations (Gunn 2001).

Caribou calving generally occurs from late May to mid-June (Dau 2013). Weaning generally occurs in late October and early November before the breeding season (Taillon et al. 2011). Calves stay with their mothers through their first winter, which improves calves' access to food and body condition (Holand et al. 2012). Calves orphaned after weaning (October) have greater chances of survival than calves orphaned before weaning (Holand et al. 2012, Joly 2000, Russell et al. 1991, Rughetti and Festa-Bianchet 2014).

The WACH has historically been the largest caribou herd in Alaska and has a home range of approximately 157,000 square miles in northwestern Alaska. In the spring, most mature cows move north to calving grounds in the Utukok Hills, while bulls and immature cows lag behind and move toward summer range in the Wulik Peaks and Lisburne Hills (**Map 7**, Dau 2011, WACH Working Group 2011, 2019). After calving, cows and calves move west toward the Lisburne Hills where they mix with the bulls and non-maternal cows. During the summer, the herd moves rapidly to the Brooks Range. In the fall, the majority of the herd generally moves south toward wintering grounds south of the Brooks Range (Joly 2021, pers. comm.). Rut occurs during fall migration (Dau 2011, WACH Working Group 2011).

In recent years, the timing of fall migration has been less predictable. From 2010-2019, the average dates that GPS collared caribou crossed the Noatak River ranged from Sep. 6-Oct. 13; the Kobuk River ranged from Sep. 24-Nov. 3; and the Selawik River ranged from Oct. 2-Nov. 10 (Joly and Cameron 2020). From 2010-2016, caribou migration was trending to occur earlier in the year. However, from 2017-2019, caribou crossed the Noatak River, but then there was substantial delay before caribou crossed the Kobuk and Selawik Rivers (**Figure 1, Table 7**). This appears to have been the case for 2020 as well. During the fall 2020 Northwest Arctic Council meeting in early November, Council members stated that only Noatak had harvested caribou in the fall and that caribou had not yet passed through the Southern portions of Unit 23. While data has yet to be analyzed, the first GPS collared caribou did not cross the Kobuk River until November, which is the latest first crossing since data collection began in 2010 (July 2021, pers. comm.). Reasons for changes in migration phenology are unknown.

The proportion of caribou using certain migration paths also varies each year (**Figure 2**, Joly and Cameron 2020). Changes in migration paths are likely influenced by multiple factors including food availability, snow depth, rugged terrain, and dense vegetation (Fullman et al. 2017, Nicholson et al. 2016). If caribou travelled the same migration routes every year, their food resources would likely be depleted (NWARAC 2016a).

The WACH Working Group consists of a broad spectrum of stakeholders, including subsistence users, sport hunters, conservationists, hunting guides, reindeer herders and transporters. The Group is also technically supported by NPS, FWS, BLM, and ADF&G personnel. The WACH Working Group developed a WACH Cooperative Management Plan in 2003 and revised it in 2011 and 2019 (WACH Working Group 2011, 2019). The WACH Management Plan identifies nine plan elements: cooperation, population management, habitat, regulations, reindeer, knowledge, education, human activities, and changing climate, as well as associated goals, strategies, and management actions. As part of the population management element, the WACH Working Group developed a guide to herd management determined by population size, population trend, and harvest rate. Population sizes guiding management level determinations were based on recent (since 1970) historical data for the WACH (WACH Working Group 2011, 2019). Revisions to recommended harvest levels under liberal and conservative management were made in 2015 (WACH Working Group 2015) and 2019 (WACH Working Group 2019, **Table 6**).

The WACH population declined rapidly in the early 1970s, bottoming out at about 75,000 animals in 1976. Aerial phot censuses have been used since 1986 to estimate population size. The WACH population increased throughout the 1980s and 1990s, peaking at 490,000 animals in 2003 (**Figure 3**). Beginning in 2003, the herd declined at an average annual rate of 7.1% from approximately 490,000 caribou to 200,928 caribou in 2016 (Caribou Trails 2014; Dau 2011, 2014, Parrett 2016). In 2017, the herd increased to an estimated 259,000 caribou (Parrett 2017a). However, part of this increase may have been due to improved photographic technology as ADF&G switched from film to higher resolution digital cameras. The 2019 population estimate was 244,000 caribou (Hansen 2019a). No phot census was completed in 2020, but ADF&G plans to conduct a census in 2021 (WACH Working Group 2020).

Between 1982 and 2011, the WACH population was within the liberal management level prescribed by the WACH Working Group (**Figure 3, Table 6**). In 2013, the herd population estimate fell below the population threshold for liberal management of a decreasing population (265,000), slipping into the conservative management level where it has remained. In 2020, no photocensus was completed, and the WACH Working Group voted to maintain the herd's status at the conservative declining level (WACH Working Group 2020).

Between 1970 and 2017, the bull:cow ratio exceeded Critical Management levels identified in the 2019 WACH Management Plan (**Figure 4**). However, the average annual number of bulls:100 cows was greater during the period of population growth (54:100 between 1976–2001) than during the recent period of decline (44:100 between 2004-2016). Additionally, Dau (2015) states that while trends in bull:cow ratios are accurate, actual values should be interpreted with caution due to sexual segregation during sampling and the inability to sample the entire population, which likely account for more annual variability than actual changes in composition.

Although factors contributing to the 2003-2016 decline are not known with certainty, increased adult cow mortality, and decreased calf recruitment and survival played a role (Dau 2011). Since the mid-1980s, adult mortality has slowly increased while recruitment has slowly decreased (**Figure 5**, Dau 2013). Prichard (2009) developed a population model specifically for the WACH using various demographic parameters and found adult survival to have the largest impact on population size, followed by calf survival and then parturition rates.

Calf production has likely had little influence on the population trajectory (Dau 2013, 2015). Between 1990 and 2003, the June calf:cow ratio averaged 66 calves:100 cows/year. Between 2004 and 2016, the June calf:cow ratio averaged 71 calves:100 cows/year (**Figure 6**). In June 2016, 85 calves:100 cows were observed, which approximates the highest parturition level ever recorded for the herd (86 calves:100 cows in 1992) (Dau 2016a).

Decreased calf survival through summer and fall and recruitment into the herd likely contributed to the recent population decline (Dau 2013, 2015). Fall calf:cow ratios indicate calf survival over summer. Between 1976 and 2017, the fall calf:cow ratio ranged from 35 to 59 calves:100 cows/year, averaging 47 calves:100 cows/year (**Figure 6**). Since 2008, ADF&G has recorded calf weights at Onion Portage as an index of herd nutritional status. In September 2015, calf weights averaged 100 lbs., the highest average ever recorded (Parrett 2015b).

Similarly, the ratio of short yearlings (SY, 10-11 months old caribou) to adults provides a measure of overwintering calf survival and recruitment. Between 1990 and 2020, SY:adult ratios ranged from 9-26 and averaged 18 SY:100 adults/year (**Figure 6**). SY:100 adult ratios were high from 2016-2018, ranging from 22-23 SY:100 adults (Dau 2016b, NWARAC 2019a). The 2020 SY:adult ratio was 17 SY:100 adults (WACH Working Group 2020).

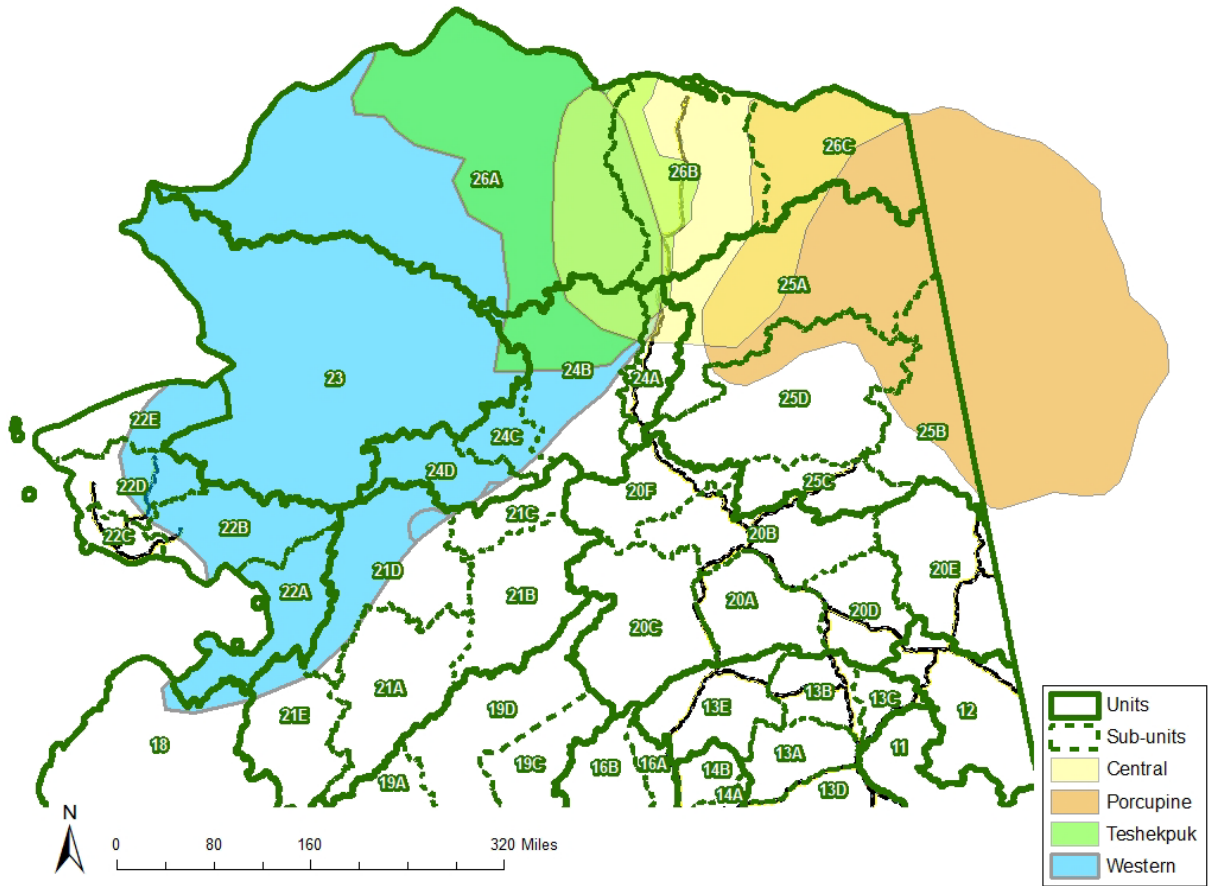
Cow mortality affects the trajectory of the herd (Dau 2011, 2013, Prichard 2009, NWARAC 2019a). The annual mortality rate of radio-collared adult cows increased from an average of 15% between 1987 and 2003 to 23% from 2004-2014 (**Figure 5**, Dau 2011, 2013, 2014, 2015). Mortality rates declined in

2015 and 2016, but then increased sharply in 2017. However, the increased mortality rate in 2017 may be due to a low and aging sample size as few caribou have been collared in the past two years (Prichard et al. 2012, NWARAC 2019a) and/or difficult weather conditions (Gurarie et al. 2020). Estimated mortality includes all causes of death including hunting (Dau 2011). Dau (2015) states that cow mortality estimates are conservative due to exclusion of unhealthy (i.e. diseased) and yearling cows. Dau (2013) attributed the high mortality rate for 2011-2012 (33%, **Figure 5**) to a winter with deep snows, which weakened caribou and enabled wolves to prey upon them more easily. Prior to 2004, estimated adult cow mortality only exceeded 20% twice, but exceeded 20% in 7 out of 9 regulatory years between 2004 and 2012 (**Figure 5**). These estimates are susceptible to collar sample size and how long the collars have been on individuals (Dau 2015, 2015b, Prichard et al. 2012).

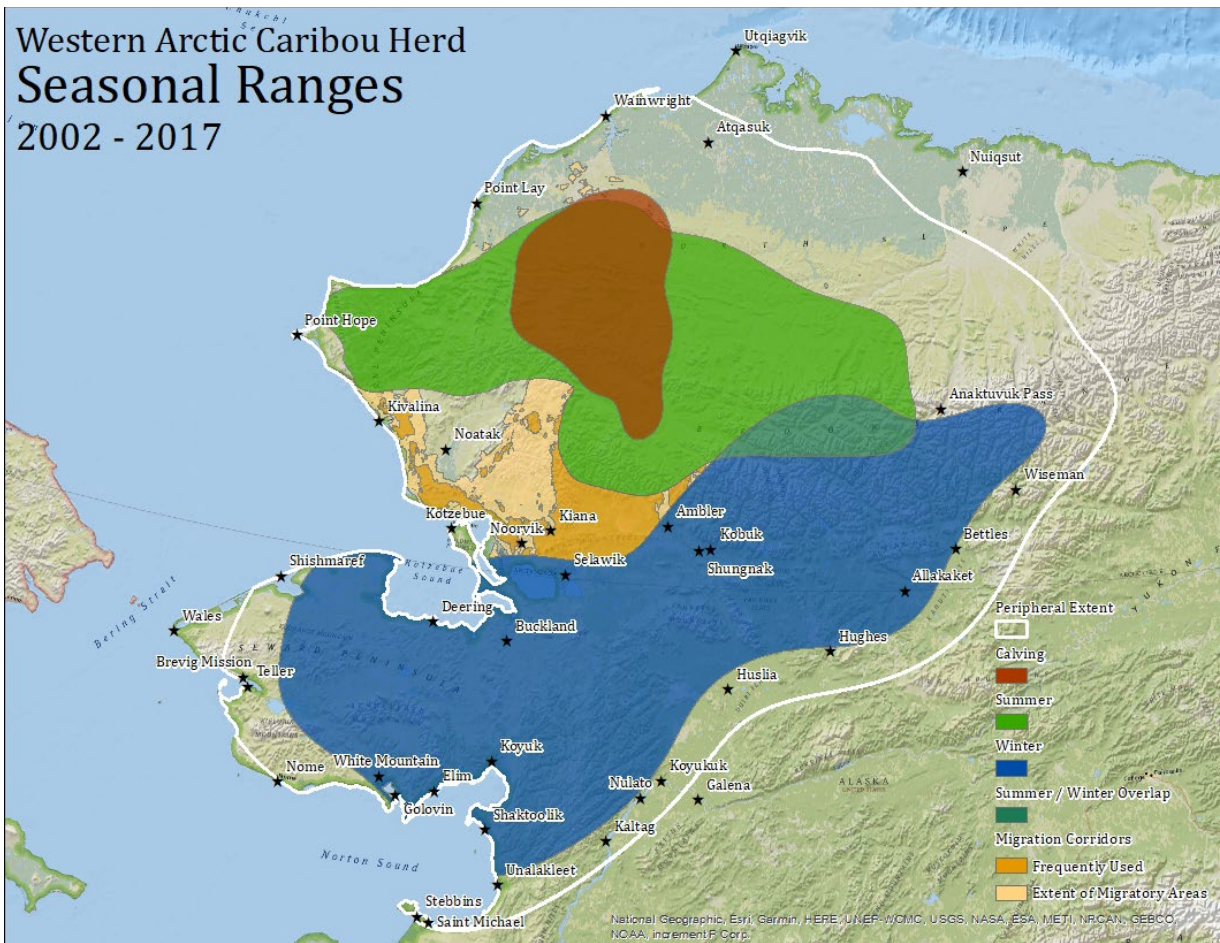
Far more caribou died from natural causes than from hunting between 1992 and 2012 (Dau 2013). Cow mortality remained constant throughout the year, but natural and harvest mortality for bulls spiked during the fall. However, as the WACH has declined and estimated harvest has remained relatively stable, the percentage of mortality due to hunting has increased relative to natural mortality. For example, during the period October 1, 2013 to September 30, 2014, estimated hunting mortality was approximately 42% and estimated natural mortality about 56% (Dau 2014). In previous years (1983–2013), the estimated hunting mortality exceeded 30% only once in 1997-1998 (Dau 2013). Additionally, Prichard (2009) and Dau (2015) suggest that harvest levels and rates of cows can greatly impact population trajectory. If bull:cow ratios continue to decline, harvest of cows may increase, exacerbating the current population decline.

Dau (2015) speculates that fall and winter icing events were the primary factor initiating the population decline in 2003. Increased predation, hunting pressure, deteriorating range condition (including habitat loss and fragmentation), climate change, and disease may also be contributing factors (Dau 2015, 2014, Joly et al. 2011). Joly et al. (2007) documented a decline in lichen cover in portions of the wintering areas of the WACH. Dau (2011, 2014) speculated that degradation in range condition is not thought to be a primary factor in the decline of the herd because animals have generally maintained good body condition since the decline began. Body condition is estimated using a subjective scale from 1-5. The fall body condition of adult females in 2015 was characterized as “fat” (mean= 3.9/5) with no caribou being rated as skinny or very skinny (Parrett 2015b). However, the body condition of the WACH in the spring may be a better indicator of the effects of range condition versus the fall when the body condition of the herd is routinely assessed and when caribou are in prime condition (Joly 2015, pers. comm.).

Caribou feed on a wide variety of plants including lichens, fungi, sedges, grasses, forbs, and twigs of woody plants. Arctic caribou depend primarily on lichens during the fall and winter, but during summer they feed on leaves, grasses and sedges (Joly and Cameron 2018, Miller 2003).



Map 6. Herd overlap and ranges of the WACH, TCH, CACH, and PCH.



Map 7. Western Arctic Caribou Herd seasonal range map, 2002-2017 (image from WACHWG 2019).

Table 6. Western Arctic Caribou Herd management levels using herd size, population trend, and harvest rate (WACH Working Group 2019).

Management and Harvest Level	Population Trend			Harvest Recommendations May Include:
	Declining Adult Cow Survival <80% Calf Recruitment <15:100	Stable Adult Cow Survival 80%-88% Calf Recruitment 15-22:100	Increasing Adult Cow Survival >88% Calf Recruitment >22:100	
Liberal	Pop: 265,000+	Pop: 230,000+	Pop: 200,000+	<ul style="list-style-type: none"> • Reduce harvest of bulls by nonresidents to maintain at least 30 bulls:100 cows • No restriction of bull harvest by resident hunters unless bull:cow ratios fall below 30 bulls:100 cows
	Harvest: 14,000+	Harvest: 14,000+	Harvest: 14,000+	
Conservative	Pop: 200,000-265,000	Pop: 170,000-230,000	Pop: 150,000-200,000	<ul style="list-style-type: none"> • Encourage voluntary reduction in calf harvest, especially when the population is declining • No cow harvest by nonresidents • Restriction of bull harvest by nonresidents • Limit the subsistence harvest of bulls only when necessary to maintain a minimum 30:100 bull:cow ratio
	Harvest: 10,000-14,000	Harvest: 10,000-14,000	Harvest: 10,000-14,000	
Preservative	Pop: 130,000-200,000	Pop: 115,000-170,000	Pop: 100,000-150,000	<ul style="list-style-type: none"> • No harvest of calves • Limit harvest of cows by resident hunters through permit hunts and/or village quotas • Limit the subsistence harvest of bulls to maintain at least 30 bulls:100 cows • Harvest restricted to residents only, according to state and federal law. Closure of some federal public lands to non-qualified users may be necessary
	Harvest: 6,000-10,000	Harvest: 6,000-10,000	Harvest: 6,000-10,000	
Critical	Pop: <130,000	Pop: <115,000	Pop: <100,000	<ul style="list-style-type: none"> • No harvest of calves • Highly restrict the harvest of cows through permit hunts and/or village quotas • Limit the subsistence harvest of bulls to maintain at least 30 bulls:100 cows • Harvest restricted to residents only, according to state and federal law. Closure of some federal public lands to non-qualified users may be necessary
	Harvest: <6,000	Harvest: <6,000	Harvest: <6,000	

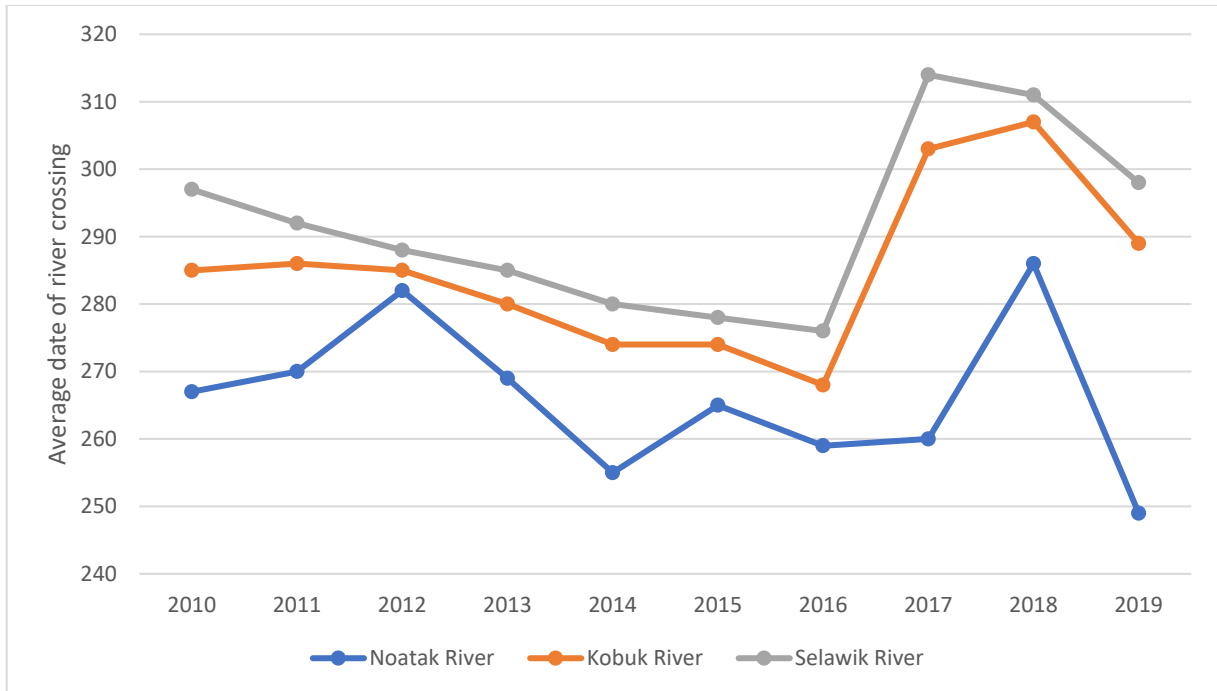


Figure 1. Average dates GPS collared caribou crossed the Noatak, Kobuk and Selawik Rivers during fall migration. Calendar dates were converted to numerical dates (e.g. February 1 would be 32). (Joly and Cameron 2020).

Table 7. Fall migration timing and prevalence of river crossing events by Western Arctic Herd caribou. Reported results are average date (standard deviation in number of days); percentage of collared cows crossing; and sample size results for generally southward 'fall' migration. Dates are for the first crossing if the individual re-crosses. Duration is the number days between Noatak and Selawik River crossings. Average (Ave) is for all years. (Table from Joly and Cameron 2020).

Year	Noatak River Crossing Date (SD); % Crossed; N	Kobuk River Crossing Date (SD); % Crossed; N	Selawik River Crossing Date (SD); % Crossed; N	Duration
2019	Sept 6 (42.7); 46.8%; 47	Oct 16 (13.3); 36.2%; 47	Oct 25 (14.4); 27.7%; 47	49
2018	Oct 13 (28.6); 56.0%; 50	Nov 3 (23.2); 20.0%; 50	Nov 7 (16.1); 16.0%; 50	35
2017	Sep 17 (40.0); 65.9%; 82	Oct 30 (22.5); 48.1%; 81	Nov 10 (18.2); 42.3%; 78	54
2016	Sept 15 (21.1); 73.3%; 75	Sep 24 (12.7); 58.1%; 74	Oct 2 (15.4); 52.1%; 73	17
2015	Sep 22 (29.5); 85.7%; 49	Oct 1 (22.3); 85.4%; 48	Oct 5 (21.0); 85.4%; 48	13
2014	Sep 12 (19.9); 88.9%; 45	Oct 1 (15.8); 84.8%; 45	Oct 7 (15.6); 86.4%; 44	25
2013	Sep 26 (16.9); 100%; 35	Oct 7 (17.4); 91.4%; 35	Oct 12 (16.4); 88.6%; 35	16
2012	Oct 8 (20.8); 84.8%; 33	Oct 11 (17.7); 78.8%; 33	Oct 14 (18.1); 70.0%; 33	6
2011	Sep 27 (37.2); 74.4%; 39	Oct 13 (27.0); 71.8%; 39	Oct 19 (27.4); 61.5%; 39	22
2010	Sep 24 (16.4); 96.7%; 30	Oct 12 (17.6); 76.7%; 30	Oct 24 (11.7); 62.1%; 29	30
Ave	Sep 23 (11.4); 77.3%; 49	Oct 12 (12.5); 65.1%; 48	Oct 19 (13.4); 59.2%; 48	27

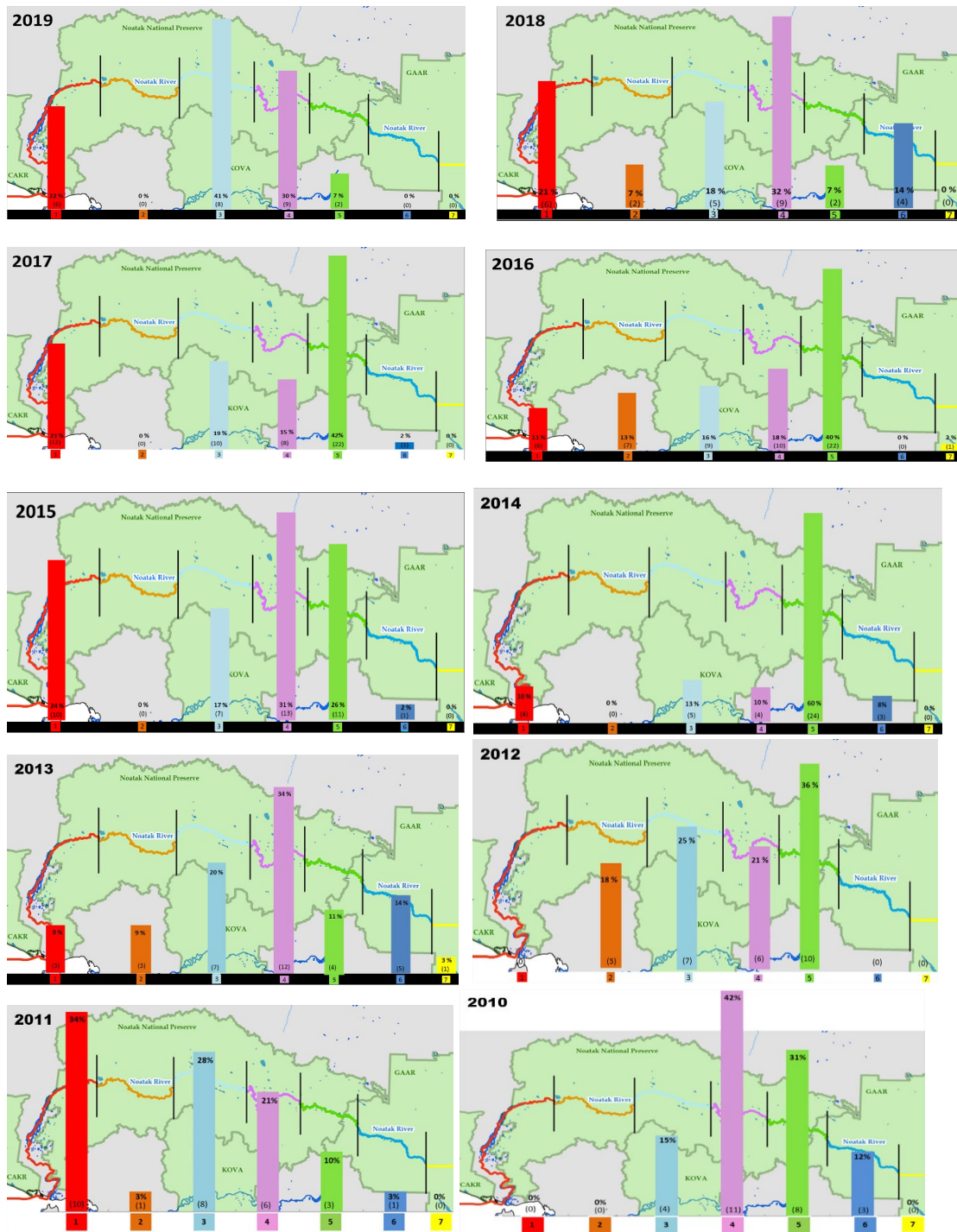


Figure 2. 2010-2019 distribution of caribou crossing the Noatak River during fall. Histograms depict where collared female caribou crossed the Noatak River, generally from north to south, on their fall migration. Relative percentages (top number) and the absolute number (middle number) of caribou are provided. The river is divided into seven (lowest number) color-coded segments which are displayed in the background. The middle five segments are 100 river kilometers long, while the westernmost segment (red) is 200 km (before extending into the Chukchi Sea) and the easternmost (yellow) runs as far east as WACH caribou are known to migrate (Joly and Cameron 2020).

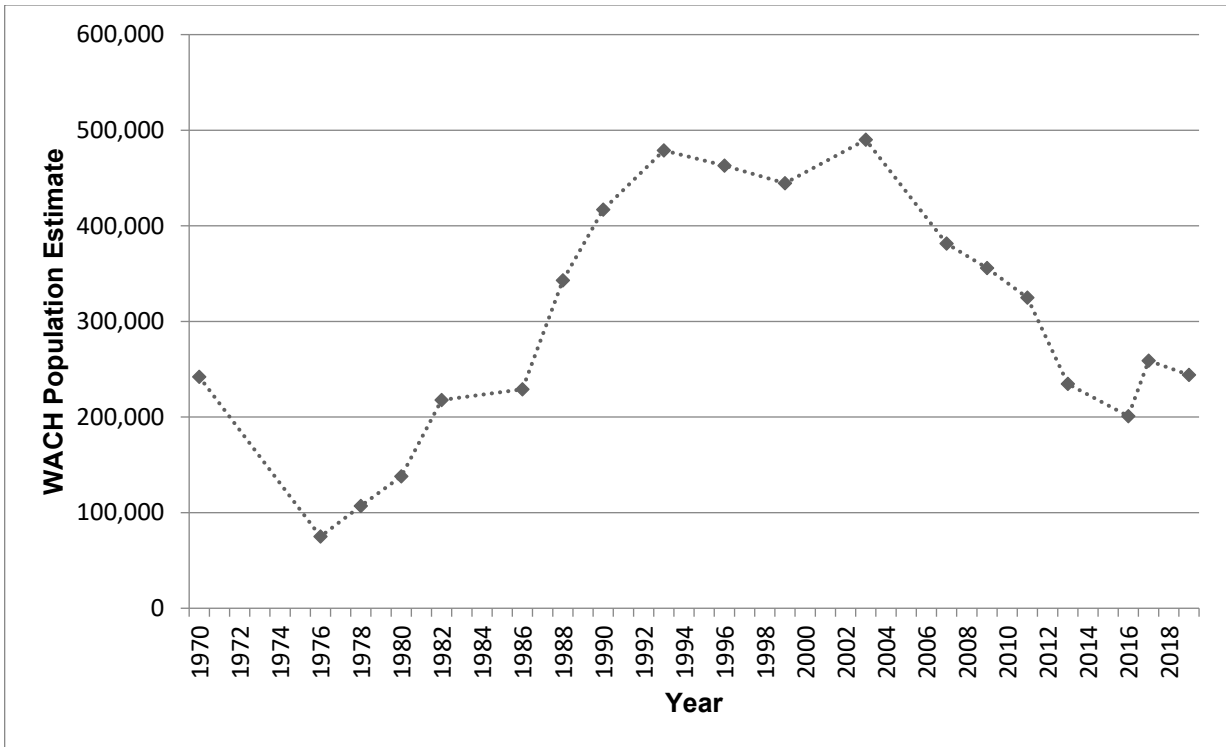


Figure 3. The WACH population estimates from 1970–2017. Population estimates from 1986–2017 are based on aerial photographs of groups of caribou that contained radio-collared animals (Dau 2011, 2013, 2014, Parrett 2016, 2017a, Hansen 2019a).

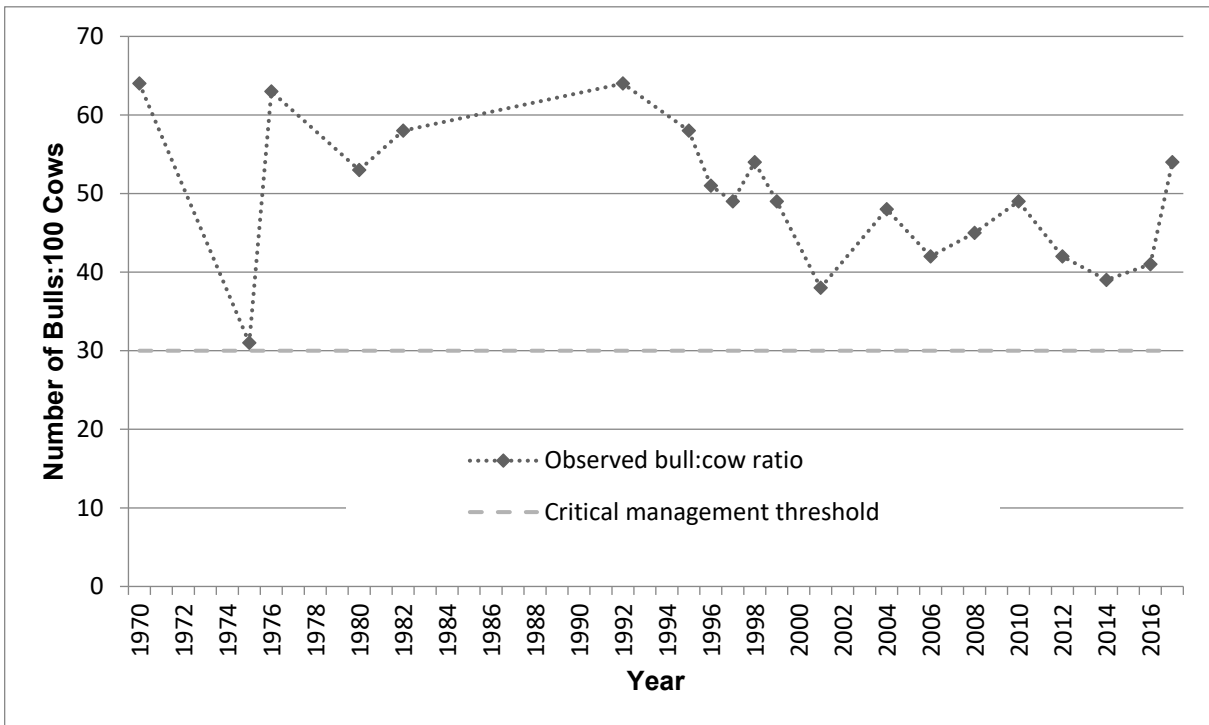


Figure 4. Bull:Cow ratios for the WACH (Dau 2015, ADF&G 2017c, Parrett 2017a).

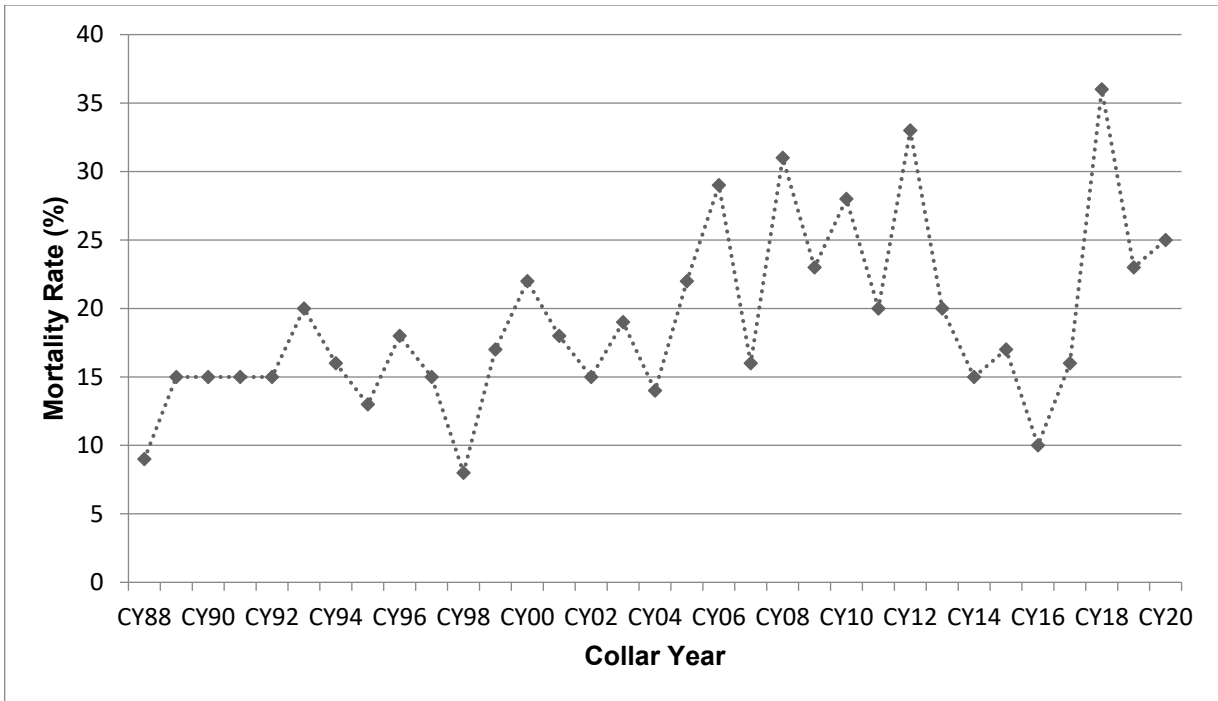


Figure 5. Mortality rate of radio-collared cow caribou in the Western Arctic caribou herd (Dau 2013, 2015, 2016b, NWARAC 2019a, WACHWG 2020). Collar Year = 1 Oct-Sep 30.

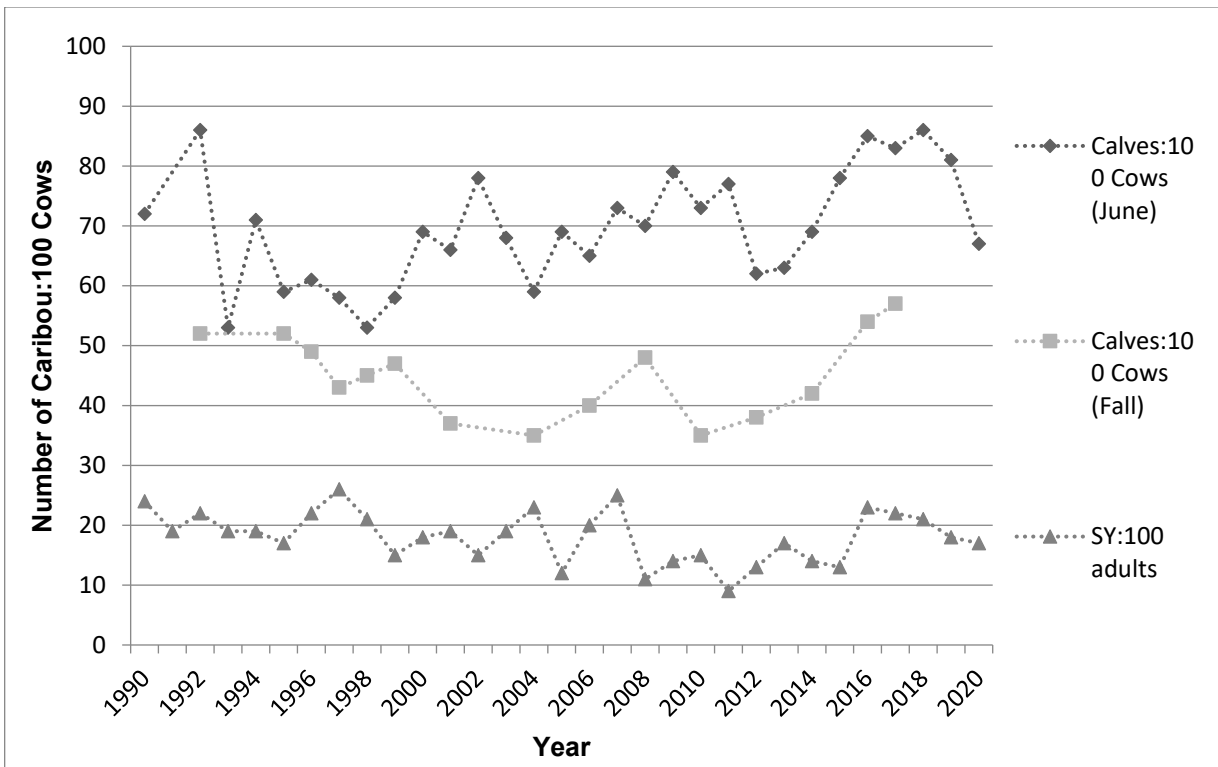


Figure 6. Calf:cow and short yearling (SY):adult ratios for the WACH (Dau 2013, 2015, 2016a, ADF&G 2017c, Parrett 2017a, NWARAC 2019a, WACHWG 2020). Short yearlings are 10-11 months old caribou.

Unit 23 Moose

Moose first appeared in eastern Unit 23 during the 1920s, expanding their range from the east. Over the next several decades, moose spread northwest across Unit 23 to the Chukchi Sea coast (**Map 8**) (LeResche et al. 1974, Tape et al. 2016, Westing 2012). The Unit 23 moose population grew through the late-1980s (Westing 2012). This rise in population was followed by severe winters and extensive flooding from 1988-1991 which, in conjunction with predation by brown bears and wolves, reduced the population and overall moose density (Westing 2012). State management objectives for moose in Unit 23 include (Saito 2014):

- Maintain a unit-wide adult moose population of 8,100-10,000 moose
- Noatak River and northern drainages 2,000-2,300 moose
- Upper Kobuk River drainage 600-800 moose
- Lower Kobuk River drainage 2,800-3,400 moose
- Northern Seward Peninsula drainages 700-1,000 moose
- Selawik River drainage 2,000-2,500 moose
- Maintain a minimum fall ratio of 40 bulls:100 cows, except in the Lower Kobuk where bull:cow ratios are skewed by its disproportional use by maternal cows. The higher bull:cow ratio goals are due to the low densities and wide distribution of moose throughout Unit 23 (Saito 2014).

The NPS, in cooperation with ADF&G, conducts spring population and fall composition surveys for moose in Unit 23. Surveys are conducted within census areas on a rotating basis with each census area being surveyed approximately every five years (**Map 9**, Alaska Board of Game 2017). Census areas have fluctuated throughout the years due to time and financial constraints as well as evolving survey techniques (Saito 2017, pers. comm.). In 2012, the Squirrel River drainage was moved from the Lower Noatak census area to the Lower Kobuk census area (Saito 2014). In 2014, the Upper Kobuk census area was expanded to include previously unsurveyed areas (Saito 2017, pers. comm.). Current census areas are static for the foreseeable future.

Moose density is primarily influenced by local factors such as snow depth, fire frequency, forage availability, and predators (Gasaway et al. 1992, Stephenson et al. 2006, Boertje et al. 2009, Street et al. 2015). Therefore, moose in Unit 23 are not evenly distributed across the landscape, with some drainages experiencing higher densities of moose than others. Between 2001 and 2017, total moose densities ranged across census areas from 0.03-0.7 moose/mi² while adult moose densities ranged from 0.03-0.59 moose/mi² (**Table 8**, Robison 2017, Saito 2014, 2016, pers. comm.).

Since 2009, the estimated moose population in almost every census area has declined (**Figure 7**). (Note: While the population estimate for the Selawik River drainage survey area increased between the 2016 and 2021 surveys, the increase is very small and still well below the 2011 estimate. The apparent decline in the Upper Kobuk is not statistically significant). The most recent population estimates are also well below State population objectives in every area except the Upper Kobuk, which just meets its lower State population objective (**Table 9**, Saito 2014, 2016a, pers. comm., Robison 2017, NWARAC

2019a). An estimated 70% of the Unit 23 moose population is found in the Selawik, Lower Kobuk, and Lower Noatak River census areas (NWARAC 2018a). All three of these areas have experienced substantial population declines. (Note: both the old (smaller) and new (larger) Upper Kobuk census areas were surveyed in 2014. The old census area data is depicted in **Figure 7** for better comparability across years while the new census area data is listed in **Table 9**).

In 2016 and 2017, ADF&G provided a unit-wide population estimate of 7,500 moose (ADF&G 2017a). In 2018, ADF&G estimated the Unit 23 moose population at 6,300 moose, representing a 16% decline (NWARAC 2018a). The most recent unit-wide moose population estimate was reported at 5,600 moose in a comment on WSA19-04 submitted by ADF&G. This represented an additional 11% decline in the population since the 2018 estimate. The Council and the public have also repeatedly reported at recent meetings that there are noticeably fewer moose than in the past (NWARAC 2017a, 2018a).

ADF&G conducts composition surveys in the fall to estimate bull:cow and calf:cow ratios. In 2008, ADF&G changed the methodology of fall composition surveys, and data are not comparable between survey methods (Saito 2014). From 2004-2007, Unit 23 bull:cow ratios averaged 39 bulls:100 cows. Since 2008, bull:cow ratios have ranged across survey areas from 34-54 bulls:100 cows, although composition surveys are conducted sporadically (**Table 10**) (Saito 2014, 2016a pers. comm., 2018 pers. comm.). In all census areas with multiple composition surveys since 2008, bull:cow ratios have declined and are below or near the State management objectives (**Table 10**). However, composition surveys are not a random sampling and are likely biased toward higher bull:cow ratios. This is because cows, particularly cows with calves, prefer more enclosed habitat for predator protection, which also makes them more difficult to see by aerial surveyors (Fronstin 2021, pers. comm.).

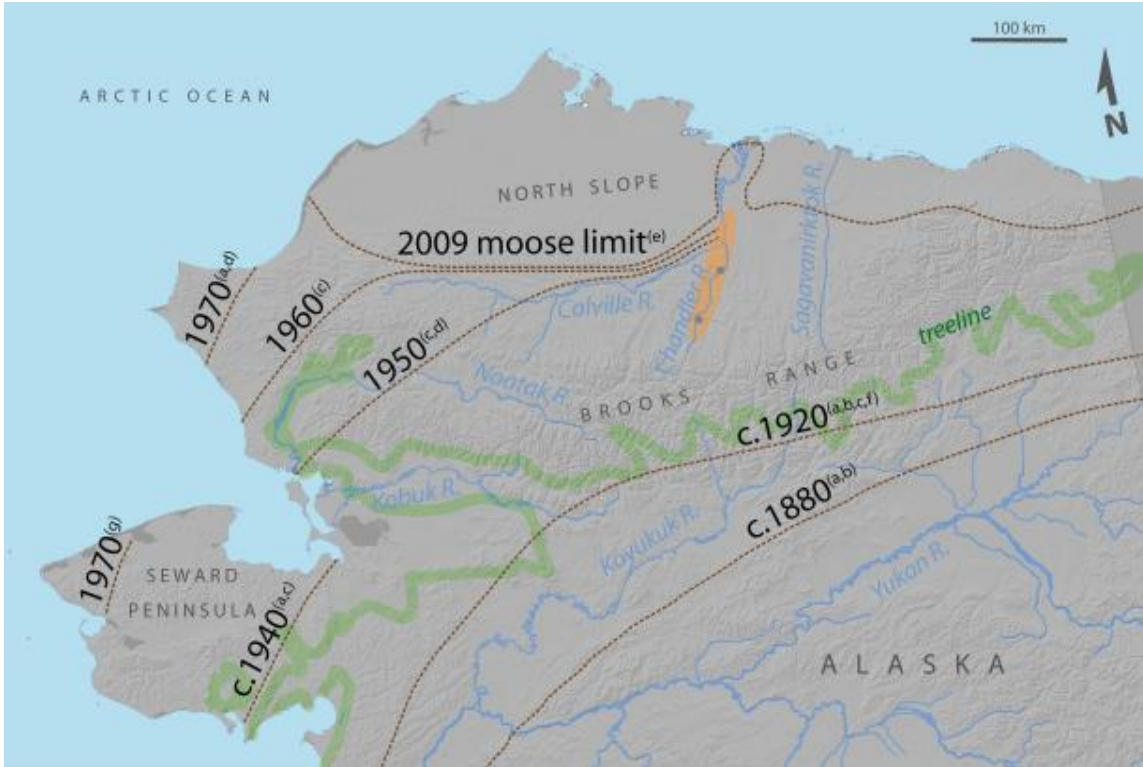
Fall calf:cow ratios of < 20 calves:100 cows, 20-40 calves:100 cows, and > 40 calves:100 cows may indicate declining, stable, and growing moose populations, respectively (Stout 2010). Since 2008, calf:cow ratios have ranged across survey areas from 4-24 calves:100 cows (**Table 10**) (Saito 2014, 2016a pers. comm., 2018 pers. comm.). These low calf:cow ratios suggest that the Unit 23 moose population is declining, with the possible exception being the Lower Kobuk survey area which has a larger percentage of maternal cows. During spring population surveys, ratios of calves:100 adults are also estimated as a measure of recruitment. Between 2001 and 2021, ratios ranged across survey areas from 7-23 calves:100 adults (Saito 2016a, pers. comm., 2018, pers. comm., Robison 2017, NWARAC 2019a, Fronstin 2021, pers. comm.). No clear trend is detectable with ratios increasing over time in some survey areas and decreasing or fluctuating in others.

While predation by brown bears, black bears, and wolves affects moose population dynamics in Unit 23, the overall level of impact of predators in relation to other factors such as weather, snow depth, disease, and human harvest is unknown, although deep snow and icing events limit moose movements, increasing their susceptibility to predation (Saito 2014, Fronstin 2018 pers. comm.). Relatively high moose densities and calf:cow ratios in the Kobuk River delta, where predator populations are lower due to its proximity to year-round human travel routes, suggest predators may be affecting moose in the more remote portions of the unit and that cows with calves may travel to the delta for safety (Saito

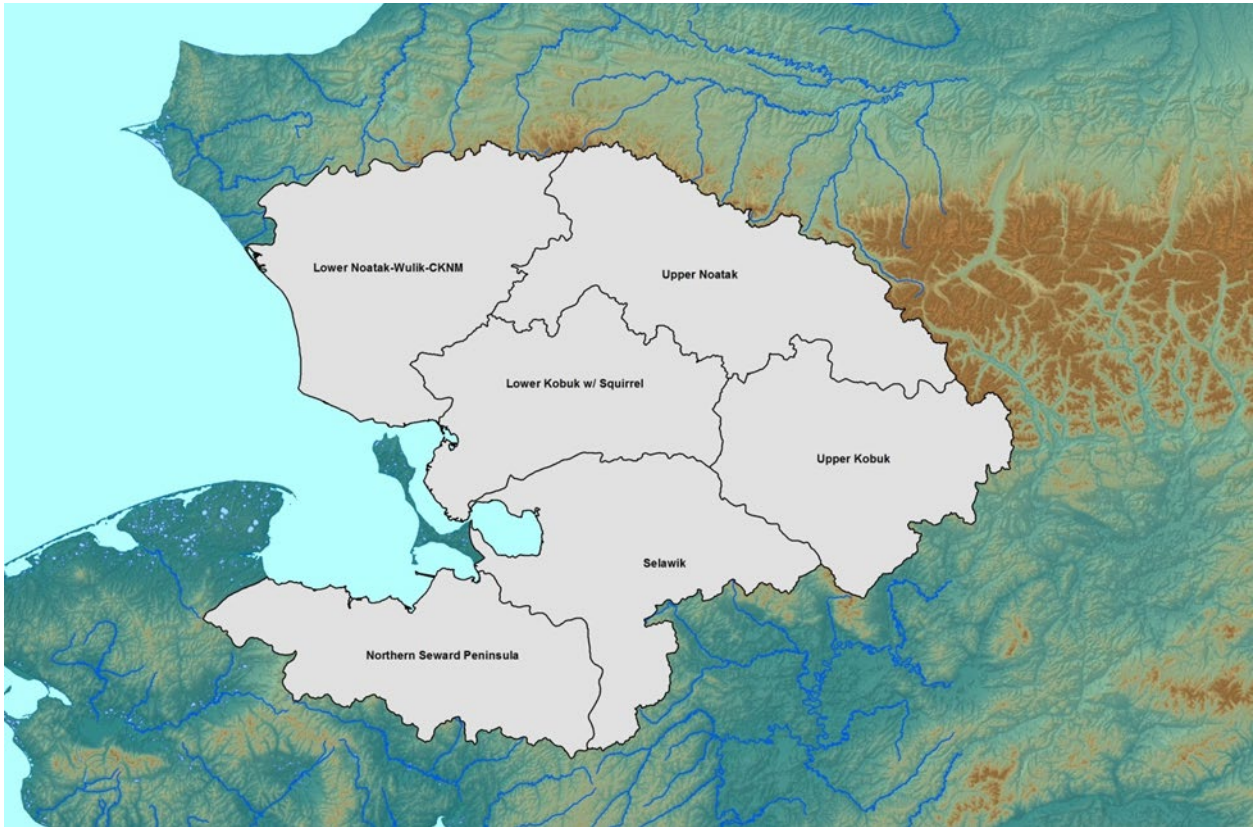
2014, Fronstin 2021, pers. comm.). However, preliminary results from a 3-year (2018-2020) calf survival study in the Lower Kobuk drainage indicate survival rates of around 65% for the first year with 77% of mortalities occurring from bear predation (108 out of 140 mortalities), which is comparable to other moose populations in Alaska (Hansen 2021, NWARAC 2018b). Further, the Lower Kobuk is primarily composed of the Kobuk River delta, which provides extensive riparian habitat. Thus, the situation mirrors the results from neighboring Unit 24, where moose productivity was higher where vegetative productivity was higher (Joly et al. 2017). As humans primarily harvest bull moose and bull:cow ratios have not substantially declined across years despite substantial population declines, human harvest may not be a limiting factor (NWARAC 2017b).

As moose are on the edge of their range in Unit 23, lower moose densities and habitat limitation are expected. However, the Unit 23 moose population does not appear to be nutritionally limited in the lower Kobuk survey area (Hansen 2021). A 2017 browse survey, completed in the Lower Kobuk, suggested that winter forage is not a limiting factor for moose populations with browse removal rates of only 19% (Hansen 2021, NWARAC 2018a). Twinning rates are another indicator of habitat and food limitations. From 2016-2020, 36-55% of cows surveyed in the Lower Kobuk had twins, further suggesting food is not a limiting factor and the population is not experiencing a density-dependent response (NWARAC 2018a). However, as stated above, the lower Kobuk area contains higher quality habitat and correspondingly higher moose densities than the rest of the unit.

Moose rely on willow and shrub habitats for browsing and for cover from predators. Shrub and willow productivity, height, and cover have increased and expanded in Unit 23 in response to rising average temperatures (Tape et al. 2016). Taller vegetation provides more suitable cover and increased available forage above the snowpack (Tape et al. 2016). Wildfire (the primary driver of boreal forest succession) frequency and shrub habitat is also forecasted to increase in Northern Alaska as the Arctic climate warms, resulting in more moose habitat in Unit 23 in the future (Joly et al. 2012, Swanson 2015). During a 2005 habitat survey in Unit 23, willows did not appear to be over-browsed by moose (Westing 2012).



Map 8. Temporal moose distribution changes in northern Alaska (figure from Tape et al. 2016).



Map 9. ADF&G moose census areas in 2017 (figure from Saito 2017, pers. comm.).

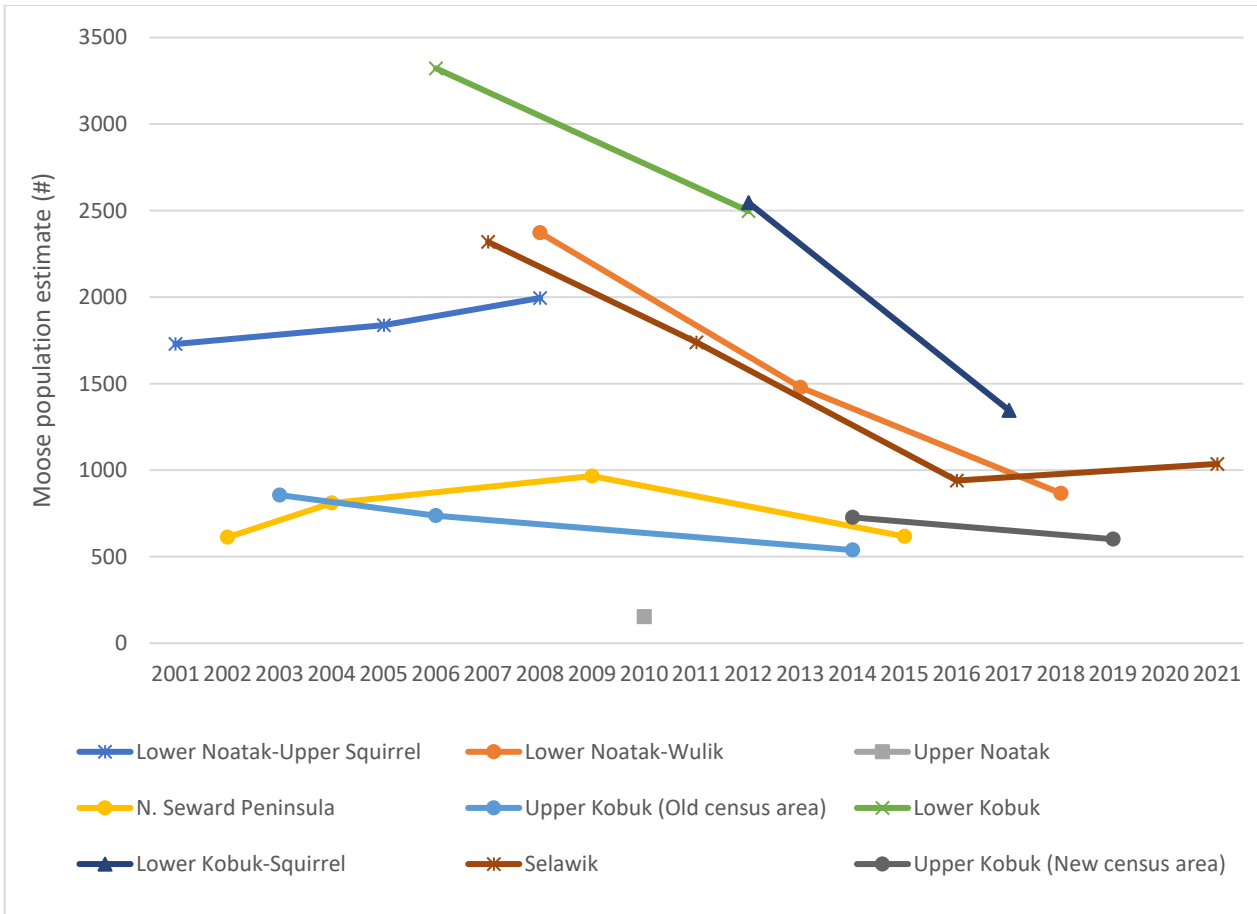


Figure 7. Total moose population estimates from 2001 to 2019 by census area. The old Upper Kobuk and new Upper Kobuk census area population estimates are both shown here (Fronstin 2021, pers. comm.).

Table 8. Moose population data collected during spring population census surveys in Unit 23 since 2001. The Upper Kobuk was surveyed in 2014 using both the older census area and the updated census area (Fronstin 2021, pers. comm.).

Census Area	Year	Moose Observed	Total Moose Estimated	Census Area (mi ²)	Area Surveyed (mi ²)	Total Density (/mi ²)	Adult Density (/mi ²)	Calves:100 adults
Lower Noatak-Upper Squirrel	2001	709	1,729	5,230.2	832	0.33	0.3	10
	2005	575	1,838	5,349.7	915.5	0.34	0.3	13
	2008	596	1,995	5,290.0	1,241.7	0.38	0.34	13
Lower Noatak-Wulik	2008	685	2,372	7,161.1	1,515.4	0.33	0.29	14
	2013	413	1,478	6,404.5	1,310.2	0.23	0.21	11
	2018	489	866	6,404.5	2,325.4	0.14	0.12	14
Upper Noatak	2010	100	153	4,485.6	1,972.1	0.03	0.03	12
Northern Seward Peninsula	2002	520	612	5,888.5	1,220.7	0.1	0.1	7
	2004	610	810	5,882.9	1,934.3	0.14	0.12	12
	2009	293	966	5,773.2	1,271.2	0.17	0.16	8
	2015	310	617	5,767.8	1,791.2	0.11	0.09	15
	2020	433	--	--	--	--	--	22
Upper Kobuk	2003	252	856	4,001.5	900.6	0.21	0.19	12
	2006	219	737	4,001.5	973.7	0.18	0.16	15
	2014	136	538	3,990.8	839.2	0.13	0.13	7
	2014	186	727	5,056.8	1,082.5	0.14	0.13	7
	2019	328	601	5,056.8	2,139.1	0.12	0.1	23
Lower Kobuk	2006	1,540	3,322	4,870.5	1,468.1	0.68	0.58	19
	2012	789	2,497	4,870.5	1,457.6	0.51	0.48	8
Lower Kobuk-Squirrel	2012	789	2,546	5,338.0	1,290.8	0.48	0.44	8
	2017	796	1,346	5,338.0	2165.2	0.25	0.22	15
Selawik	2007	678	2,319	6,580.1	1,845.2	0.35	0.32	10
	2011	448	1,739	6,559.0	1,289.1	0.27	0.24	11
	2016	520	940	6,559.0	2,273.0	0.14	0.13	14
	2021	--	1,036	--	--	--	--	10

Table 9. Comparisons across Unit 23 study areas of the most recent moose population estimates, population objectives, and harvestable surpluses. The harvestable surplus is calculated as 6% of the population. The Upper Kobuk census area represents the updated census area that was created in 2014. The spring 2017 and 2018 surveys in the Lower Kobuk and Lower Noatak-Wulik survey areas, respectively are incorporated in the table, but not into the extrapolated population total. Extrapolated total incorporates estimated populations in non-surveyed portions of Unit 23 (Robison 2017, Saito 2016a pers. comm., 2018 pers. comm., NWARAC 2018a, 2019, Fronstin 2021, pers. comm.).

Unit 23 Study Area	Most recent survey year	Population Estimate	Population Objective	Estimated Harvestable Surplus
Noatak River Drainages	2010 (Upper), 2018 (Lower)	1,019	2,000- 2,300	61
Lower Kobuk River Drainage	2017	1,346	2,800- 3,400	81
Upper Kobuk River Drainage	2019	601	600-800	36
Selawik River Drainage	2021	1,036	2,000- 2,500	62
Northern Seward Peninsula	2015	617	700-1,000	37
Total		4,619		277
Extrapolated 2017 Total		7,500		450
Extrapolated 2018 Total		6,300		378
Extrapolated 2019 Total		5,600		336

Table 10. Bull:cow and calf:cow ratios in fall composition surveys conducted after 2007 (Saito 2014, 2016a pers. comm., 2018 pers. comm., Fronstin 2021, pers. comm.).

Survey Area	Year	Bulls:100 Cows	Calves:100 Cows
Selawik	2008	54	18
	2010	47	19
	2015	43	20
Lower Kobuk	2011	45	15
	2017	38	34
Lower Noatak	2013	53	4
	2018	41	17
Northern Seward Peninsula	2009	53	4
	2020	52	
Seward Peninsula	2014	34	16

Unit 26A Moose

Prior to the 1940s, moose were scarce along the North Slope. Subsequently, populations expanded along the limited riparian habitat of the major drainages (LeResche et al. 1974) and have become well established in the southeast portion of Unit 26A. The northern extent of the moose populations on the North Slope is thought to be limited by habitat availability. The moose in these areas tend to concentrate along riparian corridors where browse is most abundant. Nearly all the moose are confined to the riparian habitat along the large river corridors during the winter but during summer many of the moose disperse north across the coastal plain and south into the foothills of the Brooks Range (Klimstra and Daggett 2020).

Recommended State management objectives for moose in Units 26A are (Klimstra and Daggett 2020):

- Manage for a population of 600-800 moose
- Manage for a fall bull:cow ratio of $\geq 30:100$
- Manage for a fall calf:cow ratio of $\geq 30:100$
- Manage for \geq to 20% short yearlings in spring

Since the late 1970s, ADF&G has conducted spring aerial surveys in all the major drainages of Unit 26A to assess population status and recruitment of short yearlings (10 to 11 months old) (Carroll 2000, 2010). These surveys produce a direct population count because the treeless landscape results in a sightability factor of one, and the deep spring snows concentrate moose in riparian corridors, which are all systematically surveyed. Of note, all the population counts included the Ikillik River, which is part of the Colville River drainage, but is in Unit 26B (Carroll 2010). Between 1970 and 2021, the Unit 26A moose population fluctuated, ranging from 294-1,535 moose (**Table 11**). Currently, the Unit 26A moose population is relatively low, but may be rebounding. Over the same time period, the percentage of short-yearlings ranged from 1-25% of the Unit 26A moose population (Klimstra and Daggett 2020, Daggett 2021, pers. comm.) (**Table 11**).

The periods of population declines resulted from poor calf survival and high adult mortality. Moose mortality was likely due to malnourishment, bacterial diseases, mineral deficiencies, predation from wolves and bears, weather factors, and competition with snowshoe hares for browse. In 2008, weights of short yearlings averaged 322 pounds, which was the lightest recorded in Alaska and an indicator of malnourishment. Human harvest of moose is very low and likely does not significantly influence abundance of the Unit 26A moose population (Klimstra and Daggett 2020).

ADF&G also periodically conducts fall composition surveys. Between 2010 and 2014, bull:cow ratios ranged from 42-97 bulls:100 cows, exceeding the State population goals. Over the same time period, the percentage of calves in the population ranged from 7-18% with the lowest calf:cow ratio occurring in 2014 (Klimstra and Daggett 2020). No composition surveys have been conducted since 2014 (Daggett 2021, pers. comm.).

Table 11. Moose observed during spring aerial censuses conducted in Unit 26A (Carroll 2010, OSM 2013, Klimstra and Daggett 2020, Daggett 2021, pers. comm.).

Year	Moose observed			% Short yearlings
	Adults	Short yearlings	Total ^a	
1970	911	308	1,219	25
1977	991	267	1,258	21
1984	1,145	302	1,447	21
1991	1,231	304	1,535	20
1995	746	11	757	1
1999	274	52	326	16
2002	502	74	576	13
2005	863	185	1,048	18
2008	1,023	157	1,180	13
2011 ^b	545	64	609	11
2014	290	4	294	1
2017	285	63	348	17
2021	349	88	437	20

^a Includes moose counted on the Itkillik River which is part of the Colville River drainage, but is in Unit 26B. In 2008, there were 64 moose, including 4 calves on the Itkillik River (Carroll 2010).

^b Information provided by Geoff Carroll (Carroll 2013, pers. comm.)

Habitat

Moose in Unit 26, which are on the extreme edge of their distribution, are limited by marginal habitat and thus are more vulnerable to environmental variations than populations in more optimal locations and habitat. During the winter the moose in this area are confined to the riparian areas on the coastal plain. During the summer a majority of them will disperse from the river bottoms but usually remain near riparian habitat and during the fall, when the snow begins to accumulate, they move back to the riparian corridors of the large river systems (Carroll 2010).

A habitat study was initiated in April 2008 on the Colville River in areas where moose browsed between the mouth of the Killik River and Umiat to determine the quantity of browse available to moose in the riparian area in the winter. Results indicated a 12% browse removal rate, which was similar to other areas in the State which have moderate browsing and twinning rates. Thus it appears that the poor survival rate of collared animals, low weights of the short-yearlings, and apparent starvation of several moose during the 2008 capture season was not related to the quantity of browse in Unit 26A (Carroll 2010). Quantity and availability (willows covered up by snow drifts), accessibility (effects of deep snow on access), and

increased tannins in the willows (in response to snowshoe hares eating the bark) are factors which could contribute to malnourishment seen in some of the moose. In 2009, samples were taken to assess the quality of the browse but the results are not currently available (Carroll 2010).

Harvest History

Western Arctic Caribou Herd

The State manages the WACH on a sustained yield basis (i.e. managing current harvests to ensure future harvests). The harvestable surplus when the WACH population trend is declining is calculated as 6% of the estimated population (WACH Working Group 2011, Parrett 2017b, pers. comm.). In 2017, the WACH harvestable surplus was 15,540 caribou (6% of 259,000 caribou). Assuming the herd population remained stable in 2018 and 2019, the harvestable surplus remains 15,540 caribou. This is a substantial increase from the 2016 harvestable surplus of 12,056 caribou when harvest likely exceeded sustainable levels. However, there is substantial uncertainty in harvestable surplus estimates (Parrett 2015a, Dau 2015). Of particular concern is the overharvest of cows, which has probably occurred since 2010/11 (Dau 2015). Dau (2015:14-29) states, “even modest increases in the cow harvest above sustainable levels could have a significant effect on the population trajectory of the WACH.”

Caribou harvest by local hunters is estimated from community harvest surveys, if available, and from models developed by A. Craig with ADF&G’s Division of Wildlife Conservation Region V. These models incorporate factors such as community size, availability of caribou, and per capita harvests for each community, which are based on mean values from multiple community harvest surveys (Dau 2015). In 2015, Craig’s models replaced models developed by Sutherland (2005), resulting in changes to local caribou harvest estimates from past years. While Craig’s models accurately reflect harvest trends, they do not accurately reflect actual harvest numbers (Dau 2015). (Note: no model accurately reflects harvest numbers). This analysis only considers the updated harvest estimates using Craig’s new model as cited in Dau (2015). Caribou harvest by nonlocal residents and nonresidents are based on harvest ticket reports (Dau 2015). Hunters considered local by ADF&G are functionally identical to Federally qualified subsistence users (e.g. Residents of St. Lawrence Island are technically Federally qualified subsistence users, but do not frequently harvest Western Arctic caribou) (**Map 2**).

From 1999–2017, the average estimated total harvest from the WACH was 14,119 caribou/year, ranging from 11,729–16,219 caribou/year (Hansen 2020, pers. comm., **Figure 8**). These harvest levels are within the conservative harvest level specified in the WACH Management Plan (**Table 6**). In 2015 and 2016, total local harvest estimates were 14,360 caribou and 14,971 caribou, respectively (Hansen 2019b, pers. comm.). While these harvest estimates are below the 2017–2019 harvestable surpluses, they exceed the 2016 harvestable surplus. Of note, harvest estimates do not include wounding loss, which may be hundreds of caribou (Dau 2015).

Local hunters account for approximately 95% of the total WACH harvest and residents of Unit 23 account for approximately 58% of the total harvest on average (**Figure 9**, ADF&G 2017c). Comparison of caribou harvest by community from household survey data (**Table 15**) with **Figure 2** demonstrates that local community harvests parallel WACH availability rather than population trends. For example, Ambler

only harvested 325 caribou when the WACH population peaked in 2003 but harvested 685 caribou in 2012 when most of the WACH migrated through eastern Unit 23. Similarly, Noatak only harvested 66 caribou in 2010 when no GPS-collared caribou migrated through western Unit 23. Harvest increased substantially (360 caribou) the following year when 37% of the GPS-collared caribou (and thus, a greater proportion of the WACH) migrated through western Unit 23.

Between 1998 and 2018, annual reported caribou harvest in Unit 23 ranged from 168-676 caribou (**Figure 10**). Over the same time period, reported harvest by non-Federally qualified users ranged from 131-657 caribou. The lowest reported harvest occurred in 2016 when all Federal public lands in Unit 23 were closed to non-Federally qualified users, but before harvest reporting was required for Federally qualified subsistence users living locally. Regardless, local compliance with reporting mandates is considered low but increasing. In 2017, the BOG began requiring registration permits, which is reflected in the greater number of reported caribou harvest by Federally qualified subsistence users (**Figure 10**). On average, 76% of WACH caribou harvested by nonlocals are harvested in Unit 23 (Dau 2015). Between 2016, when Federal lands closure began, and 2019, reported caribou harvest by non-local hunters in Unit 23 averaged 161 caribou (WinfoNet 2018, 2019).

From 1999-2013, 72% of nonlocal hunters on average accessed the WACH by plane. Most nonlocal harvest (85-90%) occurs between Aug. 25 and Oct. 7. In contrast, most local, subsistence hunters harvest WACH caribou whenever they are available using boats, 4-wheelers, and snowmachines (Dau 2015, Fix and Ackerman 2015). In Unit 23, caribou have historically been available during fall migration, but this has no longer been the case in recent years; caribou migration has occurred later in fall, resulting in subsistence harvest also occurring later, which in turn contributes to food insecurity.

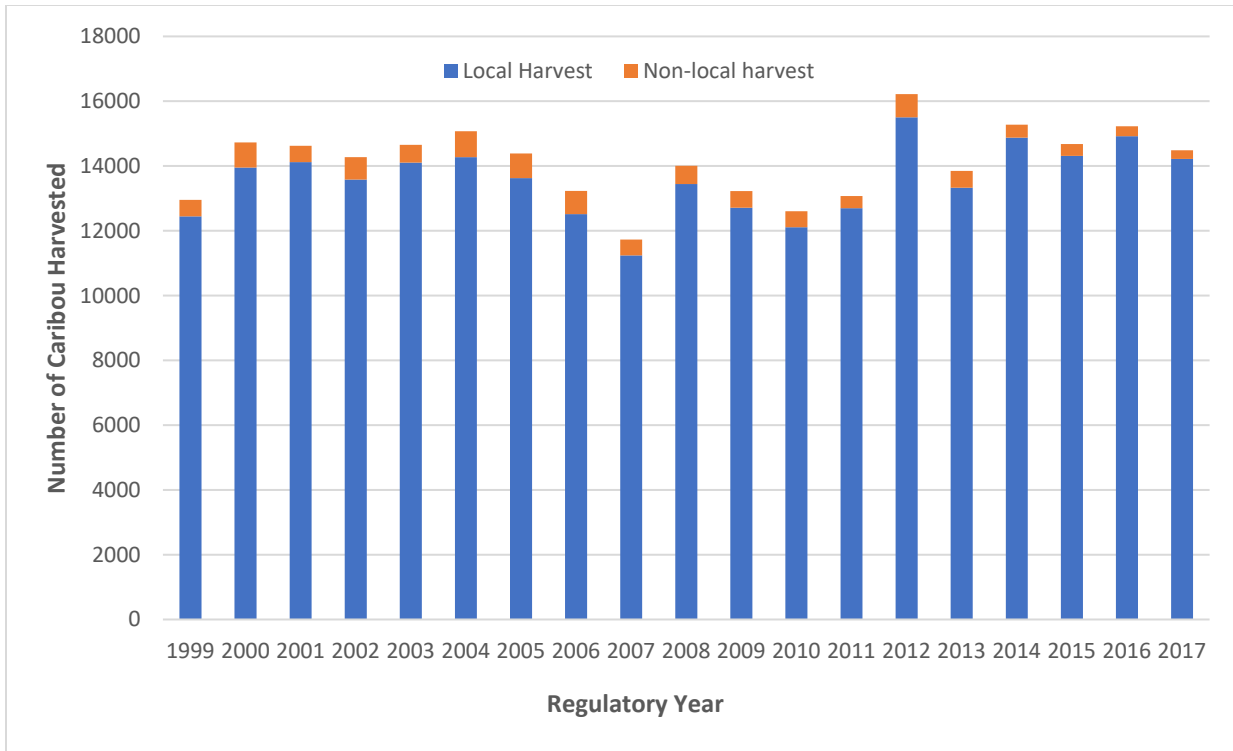


Figure 8. Estimated number of caribou harvested from the WACH by residency (Hansen 2020, pers. comm.). Local harvest is an estimate derived from models; non-local harvest is from harvest reports.

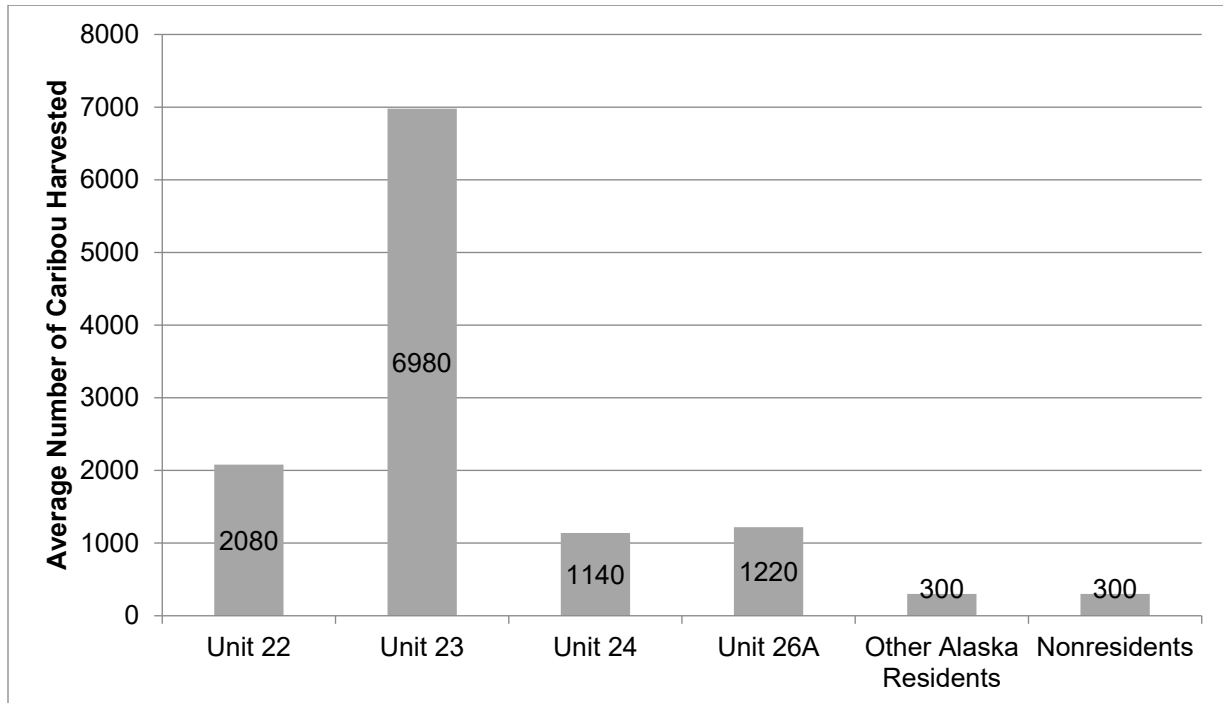


Figure 9. Average number of caribou harvested by unit and residency from 1998-2015 (ADF&G 2017c).

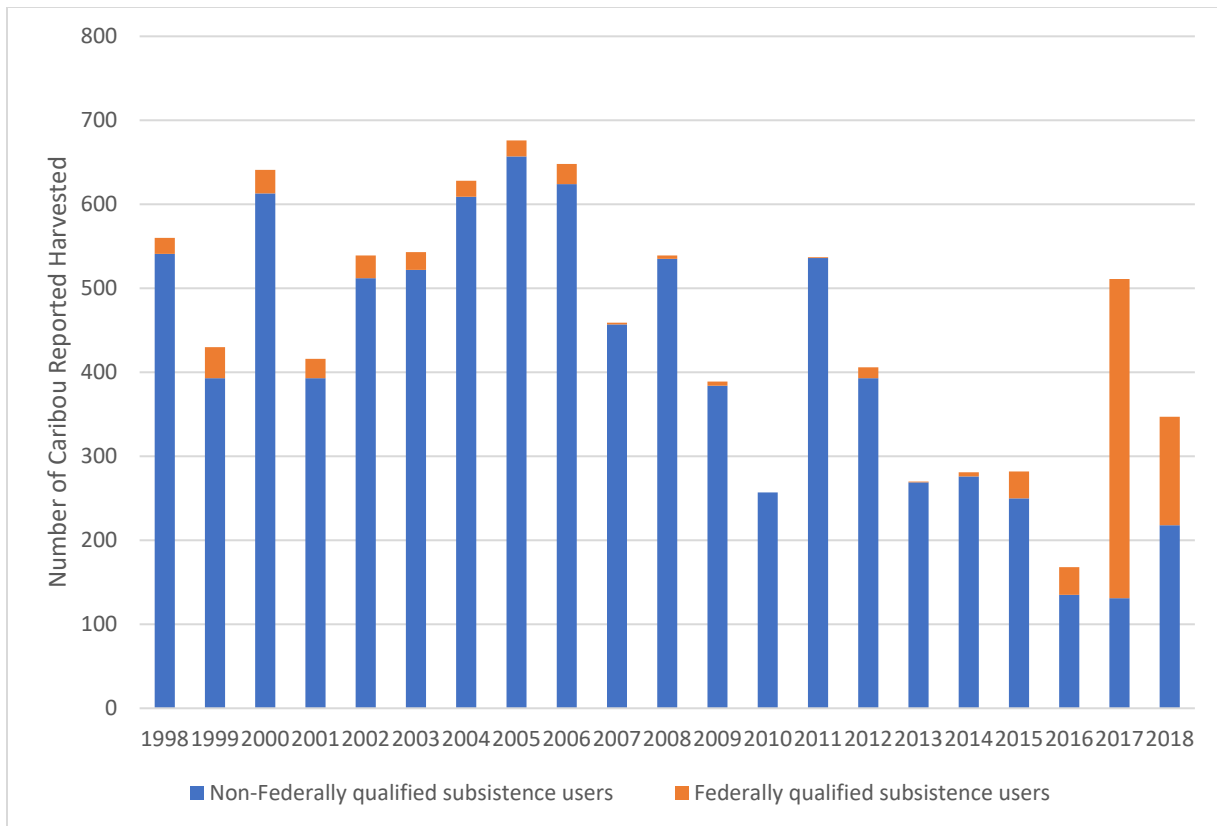


Figure 10. Reported caribou harvest in Unit 23 (WinfoNet 2018, 2019).

Unit 23 Moose

Harvest data is derived from State harvest reports and community household surveys. Community household surveys are used, in part, as a method to determine whether harvest is being reported accurately in State harvest reports. Harvest reports provide data on an annual basis. Community household surveys gather data from local communities pertaining to subsistence harvest on an irregular basis, with many communities only being visited once over a ten year time span. In Unit 23, community household surveys show that moose harvest is underreported by local users (users residing in Unit 23), but nonlocal user harvest can be assumed accurate based on the requirement of a registration permit (RM880) for the any-antlered bull resident harvest and drawing permits for non-resident harvest (before the non-resident hunt was closed). This section will discuss State harvest report data prior to reviewing community household survey data.

Between 2005 and 2019, total reported moose harvest in Unit 23 ranged from 55-189 moose, averaging 133 moose (**Table 12**) (ADF&G 2016, 2018a). The lowest reported harvest was in 2018, after ADF&G cancelled the nonresident moose season and Federal public lands were closed to moose harvest except by Federally qualified subsistence users for part of the December season (WSA18-04). Local resident (residents of Unit 23), nonlocal resident, and nonresident reported harvest averaged 72 moose (55%), 40 moose (30%), and 20 moose (15%) per year, respectively (**Table 12**) (ADF&G 2016, 2021). Cows comprised 7% of the annual reported harvest on average, with 1-21 cows being harvested each year, although the actual cow harvest is likely double what is reported (Alaska Board of Game 2017). The vast

majority of moose are harvested in September (**Figure 11**) (WINFONET 2017). Since 2006, more moose have been harvested from the Kobuk River drainage than from other drainages within Unit 23 (**Figure 12**) (ADF&G 2017a). Moose hunting is the primary activity by nonlocal users on Selawik National Wildlife Refuge (Georgette 2017, pers. comm.).

Since 2000, community household survey data has indicated 350-450 moose are harvested each year by local residents (Saito 2014). In regulatory year 2012/13 specifically, ADF&G estimated moose harvest by local residents as 342 moose (Saito 2014). When community harvest data is taken into account, local residents represent approximately 73% (2015) of the Unit 23 annual harvest, conservatively (NWARAC 2017b). The only community household survey data available for the number of cow moose harvested by local residents are for 2008 and 2009 in the villages of Noorvik, Shungnak, Ambler, Buckland, Kiana, and Kobuk. These data indicate 3 out of 67 total moose harvested were cows, although 6 moose were of unknown sex (ADF&G 2018b).

ADF&G calculates the harvestable surplus of moose in Unit 23 as 6% of the population (Saito 2016a, pers. comm.). As the 2018 unit-wide population estimate was 6,300 moose, 378 moose was the estimated harvestable surplus. In 2019, the population estimate and harvestable surplus declined to 5,600 moose and 336 moose, respectively. Reported harvest by nonlocal residents and nonresidents (~67 moose/year) combined with community household survey harvest estimates for local residents (350-450 moose/year) indicate that total Unit 23 moose harvests likely exceed the harvestable surplus. While the State has closed the nonresident season, and nonlocal resident reported harvest declined in 2016 and 2017 (**Table 12**), harvest estimates by local residents alone may still exceed the harvestable surplus (Saito 2014).

Harvest within individual drainages may be particularly high or have disproportionate effects on the population. For example, ADF&G estimates that approximately 70 moose are taken from Selawik drainage each year, which translates to a 7% harvest rate (**Figure 12**) (NWARAC 2016a). During winter months, large congregations of moose have been observed near villages, which can make these moose highly susceptible to harvest (Alaska Board of Game 2017). The Lower Kobuk River drainage hosts a disproportionate number of maternal cows, possibly because this area appears to support fewer large predators due to its proximity to human travel corridors (Saito 2014). More moose are also harvested from the Kobuk River drainage than any other drainage (**Figure 12**). This suggests cow moose in the Kobuk River drainage are particularly susceptible to harvest, although the taking of cows with calves is prohibited under both State and Federal regulations, and the cow moose hunt is now closed under both Federal and Subsistence regulations. While recent restrictions to State regulations have decreased reported moose harvest, decline of the Western Arctic Caribou Herd has likely increased moose harvest by local residents trying to meet their subsistence needs (Saito 2014, NWARAC 2017a, 2018a). During recent Council meetings, subsistence users have commented on the importance of moose as a subsistence resource, particularly when caribou are scarce (OSM 2017a, NWARAC 2017a, 2018a).

Table 12. Reported moose harvest in Unit 23 for 2005-2019 from ADF&G harvest ticket and permit reports (ADF&G 2021a).

Year	Local Resident Harvest	Nonlocal Resident Harvest	Nonresident Harvest	Total Harvest	Male	Female	Unknown
2005	65	41	41	148	137	10	1
2006	79	49	30	159	150	7	2
2007	64	29	25	123	116	7	0
2008	62	48	40	151	143	7	1
2009	80	50	23	155	144	10	1
2010	102	63	22	189	169	17	3
2011	72	45	26	144	133	11	0
2012	75	57	24	156	146	10	0
2013	88	53	21	164	151	12	1
2014	74	40	10	124	109	14	1
2015	85	59	20	165	144	21	0
2016	63	18	11	95	90	4	1
2017	66	18	0	84	78	5	1
2018	42	13	0	55	54	1	0
2019	61	15	0	76	76	0	0
Average	72	40	20	132	123	9	1

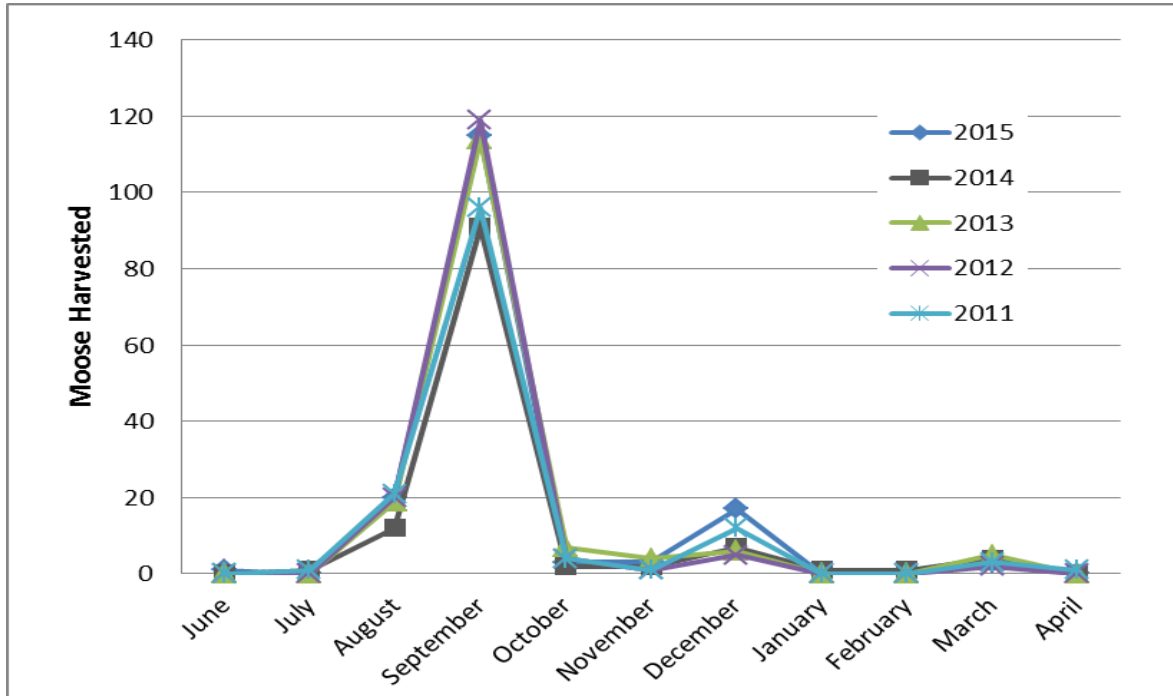


Figure 11. Moose harvest, by month, among users of Unit 23 from 2011-2015 according to State harvest reports (WINFONET 2017).

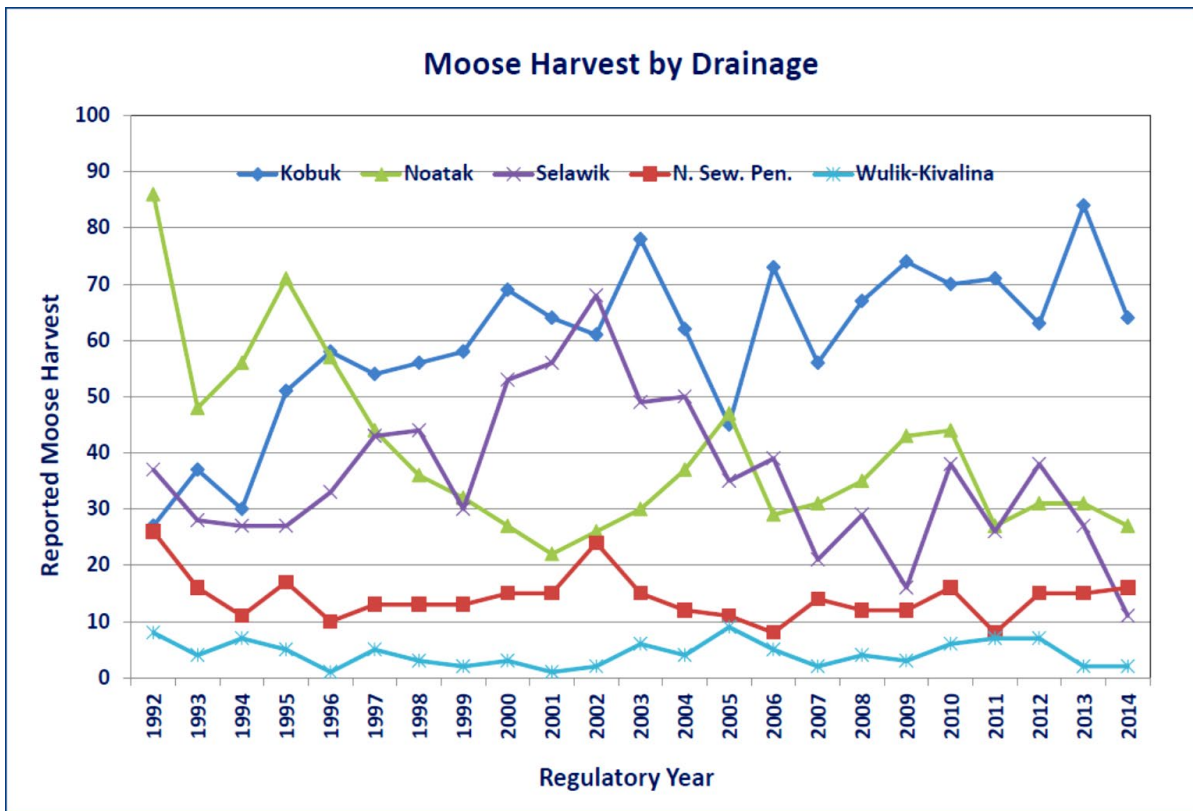


Figure 12. Moose harvest, by drainage, among users of Unit 23 from 1992-2014 according to State harvest reports (figure from ADF&G 2017a).

Unit 26A Moose

Moose harvest in all of Unit 26A averaged 57 per year until 1995, which was several years after the peak estimated abundance of the moose population in 1991. Although the trend area counts began to decline in 1992, the harvest remained at the higher levels for several years (Carroll 2010). In 1995, when more restrictive regulations were implemented, the harvest dropped to 14 moose, and then remained low between 1996 and 2004 at an average of 4 moose per year. One of the most important changes affecting harvest levels in this area was the ban on the use of aircraft beginning in 1996. In 2006, in response to an increasing moose population, the BOG allowed the use of aircraft to hunt moose in Unit 26A under a State draw permit hunt (DM980/981), but not under the general season by harvest ticket. However, the BOG discontinued the draw permit hunt, and therefore any use of aircraft, in 2015. Between 2009 and 2019, the average reported moose harvest was 3.73 moose per year (**Table 13**).

The non-resident moose hunt in Unit 26A has been closed since 2014. While the ADF&G harvest report website showed one moose harvested by non-residents in 2018 and 2019, this may be reported illegal harvest (Daggett 2021, pers. comm.). In recent years (2015-2019), non-local resident moose harvest has averaged 0.8 moose per year, while local resident harvest has averaged 1.4 moose per year (ADF&G 2021a).

Table 13. Reported moose harvest in Unit 26A for 2009-2019 from ADF&G harvest ticket and permit reports (ADF&G 2021a).

Regulatory Year	Local Resident Harvest	Nonlocal Resident Harvest	Nonresident Harvest	Unknown Residency Harvest	Total Harvest	Male	Female	Unknown
2009	2	0	1	0	3	2	1	0
2010	1	0	0	3	4	4	0	0
2011	2	0	0	0	2	2	0	0
2012	4	5	0	0	9	8	1	0
2013	2	2	0	0	5	5	0	0
2014	1	0	0	1	2	1	1	0
2015	0	0	0	3	3	2	1	0
2016	2	2	0	0	4	4	0	0
2017	3	0	0	0	3	3	0	0
2018	1	1	1	0	3	3	0	0
2019	1	1	1	0	3	3	0	0
Average	1.73	1	0.27	0.64	3.73	3.36	0.36	0

Commercial Use Authorization activity on National Park Service Lands in Unit 23

Table 14 shows several metrics of the presence of Commercial Use Authorization resulting activity in the Western Arctic National Parklands (WEAR). Each guide is limited to 12 clients a year (NWARAC 2020a). Hunting by non-locals in WEAR is only permitted in Noatak National Preserve.

In 2020, two guides and four transporters operated in WEAR, as well as six air taxi companies (NWARAC 2020a). In 2019, there were three guides operating, and a total of 11 companies holding

Commercial Use Authorizations (WEAR 2019). In 2018, there were three guide companies operating, and a total of 18 companies holding Commercial Use Authorizations (WEAR 2018).

Table 14 demonstrates that most of the transporter traffic occurs within Noatak National Preserve and is likely associated with hunting by non-Federally qualified users; Kobuk Valley National Park and Cape Krusenstern National Monument are only open to hunting by local residents. However, transporter traffic still occurs in Kobuk Valley National Park and Cape Krusenstern National Monument, and some of the traffic in Noatak National Preserve is likely not hunting related.

Table 14. Transporter and guide activity on National Park Service Lands in Unit 23. (WEAR 2017, 2018, 2019, 2020). CUA = Controlled Use Area.

Year	Number of Visitors via CUA/ Concession aires	Number of Visitor Days via CUA/ Concession aires	Number of Caribou harvested via Transporters and Guides	Number of Moose harvested via Transporters and Guides	Number of Air Taxi/ Transport Flights
Noatak National Preserve (NOAT)					
2020	456	3,324	366	1	361
2019	543	3,079	165	6	245
2018	319	1,724	66	2	119
2017	232	223	--	--	--
Kobuk Valley National Park (KOVA)					
2020	53	124	0	0	23
2019	496	946	0	0	144
2018	205	415	0	0	67
2017	212	73	0	0	--
Cape Krusenstern National Monument (CAKR)					
2020	11	11	0	0	5
2019	79	173	0	0	25
2018	73	120	0	0	25
2017	15	4	0	0	--
Western Arctic Parklands (NOAT, KOVA, and CAKR) TOTAL					
2020	520	11	366	1	389

Year	Number of Visitors via CUA/ Concession aires	Number of Visitor Days via CUA/ Concession aires	Number of Caribou harvested via Transporters and Guides	Number of Moose harvested via Transporters and Guides	Number of Air Taxi/ Transport Flights
2019	1,118	4,198	165	6	414
2018	597	2259	66	2	211
2017	459	300	---	--	--

Cultural Knowledge and Traditional Practices

The present-day human population in Unit 23 includes 11 regional Iñupiaq nations that were intact in the mid-19th century (Burch 1998). The estimated population of the Northwest Arctic Borough was 7,523 in 2019 (ADLWD 2019). Prior to 1840, the Iñupiat of the North Slope region, including what is now Unit 26A, were loosely organized in six groups or nations of small kin-based settlements (Burch 1980). These nations became less distinct by 1900 but communities still use the territories that preceded modern villages.

Caribou

Caribou have been a primary resource for the Iñupiat of the Northwest Arctic Region for thousands of years; caribou bones dating from 8,000 to 10,000 years ago have been excavated from archeological sites on the Kobuk River (Anderson 1968, 1988). Caribou were traditionally harvested any month of the year they were available in the Northwest Arctic Region. Hunt timing changed—and continues to change—from year to year according to the availability of caribou and their migration paths (Burch 2012; ADF&G 1991). Iñupiaq hunting values are based on the belief that hunter behavior can prevent a successful harvest and/or alter the caribou migration (Anderson 1998). Caribou continue to dominate the subsistence harvest in most communities in the region (Braem et al. 2015, Braem et al. 2017). In household harvest surveys conducted between 1964 and 2017, caribou were often the most harvested species, more than any other wild resource, in pounds of edible weight. Based on these surveys, the per capita harvest of caribou has been as high as 430 pounds per year in communities in Unit 23 (ADF&G 2021b; **Table 15**).

The objective of the fall hunt has historically been to acquire large quantities of high quality meat to freeze for winter (Burch 1994). Ideally, caribou harvesting occurs when the weather is cool enough to prevent spoilage of meat, but before freeze-up. Hunters search for caribou and attempt to intercept them at known river crossings, making the Kobuk and Noatak Rivers central to traditional hunt areas. But because of the variable range of the herd, the critical hunting sites changed each year. Noatak National Preserve was not only the hunting grounds of the people of the Noatak, it was also an alternative hunting site for people living on the Kobuk River, Selawik, and Kotzebue Sound” (Deur et al. 2019). At River crossings,

caribou can be selectively harvested with small caliber rifles. Caribou can be harvested in large numbers, when available, and transported back to villages by boat before freeze-up.

Communities in Unit 23 harvest caribou in the spring, fall, and winter, but fall is the preferred season for harvest. Prior to freeze-up, bulls have traditionally been preferred because they are fatter than cows (Georgette and Loon 1993). After freeze-up, cows are preferred, because bulls are typically skinnier and in rut by then; the meat smells bad and is of poor quality (Braem et al. 2015). For this reason, delayed migrations may result in a shift towards harvesting cows, as communities miss the opportunity to harvest fat bulls prior to freeze-up. Small groups of caribou that have over-wintered may be harvested by hunters in areas that are accessible by snowmachine.

Table 15 highlights variability in the number of caribou harvested annually by each community over time, which tends to correspond with local availability.

Table 15. Subsistence survey data showing four measures of use of caribou by Unit 23 communities between 1986 and 2017. (ADF&G 2015, 2021b; Mikow and Kostick 2016).

Community	Data year	Est Caribou Harvested	Number of Caribou per Capita	Pounds of Caribou per Capita	Percent of overall subsistence Harvest (when known)
Ambler	2012	685	2.54	330	55%
	2009	456	1.75	260	--
	2003	325	1.12	176	--
Buckland	2016	637	1.21	179	--
	2009	561	1.3	176	--
	2003	637	1.56	212	38%
Deering	2017	342	2.22	342	--
	2013	294	2.29	430	65%
	2007-2008	182	1.37	161	--
	1994	142	0.96	131	19%
Kiana	2009	440	1.18	149	--
	2006	306	0.77	108.5	31%
	1999	488	1.23	174	--
Kivalina	2010-2011	86	0.23	32	--
	2007	268	0.67	85	14%
	1992	351	0.49	138	18%
	1983	564	0.78	283.9	30%
Kobuk	1982	346	0.48	179	23%
	2012	119	0.84	98	32%
	2009	210	1.72	194	--
	2004-2005	134	1.06	148	--

Community	Data year	Est Caribou Harvested	Number of Caribou per Capita	Pounds of Caribou per Capita	Percent of overall subsistence Harvest (when known)
Kotzebue	2014	1286	0.43	59	29%
	2013	1,680	0.55	75	--
	2012	1803	0.59	78	--
	1986	1917	0.71	97	24%
Noatak	2016	337	0.59	80	--
	2010	66	0.12	16	--
	2007	441	0.9	114	31%
	2002	410	0.9	120	--
	1999	683	1.61	224	--
Noorvik	1994	615	1.62	220	48%
	2017	250	0.48	65	--
	2012	851	1.36	198	33%
	2008	767	1.19	173	--
Point Hope	2002	988	1.46	181	--
	2014	185	0.25	34	8%
	1994	355	0.5	67	23%
Selawik	2011	683	0.79	109	20%
	2006	934	1.11	165	--
	1999	1289	1.68	249	--
Shungnak	2012	396	1.47	196	53%
	2008	416	1.53	218	--
	2002	403	1.62	220	36%
	1998	561	2.17	312	--

Table 16 compares percentages of residents attempting to harvest caribou versus those succeeding in harvesting caribou in Unit 23 communities. In practice, attempted harvest depends on the presence of caribou in traditional harvest areas. It is worth noting that the percentage of individuals attempting to harvest caribou in any year may adjust to perceived abundance or availability, so the percentage attempting cannot be taken as a simple proxy of interest or need. However, the disparity between the percentage attempting to harvest and those harvesting can give us some limited information about whether people are getting as many caribou as they would like to meet their harvest goals; sharing redistributes caribou through the community in order to help meet need, and “percent receiving” is also included in **Table 16**.

Table 16. Households' attempted harvest, harvest, and sharing of caribou in Unit 23 between 1986 and 2017. (ADF&G 2021b).

Community	Year	Percent Attempting to Harvest Caribou	Percent Harvesting Caribou	Percent Receiving
Kotzebue	2014	39%	29%	72%
	2013	43%	34%	71%
	2012	44%	39%	60%
	1991	70%	63%	62%
	1986	50%	45%	58%
Selawik	2011	70%	54%	80%
	2006	65%	63%	--
	1999	61%	61%	84%
Kivalina	2010	66%	29%	73%
	2007	64%	64%	69%
	1992	77%	74%	67%
Noatak	2016	70%	51%	84%
	2010	20%	20%	45%
	2007	73%	66%	88%
	2002	76%	71%	64%
	1999	74%	72%	62%
	1994	84%	84%	50%
Lower Kobuk River Communities				
Noorvik	2017	59%	40%	40%
	2012	60%	60%	47%
	2008	70%	70%	37%
	2002	72%	71%	60%
Kiana	2009	83%	80%	60%
	2006	62%	57%	--
	1999	68%	65%	75%
Upper Kobuk River Communities				
Ambler	2012	70%	62%	60%
	2009	76%	74%	50%
	2003	74%	70%	50%
Shungnak	2012	52%	48%	74%
	2008	73%	68%	74%
	1998	74%	72%	35%

The most recent surveys conducted for communities in Unit 23 were conducted in 2017 (Deering, Noorvik), 2016 (Buckland), 2014 (Kotzebue), and 2012 (Ambler, Kobuk, Shungnak), and Kiana (2009). Therefore, harvest data from comprehensive surveys are not sufficiently up-to-date to provide accurate

information on the full impact of delayed caribou migration; new comprehensive subsistence surveys and key informant interviews are needed, particularly for Kiana, Ambler, Kobuk, Shungnak, and Kotzebue. For years in which subsistence surveys were conducted, the greatest difference between the percentage of residents attempting to harvest caribou and actually harvesting caribou occurred in Noorvik in 2017, Kotzebue in 2014, Ambler in 2012, Selawik in 2011, and Kivalina in 2010; for all five of these communities, the year with the greatest disparity was also the most recent year documented in subsistence surveys, supporting the fact that people have been having more difficulty harvesting caribou in these communities within the last decade.

User Conflict and Delayed Caribou Migration

While residents of Unit 23 rely on caribou for the majority of their subsistence harvest, non-locals are attracted to the region because of its extensive public lands and abundant wildlife. Previous discussions regarding the impacts of non-local users on the continuation of subsistence hunting for caribou in the Northwest Arctic and North Slope regions have considered the issue in the context of user conflict, defined as “persons competing for consumptive or non-consumptive uses of a finite resource” (Braem et al. 2015).

User conflicts between local and nonlocal hunters have been well documented in the Noatak National Preserve, the Squirrel River area, and along the upper Kobuk River (Georgette and Loon 1988, Jacobson 2008, Harrington and Fix 2009 *in* Fix and Ackerman 2015, Halas 2015, NWARAC 2015a, Braem et al. 2015), even during times of high caribou abundance. Since 2017, a targeted closure to non-Federally qualified users (Unit 23, within a 10 mile wide corridor (5 miles either side) along the Noatak River from the western boundary of Noatak National Preserve upstream to the confluence with the Cutler River; within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively; and within the Squirrel River drainage) has addressed some of these areas of localized high conflict. While there have been individual reports of user conflict throughout the range of the herd, other public lands such as Bering Land Bridge National Preserve, Selawik NWR, and GAAR do not have the same traditional knowledge-based record of caribou disruption. Braem et al. note that “The roots of [this] conflict are varied, but they involve displacement of local hunters from traditional hunting sites, hunt disruption (largely by aircraft traffic), and differences in hunting practices and culture” (2015:177).

The local practice of letting the first caribou go by, or not harvesting the leaders, is one of the most widely held and commonly repeated traditional “laws” to this day. For example, in *Uqausriptigun: In our own words*, a Selawik Refuge publication based on 2003 interviews, elder Ralph Ramoth Sr. states “you must let the first caribou go by. Let the first bunch go by and the rest of them will follow...For example, if the caribou start coming down those hills right there, and if I go out and hunt them right now, I could re-route them away.” The widely held opinion that this traditional law is being broken by non-local hunters, and the attribution of the delayed migration to this cause, is key in this issue. Local subsistence users take umbrage with the location and timing of the non-local harvest in particular, rather than the number of animals taken.

Past management has focused on addressing short-term interruptions to caribou movement and displacement of local hunters in high conflict harvest and air travel areas; local complaints that the presence of non-local activity may be contributing to large scale delay, diversion, or cessation of the herd's migration on a long-term basis suggests that management actions to date (partial closures and Controlled Use Areas) have not been sufficient to ensure continuation of subsistence.

Concerns over delayed caribou migration—and the potential role of non-local hunting activities in diverting and delaying migration—is well documented through repeated Regional Advisory Council testimony and sharing of local and traditional knowledge (e.g. NWARAC 2015a, 2015b, 2016a, 2015b, 2017a, 2017b, 2018a, 2018b, 2019a, 2019b, 2020a, 2021b, 2021). In areas of high conflict, local hunters have expressed concerns over aircraft and nonlocal hunters disrupting caribou migration by scaring caribou away from river crossings, landing and camping along migration routes, and shooting lead caribou (Halas 2015, Fix and Ackerman 2015, NWARAC 2015a). During key informant interviews conducted by ADF&G Division of Subsistence in Noorvik between 2012 and 2014:

Several residents expressed concern for specific human actions that could result in changes to caribou migratory patterns: patterns which largely determine if caribou will be accessible or not to Noorvik hunters in any given year. Specific examples included hunters harvesting the first caribou to migrate (which are widely perceived as leading the entire migrating herd, usually in fairly predictable patterns when not disturbed), inexperienced hunters harvesting caribou at river crossings “just when they get in the water, instead of waiting until they are mid-stream” and thereby pushing the caribou herd back on land, and sport hunters or biologists disturbing caribou herds with airplane traffic (Braem et al. 2017:142).

Some studies and local observations of WACH caribou response to aircraft have suggested that animal response is limited in temporal and spatial scale (Fullman et al. 2017) and that many factors contribute to larger scale shifts in migration. Dau (2015) noted that substantial transporter traffic in the Anisak drainage, which is within the Noatak National Preserve, has not diverted migrating WACH caribou. Fullman et al. (2017) studied the effects of environmental features and sport hunting on caribou migration in northwestern Alaska. These authors found that caribou tended to avoid rugged terrain and that the migration of caribou through Noatak NP does not appear to be hindered by sport hunting activity. They indicated that their results do not preclude the possibility of short-term effects (< 8 hours) altering the availability of caribou for individual hunters, and that the lack of observed influence of hunting activity could be related to limitations in the telemetry and sport hunter datasets used in the study (i.e. caribou locations were only recorded every 8 hours, not every sport hunter camp was included, and only landings events from transporter aircraft were considered). However, the issue of cumulative effects of air traffic on caribou migration as well as subsistence access and hunter behavior has not received adequate attention in the literature (Stinchcomb et al. 2019).

Delays in caribou migration are known to have created difficulty for virtually all communities in Unit 23 (Dau 2015, Braem et al. 2015, NWARAC 2020a, 2021). Local WACH harvest has been relatively stable in Unit 23 since the 1990s, but residents of some communities have had to “greatly increase their expenditure of money and effort to maintain these harvest levels” (Dau 2015:14-30). This is due in part to

having to travel farther, more frequently, and for longer durations to find caribou (Halas 2015; Gonzalez et al. 2018), which corresponds with reduced success rate as reported in the most recent comprehensive subsistence surveys (ADF&G 2021b). In addition, regardless of specific timing, variability from year to year places additional uncertainty and stress on communities regarding their food supply, as has occurred in Shungnak on the upper Kobuk River (Braem et al. 2015).

According to a review of grey literature on aircraft-subsistence user conflict, “Specific reports or observations about aircraft activity harassing wildlife, changing caribou (*Rangifer tarandus*) migration routes, and frustrating harvesters have been increasing [in the Alaskan Arctic] since the early 2000s” (Stinchcomb et al. 2019:132). Simultaneously, research on the cumulative impact of changes to soundscapes on both caribou and the behavior of subsistence hunters is growing (Stinchcomb 2017; Stinchcomb et al 2020). Halas (2015) and Stinchcomb et al. (2019) note that even when the question of whether or not migration patterns are affected by aircraft in the long term is put aside, aircraft activity can lead to changes in harvesting behavior. Subsistence hunters avoid areas with air traffic; this displacement in turn prevents continued use of traditional areas and can even accelerate loss of place-based traditional knowledge. The authors also found that avoidance of high air-traffic areas results in longer trips and higher fuel costs for harvesters (Stinchcomb et al. 2019), consistent with testimony from the Northwest Arctic Regional Advisory Council (NWARAC 2020a, 2021).

Concerns about the impact of non-local hunters on caribou migration led to a unit wide closure in 2016 and targeted closure of Federal public lands along the Noatak River, within the northern and southern boundaries of the Eli and Agashashok River drainages, respectively, and within the Squirrel River drainage to non-Federally qualified users beginning in 2017. According to interviews conducted by Gonzalez et al. in Noatak following the closures, “Some residents...felt that the closure of federal lands to non-Federally-qualified users in Unit 23 helped hunters from the community harvest caribou. Others commented that the herd was a great distance from the community and the expenses to reach it limited attempts to harvest” (2018:19). Key informant interviews have not been conducted by ADF&G Division of Subsistence since 2017 in any Unit 23 communities, so additional information about the effects of the partial closure must be gleaned from transcripts of Northwest Arctic Regional Advisory Council meetings.

Other areas previously identified as high conflict in Unit 23 which remain open to non-Federally qualified users include the Upper Kobuk River, although this area is surrounded by State-managed lands, so Federal lands closure would not affect this area. Delayed migrations and arrival at the Kobuk River have been noted since 2000 (Dau 2015). Federal lands occurring within Kobuk Valley National Park, as well as other National Parks and Monuments in the Unit, are already closed to non-Federally qualified users, open only to local resident zone communities. Selawik National Wildlife Refuge, BELA, most BLM lands, the portion of Gates of the Arctic National Preserve within Unit 23, and small areas of the Alaska Maritime National Refuge within the unit remain open to non-Federally qualified users. However, caribou are often no longer present in some of these areas during the fall season, and aircraft restrictions in some of these areas mean that air traffic is limited in some of these remaining open areas. Specifically, in the far Western portion of Noatak National Preserve and in a portion of Selawik National Wildlife Refuge (**Map 5, Table 5**).

User conflict on the North Slope has centered primarily on the caribou migration patterns in the vicinity of Anaktuvuk Pass. A long-held cultural practice in the region requires that lead adult female caribou be allowed to establish migratory paths unhindered by human activity. Dau (2015) suggests that once lead caribou establish migration routes, the caribou behind them will follow regardless of hunting or other disturbances such as aircraft. In response to complaints from Anaktuvuk Pass residents about caribou migration being affected by nonsubsistence hunter activity, ADF&G attempted to document such effects from 1991-93, but none were found (OSM 1995). However, residents of Anaktuvuk Pass stated that the closure of Federal public lands to non-Federally qualified users for caribou hunting in Unit 23 during the 2016/17 regulatory year was perceived as having improved the situation, allowing for the resumption of historical migration patterns and harvest activities (OSM 2017a, 2017b).

The proponents of this request also expressed concern over non-local hunting activity in Unit 26A disrupting and delaying caribou migration through Unit 23. Concerns over the Federal lands closure in Unit 23 also included displacement of non-local caribou hunters into adjacent units, including Unit 26A.

Moose

Moose are a relatively recent addition to both the Northwest Arctic and North Slope regions and have been incorporated into subsistence diets as their ranges have expanded. Archaeological sites in tundra and northern tree-line areas of Alaska demonstrate few moose remains until the mid-20th century, and this is consistent with historical accounts and minor representation in Iñupiat culture (Hall 1973, Coady 1980, Tape et al. 2016).

Shifts in caribou herd migration and size cause variability in their availability to communities, with harvest strategies for other available species, such as moose, often changing accordingly over time (Georgette and Loon 1993). Because moose harvest increases and decreases in response to the availability of other resources such as caribou and marine mammals, data from subsistence surveys need to be understood in the context of flexible subsistence strategies over time. A single year of data may over or under-represent a community's dependence on moose during times when caribou or marine mammals are less available.

Unit 23

In the upper Kobuk River in northwest Alaska, moose did not appear until the 1920s but soon thereafter populated the entirety of the drainage. Moose were present in the tributaries of the upper and middle Noatak River in the 1940s and became more common downriver after 1960. The presence of moose is especially recent in lowland and coastal areas; by the 1980s, moose were present in suitable habitat throughout northwest Alaska (Georgette and Loon 1993).

According to Georgette and Loon (1993), residents of Kotzebue continued to consider moose as secondary to caribou in their importance and desirability as a subsistence food; they were taken to add dietary variety. Residents hunted moose in the fall, but moose were also harvested throughout the winter as needed. The relative size of moose made them more difficult to butcher and pack than caribou, and

hunters often preferred to harvest the species as close as possible to the edge of a river or a lake in proximity to their boat (Georgette and Loon 1993).

In many parts of the Northwest Arctic, shifts in caribou herd migration and size cause variability in their availability to communities, with harvest strategies for other available species, such as moose, often changing accordingly over time (Georgette and Loon 1993). On the North Slope coastal communities, more moose may be harvested in years with poor whale or caribou harvests. Because moose harvest increases and decreases in response to the availability of other resources data from subsistence surveys needs to be understood in the context of flexible subsistence strategies over time. A single year of data may underrepresent a community's dependence on moose during times when caribou or marine mammals are less available. For this same reason, trends in moose availability most likely cannot be reliably deduced based on trends in numbers of moose taken as reported in subsistence surveys or harvest reports.

The average per capita harvest of moose in Kotzebue in 2014, the most recent survey year, was 14.6 pounds, accounting for only 7% of the average household harvest (**Table 17**, ADF&G 2021b). Approximately 22% of Kotzebue households attempted to harvest moose, and 10% of Kotzebue households successfully harvested moose (compared to 29% harvesting caribou) (**Table 18**, ADF&G 2021b). Despite the small percentage of households harvesting moose, sharing of this resource was widespread with approximately 50% of households using it (**Table 17**, ADF&G 2021b.).

The harvest and use of a resource in regional hubs with larger populations may be different than that of a rural village since the former tends to be more heterogeneous in “culture, birthplace, education, employment, and length of residency” (Georgette and Loon 1993: 4). In 2012 (the most recent survey year), the rural northwest arctic community of Ambler harvested approximately 27 pounds of moose per capita, with 19% of households harvesting the resource (compared to 62% harvesting caribou) and 49% of households using the resource (ADF&G 2021b).

Georgette and Loon (1993) suggested that future declines in caribou availability in the region could result in increased reliance on moose to meet the subsistence harvest demands of Kotzebue residents. Given recent declines in the Western Arctic Caribou Herd (Dau 2015), moose may already be becoming a more prominently sought after resource for meeting subsistence needs in the region. **Table 18** compares the percentage of community residents attempting to harvest moose, successfully harvesting moose, and receiving moose from others, according to comprehensive subsistence surveys. There does appear to be a general increase over time in the percentage of community members attempting to harvest moose, except in the upper Kobuk River communities; however, sufficiently recent data is not available to substantiate a trend. An increase in the percentage of community members attempting to harvest moose could reflect several different variables, such as moose availability and the need to offset lack of caribou. **Table 17** tracks trends in the percentage of community residents using moose, pounds per capita of moose used, and the percentage of the overall subsistence harvest comprised by moose, according to comprehensive subsistence surveys. A clear trend does not emerge from these data on use of moose use by residents of Unit 23, but a pattern may emerge when updated subsistence survey data becomes available. Declining moose populations may temper the availability of this resource to offset lower availability of caribou.

Table 17. Subsistence survey data showing three measures of use of moose by Unit 23 communities between 1986 and 2017 (ADF&G 2021b).

Community	Year	Percent Using Moose	Pounds of Moose per Capita	Percent of Total Harvest (when known)
Kotzebue	2014	52%	14.6	7%
	2013	43%	13	15%
	2012	37%	12.5	14%
	1991	62%	34.6	--
	1986	42%	13	--
Selawik	2011	75%	24.8	5%
	2006	Unknown	32.4	--
	1999	55%	48.5	--
Kivalina	2010	49%	18.8	37%
	2007	31%	4.8	--
	1992	48%	26.4	--
Noatak	2016	24%	8.4	9%
	2010	27%	8.6	32%
	2007	46%	10.8	3%
	2002	22%	4	--
	1999	18%	5.7	--
	1994	12%	3.5	--
Lower Kobuk River communities				
Noorvik	2017	54%	38	36%
	2012	66%	22	4%
	2008	37%	22	11%
	2002	68%	41	--
Kiana	2006	40%	22.5	--
	1999	30%	10.1	--
Upper Kobuk River communities				
Ambler	2012	49%	27.3	5%
	2003	52%	23.2	--
Shungnak	2012	52%	8.8	--
	2008	55%	23.5	--
	2002	73%	22.8	--
	1998	50%	45.6	--
Kobuk	2012	50%	11.8	4%
	2004	64%	30.6	16%

Table 18. Attempted harvest, harvest, and sharing of moose in Unit 23 between 1986 and 2017 (ADF&G 2021b).

Community	Year	Percent Attempting to Harvest Moose	Percent Harvesting Moose	Percent Receiving Moose
Kotzebue	2014	22%	10%	46%
	2013	15%	7%	36%
	2012	18%	9%	30%
	1991	33%	27%	45%
	1986	27%	8%	34%
Selawik	2011	50%	23%	65%
	2006	25%	24%	--
	1999	33%	41%	38%
Kivalina	2010	35%	13%	43%
	2007	14%	10%	29%
	1992	30%	23%	31%
Noatak	2016	15%	6%	9%
	2010	12%	5%	23%
	2007	16%	9%	46%
	2002	8%	3%	20%
	1999	4%	3%	14%
	1994	7%	3%	8%
Lower Kobuk River communities				
Noorvik	2017	38%	23%	45%
	2012	23%	17%	52%
	2008	18%	15%	23%
	2002	44%	28%	54%
Kiana	2006	21%	14%	--
	1999	13%	8%	22%
Upper Kobuk River communities				
Ambler	2012	28%	19%	40%
	2003	30%	15%	45%
Shungnak	2012	11%	7%	48%
	2008	27%	23%	34%
	1998	32%	30%	20%
Kobuk	2012	30%	10%	43%
	2004	70%	22%	61%

Alternatives Considered

An alternative to closing Federal public lands in all of Units 23 and 26A to the harvest of caribou by non-Federally qualified users Aug. 1 to Sep. 30 is to expand the current targeted closure to the rest of Unit 23 only, or to an expanded portion of Unit 23, while stopping short of closing Federal public lands in both Units. Key Federal public lands in Unit 23 which currently remain open and may be candidates for partial closures include additional river corridors within Noatak National Preserve or all of Noatak National Preserve, and BLM lands in the portion of the unit north of the Kobuk River. Subsequently, additional Federal public lands in Unit 23 and portions of the National Petroleum Reserve in Unit 26A could be closed if the initial stepped closure is not sufficient to ensure continuation of subsistence hunting for caribou within Unit 23. This alternative was considered and rejected because there is not yet adequate evidence that closing Federal public lands would definitively result in caribou migrating to the Kobuk River communities earlier in the fall. Additionally, this alternative runs the risk of concentrating non-local users on State land around some communities.

Effects of the Proposal

According to Section 815(3) of the Alaska National Interest Lands Conservation Act (ANILCA), public lands may be temporarily closed to the harvest of a specified wildlife population for nonsubsistence uses if “necessary for the conservation of healthy populations of fish and wildlife, for the reasons set forth in section 816, to continue subsistence uses of such populations, or pursuant to other applicable law.” The Code of Federal Regulations 50 CFR 100.19(b)(1) further specifies that for temporary special actions, such closures should not be “an unnecessary restriction on nonsubsistence users” or “be detrimental to the long-term subsistence use of fish or wildlife resources.”

Caribou in Units 23 and 26A

If this special action request is approved, Federal public lands in Unit 23 and Unit 26A will be closed to the harvest of caribou by non-Federally qualified users from Aug. 1-Sep. 30, 2021. Only Federally qualified subsistence users—those with a customary and traditional use determination for caribou in Units 23 and Unit 26A—would be able to harvest caribou on Federal public lands in these units.

This may increase hunting pressure on State or private lands. State lands comprise 19% of Unit 23 and also encompass many of the villages in the unit (**Map 1**). If this proposal is adopted, user conflicts and concern about the effects of non-local hunters on caribou migration may increase on State lands, particularly along the upper Kobuk River. If only Unit 23 is closed to non-Federally qualified users, these users may be displaced onto Federal public lands in adjacent units (i.e. Unit 26A), which could impact hunting and harvest in those units.

If this special action request is approved, those with a history of residency and family connection in Unit 23 who are now residing in nonrural areas would not be able to harvest caribou on Federal public lands in Units 23 and 26A Aug. 1-Sep. 30, 2021, as they are not Federally qualified subsistence users. Non-Federally qualified users who are Native corporation shareholders would still be able to hunt on Native corporation lands under State regulations.

While the number of people and planes on Federal public lands may decrease substantially, user conflicts would not be fully eliminated since other users (i.e. hunters seeking species other than caribou, photographers, recreational boaters, private planes) would still be able to fly over and access Federal public lands. Additionally, non-Federally qualified users would still be able to access and harvest caribou on gravel bars below the mean high water mark within Federal public lands as these areas are considered State land. Reports from law enforcement and nonlocal hunters indicate caribou are commonly harvested on such gravel bars, which may suggest limited impacts of the closure. As the rationale for this request focuses on the effect of non-local aircraft activity on caribou migration, closure of Federal public lands could represent an unnecessary restriction on the approximately 28% of non-Federally qualified users who do not access the WACH by plane (Dau 2015).

Attempts to mitigate user conflicts in Unit 23 have already been implemented by the NPS (delayed entry zone in Noatak NP), ADF&G (Noatak Controlled Use Area), Selawik NWR (closure of certain areas to commercial use), and the Board (partial Federal lands closure in Unit 23). Controlled Use Area dates have been extended to accommodate the delayed caribou migration under both State and Federal regulations: in 2009 the Noatak Controlled Use Area dates were changed to Aug. 15-Sep. 30, and in 2020 the Noatak National Preserve Delayed Entry Area date was changed to Sep. 22.

However, more can still be done by individual Federal agencies as well as the State to further address user conflict (e.g. establishing new Controlled Use Areas in zones where caribou migration may be deflected, modifying the dates or extent of the NPS delayed entry zone, further restricting the number and activities of permitted transporters and guides, and additional education and outreach, etc.). A non-resident caribou hunt remains open in Units 23 and 26A; the State can be encouraged to improve education of non-resident as well as non-local resident hunters about Traditional Ecological Knowledge regarding caribou behavior, and cultural norms surrounding human-caribou interactions. The National Park Service could stop allowing transporters to bring hunters into Noatak National Preserve. However, there is not currently adequate evidence that ceasing transport of non-local hunters into Noatak National Preserve would result in caribou resuming their previous migration pattern. Additionally, this alternative runs the risk of concentrating non-local users on State land around some communities.

Because there are already several Controlled Use Areas in place for Units 23 and 26A, closure to non-Federally qualified users may not reduce air traffic in areas already covered by Controlled Use Areas targeting hunter activity associated with the same species. It could, however, reduce other forms of non-local hunter presence and associated activity and noise on areas already covered by Controlled Use Areas, as well as all Federal public lands. This proposal would also likely reduce air traffic over areas and during times not currently covered by Controlled Use Areas.

Approving this request may result in increased subsistence opportunity for Federally qualified subsistence users. Reducing non-local hunting, as well as air traffic and noise associated with hunting, may remove one factor possibly contributing to delay, diversion, or cessation of the caribou migration into traditional harvest areas. The role of these activities on caribou migration is currently poorly understood, particularly in combination with the impact of climate change on caribou migration and habitat use. However, Fullman et al. (2017) suggests that while aircraft can affect caribou behavior in the short-term (< 8 hours),

which can impact hunting success, aircraft are unlikely to have long-term impacts on caribou migration through the Noatak NP. The WACH have migrated through Unit 23 for thousands of years, although specific migration routes change annually (**Figure 1**). The long-held Iñupiaq tradition of letting lead caribou pass unmolested in order to establish migration routes also suggests that once migration routes are established, other caribou will follow regardless of hunting or other disturbances such as airplanes (Dau 2015).

Some discussion regarding this closure has focused on current herd numbers and classification under State and Western Arctic Caribou Herd Working Group management levels; the herd is currently being managed at the “conservative declining” level (**Table 6**), and under these frameworks, closure to non-Federally qualified subsistence users is not recommended until the herd is at the “preservative” management level, as indicated by population estimates and bull:cow ratios. However, the rationale for the request to close to non-Federally qualified users is not the current population metrics of the herd, but the continuation of subsistence uses. Specifically, the availability of the herd to Federally qualified subsistence users, and how the activity, presence, noise, and caribou-human interactions associated with non-local hunters may be affecting that availability. Traditional Ecological Knowledge indicates that interacting with caribou in particular ways, such as flying low, not letting the leader pass, or simply creating excessive noise can hinder their movement, and that such effects may not be purely transitory, or could be cumulative in nature. Therefore, it is currently unclear whether closing Federal public lands to non-Federally qualified subsistence users in either Unit 23 or Unit 26A, or both, could contribute to restoration of historic migration routes and phenology. Fullman et al (2017) suggests that while individual caribou movements can be affected by human activity, it likely does not affect long-term caribou migration through Noatak NP. However, Local and Traditional Ecological knowledge holders suggest that repeated disruption to migratory pathways may approach a tipping point, beyond which herd memory of these routes can be lost (Baltensperger and Joly 2019; Nicholson et al. 2016). Thus, acting to protect migratory pathways may be time critical.

The entirety of Unit 23 was closed to caribou hunting by non-Federally qualified subsistence users during the 2016/17 regulatory year. Testimony from the Northwest Arctic Subsistence Regional Advisory Council in the fall of 2016, following implementation of this closure, indicated that the action had a positive effect on the availability of caribou for local communities. Council members also stated that the closure allowed communities to carry out subsistence practices without tension from conflicts with non-local hunters (NWARAC 2016a).

Since 2017, there has instead been a geographically targeted closure for caribou hunting by non-Federally qualified subsistence users along the Noatak, Eli, Agashashok, and Squirrel Rivers. This targeted closure focused on mitigating user conflicts around Noatak and resulted from extensive analysis and conversations with the Northwest Arctic Council representative from Noatak. Testimony from the Northwest Arctic Council indicates that this closure has been successful in mitigating a high-conflict area and allowing residents of Noatak to harvest caribou (NWARAC 2017a). While the current closure reduced user conflicts around Noatak, including limiting on-the-ground interactions between user groups, it does not address caribou migration and availability throughout Unit 23, the focus of the current request.

The primary reason the Northwest Arctic Council submitted this special action was because of delayed caribou migration, which has prevented many subsistence users from harvesting caribou during the fall. At their fall 2020 meeting, Council members stated that only Noatak had harvested caribou. Since 2016, according to GPS-collared caribou, crossing of the Kobuk and Selawik Rivers has been delayed, while crossing of the Noatak River has remained relatively consistent (Joly and Cameron 2020, **Figure 1, Table 7**). This suggests that closing areas south of the Noatak River and north of the Kobuk River may have the greatest impact on caribou migration phenology. However, western portions of Noatak National Preserve, BLM lands within the Squirrel River drainage, Kobuk Valley NP, CAKR, and GAAR are all already closed to non-Federally qualified users. Additionally, Council members from Ambler have expressed concern in the past over closure of all Federal public lands due to the potential to concentrate non-local hunters around the Upper Kobuk villages, which are surrounded by State lands. The closure of Selawik NWR, Bering Land Bridge NP, and the BLM lands south of the Kobuk River would not have any effect on encouraging migrating caribou to cross the Kobuk River earlier in the fall.

Moose 23

If this request is approved, Federal public lands in Unit 23 will be closed to the harvest of moose by non-Federally qualified users from August 1-September 30, 2021. Only Federally qualified subsistence users—those with a customary and traditional use determination for moose in Unit 23—would be able to harvest moose on Federal public lands in Unit 23. This request seeks to reduce moose harvest by non-Federally qualified users to protect a declining population that is important to Federally qualified subsistence users.

There are substantial conservation concerns that threaten the viability of the population. Surveys indicate substantial declines in almost every survey area, and population estimates are below State objectives. Additionally, the harvestable surplus has likely been exceeded. Regulatory changes made to reduce moose harvest since 2017 under State regulations include ending the hunt for non-residents of Alaska and elimination of the antlerless moose season. Regulatory changes made under Federal regulations since 2018 include combining the Noatak River drainage and remainder hunt areas, shortening seasons, closure of the cow moose season and changing the Unit 23 harvest limit to one antlered bull. However, moose populations have continued to decline. Federally qualified subsistence users have taken steps to limit their own harvest, and the Northwest Arctic Council voted to support these restrictions. Additionally Federal public lands were closed to moose harvest by non-Federally qualified users in December 2018 via special action due to conservation and population viability concerns.

Local use and dependence on moose may increase as availability of caribou, the most important subsistence resource for residents of Unit 23, becomes less predictable due to changes in migration routes and timing. However, moose are not a traditionally preferred food in the region. Approval of this request could aid in the recovery of the Unit 23 moose population by reducing moose harvest by non-Federally qualified users and offsetting a potential increase in use of moose by Federally qualified subsistence users on Federal public lands.

If this special action request is approved, those with a history of residency and family connection in Unit 23 who are now residing outside the region would not be able to harvest moose on Federal public lands in Unit 23 Aug. 1-Sep. 30, 2021, as they are not Federally qualified subsistence users. Non-Federally qualified users who are Native corporation shareholders would still be able to hunt on Native corporation lands under State regulations.

Hunting of moose, by non-Federally qualified users, would still be permitted on State lands in the unit as well as below the mean high water line on many waterways within Federal lands (**Map 1**). Many State lands are located adjacent to Native lands, which could cause more non-Federally qualified users to harvest moose near these areas; this concern has been expressed by communities within Unit 23 in discussion about potential closures to non-Federally qualified users. Non-Federally qualified users hunting moose may still traverse Federal public lands to access State lands if this Special Action Request is approved. If all non-Federally qualified users harvest moose on State lands, this could lead to overcrowding, increasing user conflicts. The RM880 permit already requires those hunting moose in Unit 23 under State regulations to obtain their permit in the unit in July, requiring an extra trip for non-local hunters. However, there is still an option for hunting by harvest ticket for a bull with a more limited season and additional antler restrictions (50-inch antlers or antlers with 4 or more brow tines on at least one side), which does not require that hunters obtain a permit in the unit.

Moose 26A

If this request is approved, Federal public lands in Unit 26A will be closed to the harvest of moose by non-Federally qualified users from Aug. 1-Sept. 30, 2021. Only Federally qualified subsistence users—those with a customary and traditional use determination for moose in Unit 26—would be able to harvest moose on Federal public lands in Unit 26A. Hunting of moose, by non-Federally qualified users, would still be permitted on State lands in the unit as well as below the mean high water line on many waterways within Federal lands. Currently, the State’s non-resident season is closed and harvest by non-local residents in Unit 26A is very low, at an average of less than one per year (**Table 13**). Therefore, approving this request would probably not contribute to conserving the moose population.

If this special action request is approved, those with a history of residency and family connection in Unit 26A who are now residing outside of the region would not be able to harvest moose on Federal public lands in Unit 26A Aug. 1-Sep. 30, 2021, as they are not Federally qualified subsistence users. Non-Federally qualified users who are Native corporation shareholders would still be able to hunt on Native corporation lands under State regulations.

Closing to non-Federally qualified users would alleviate concerns on the part of Federally qualified subsistence users about the impact of non-local moose hunters on the moose population, as well as possible effects of non-local hunters—including those seeking out moose—on the behavior of migrating caribou. However, the Unit 26A Controlled Use Area is already in effect in this subunit under State regulations. The Unit 26A Controlled Use Area is closed to the use of aircraft for hunting moose from Jul. 1-Sep. 30 (covering the proposed closure of Aug.1-Sep. 30), as well as Jan. 1-Mar. 31. This Controlled Use Area does not apply to use of aircraft between publicly owned airports for hunting moose. The

additional effect of this closure would be to stop foot and boat traffic associated with the single moose harvested on average per year by non-local users in Unit 26A.

OSM CONCLUSION

Support WSA21-01 with modification to only close moose hunting to non-Federally qualified users in Unit 23 from Aug. 1-Sep. 30, 2021.

Justification

Caribou in Units 23 and Unit 26A

While aircraft and non-local hunting activity can affect caribou behavior in the short-term, they have not been shown to have long-term impacts on caribou migration through the Noatak NP. While the factors affecting caribou migration are poorly understood and warrant additional research, the closure of Federal public lands is not currently warranted.

The Board has already closed areas of historically high user conflicts around Noatak in Unit 23 to caribou hunting by non-Federally qualified users, while national parks (CAKR, GAAR, KOVA) in the unit are always closed. Testimony from subsistence users and GPS-collared caribou data indicate delays in caribou crossing the Kobuk River, but not the Noatak River. Therefore, closure of the Federal lands south of the Kobuk River, including Selawik NWR, BELA, and some BLM lands would not affect the timing of caribou migrating between the Noatak and Kobuk Rivers, while most Federal lands north of the Kobuk and south of the Noatak River in Unit 23 (other than the eastern portion of Noatak National Preserve) are already closed. Additionally, closure of lands in Unit 26A are not expected to prevent delays in fall migration south of the Noatak River as these lands are located north of the Noatak River.

If Units 23 and 26A are closed to the harvest of caribou by non-Federally qualified subsistence users for August and September of 2021, user conflicts and disruption of caribou movement may increase on State lands, particularly along the upper Kobuk River. Additionally, non-Federally qualified users would still be able to access and harvest caribou on gravel bars below the mean high water mark within Federal public lands as these areas are considered State land. A closure based on the disruption of aircraft traffic on migrating caribou would also pose an unnecessary restriction on non-Federally qualified users accessing these units by means other than airplanes. Aircraft traffic from other users such as recreational boaters would still occur.

Moose in Unit 23

This request seeks to reduce moose harvest during the peak of the hunting season by non-Federally qualified users to protect a declining population that is important to Federally qualified subsistence users. There are substantial conservation concerns that threaten the viability of the population. Surveys indicate substantial declines in almost every survey area, and population estimates are below State objectives. Additionally, the harvestable surplus has likely been exceeded. Regulatory changes have been made to reduce moose harvest and promote population recovery in Unit 23 under both Federal and State regulations since 2017. However, moose populations have continued to decline. Approval of this request

could aid in the recovery of the Unit 23 moose population by reducing moose harvest by non-Federally qualified users.

Moose in Unit 26A

Currently, harvest by non-local residents in Unit 26A is very low, at an average of one per year. Therefore, approval of this request would probably not contribute to conserving the moose population. The Unit 26A Controlled Use Area is already closed to the use of aircraft for hunting moose from July 1 to September 30 as well as January 1 to March 31.

LITERATURE CITED

ADF&G. 1988. Regulatory proposals submitted to the Alaska Board of Game, March 1988. Division of Boards, Juneau, AK.

ADF&G. 1991. Customary and traditional worksheets: Arctic Region: North Slope area: GMU's 23, 24, 26. Division of Subsistence, Juneau, AK.

ADF&G. 2009. Summary of Alaska Board of Game Arctic/Western region meeting. Nome, AK. November 13-16, 2009. <http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo&date=11-13-2009&meeting=arctic>. Retrieved: May 31, 2021.

ADF&G. 2015. RC069. Estimated total caribou harvest by community, per capita caribou harvest by community, and data sources, GMUs 21, 22, 23, 24 and 26: Western Arctic caribou herd and Teshekpuk caribou herd. Alaska Board of Game Meeting Information. Southcentral Region, March 13-18, 2015. http://www.adfg.alaska.gov/static/regulations/regprocess/gameboard/pdfs/2014-2015/Southcentral_03_13_15/rcs/rc069_ADFG_Caribou_harvest_data.pdf. Retrieved: February 22, 2016.

ADF&G. 2016. Community subsistence information system (CSIS). <http://www.adfg.alaska.gov/sb/CSIS/>. Retrieved: March 16, 2021.

ADF&G. 2017a. Board of Game Arctic and Western Region Meeting Materials. January 6-9, 2017. Bethel, AK.

ADF&G. 2017b. 2016-2017 draw supplement. https://www.adfg.alaska.gov/static/license/huntlicense/pdfs/2016-2017_draw_supplement.pdf. Retrieved: February 1, 2017.

ADF&G 2017c. Region V caribou overview. Alaska Board of Game. Arctic and western region. Jan. 6-9, 2017. Bethel, AK. http://www.adfg.alaska.gov/static/regulations/regprocess/gameboard/pdfs/2016-2017/aw/Tab_1.3_RegionV_Caribou_Overview.pdf. Accessed January 20, 2017.

ADF&G. 2021a. General harvest reports. <https://secure.wildlife.alaska.gov/index.cfm?fuseaction=harvestreports.main>. Retrieved: April 7, 2021.

ADF&G. 2021b. CSIS: Community subsistence information system. <http://www.adfg.alaska.gov/sb/CSIS/>. Retrieved: April 8, 2021.

ADLWD (Alaska Department of Labor and Workforce Development). 2019. Alaska population overview: 2019 estimates. <https://live.laborstats.alaska.gov/pop/estimates/pub/19popover.pdf>. Retrieved: March 16, 2020.

- Alaska Board of Game. 2017. Audio of the Alaska Board of Game Meeting proceedings. January 9, 2017. Bethel, AK. ADF&G. Juneau, AK.
- Anderson, D. D. 1968. A stone age campsite at the gateway to America. *Scientific American* 218(6): 24–33.
- Anderson, D. D. 1988. Onion Portage: the archaeology of a stratified site from the Kobuk River, Northwest Alaska. *Anthropological papers of the University of Alaska*. 22 (1-2): 1-163.
- Anderson, D.D. 1998. Kuuvanmiut subsistence: traditional Eskimo life in the latter twentieth century. National Park Service, Department of the Interior.
- Atkinson, H. 2021. Anthropologist: Personal communication: email. Western Arctic National Parklands. National Park Service. Kotzebue, AK.
- Baltensperger, A.P. and K. Joly. 2019. Using seasonal landscape models to predict space use and migratory patterns of an arctic ungulate. *Movement ecology* 7(1): 1-19.
- Betchkal, D. 2015. Acoustic monitoring report, Noatak National Preserve – 2013 and 2014. National Park Service. <https://science.nature.nps.gov/im/units/cakn/vitalsign.cfm?vsid=71>. Retrieved: February 1, 2017.
- Boertje, R. D., M. A. Keech, D. D. Young, K. A. Kellie, and T. C. Seaton. 2009. Managing for elevated yield of moose in Interior Alaska. *Journal of Wildlife Management* 73(3): 314-327.
- Braem, N.M, E.H Mikow, S.J Wilson, and M.L. Kostick. 2015. Wild food harvests in 3 Upper Kobuk River communities: Ambler, Shungnak, and Kobuk. ADF&G, Div. of Subsistence Tech. Paper No. 402. Fairbanks, AK
- Braem, N. M, E.H Mikow, M.L. Kostick; contributors: A. Brenner, A.R. Godduhn, and B. Retherford. 2017. Chukchi Sea and Norton Sound observation network: harvest and use of wild resources in 9 communities in arctic Alaska, 2012–2014. ADF&G, Div. of Subsistence Tech. Paper No. 403. Fairbanks, AK.
- Burch, Jr., E.S. 1980. Traditional Eskimo societies in northwest Alaska. *Senri Ethnological Studies* 4:253-304.
- Burch, Jr., E. S. 1994. The cultural and natural heritage of Northwest Alaska. Volume V. Nana Museum of the Arctic, Kotzebue, Alaska and U.S. National Park Service, Alaska Region. Anchorage, AK.
- Burch, Jr., E.S. 1998. The Inupiaq Eskimo nations of Northwest Alaska. University of Alaska Press. Fairbanks, AK.
- Burch, Jr., E. S. 2012. Caribou herds of Northwest Alaska 1850-2000. Edited by Krupnik Igor and Jim Dau. University of Alaska Press. Fairbanks, AK.
- Caribou Trails. 2014. News from the Western Arctic Caribou Herd Working Group. Western Arctic Caribou Herd Working Group, Nome, AK. Issue 14. http://westernarcticcaribou.org/wp-content/uploads/2014/07/CT2014_FINAL_lowres.pdf. Retrieved: June 23, 2015.
- Carroll, G. 2000. Moose survey-inventory management report. Pages 523-637 in M.V. Hicks, editor. Report of survey–inventory activities, 1997-1999. ADF&G. Federal Aid in Wildlife Restoration. Progress Report. Grants W-27-1, W-27-2. Juneau, AK.

- Carroll, G. 2010. Unit 26A moose management report. Pages 643-665 *in* P. Harper, editor. Moose management report of survey and inventory activities 1 July 2007 –30 June 2009. ADF&G. Juneau, AK.
- Carroll, G. 2013. Wildlife Biologist. Personal communication: email. ADF&G. Anchorage, AK.
- Coady J. 1980. History of moose in northern Alaska and adjacent regions. *Canadian Field Naturalist* 94: 61–68.
- Daggett, C. 2021. North Slope Area Biologist. Personal communication: email. ADF&G. Utqiagvik, AK.
- Dau, J. 2011. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A caribou management report. Pages 187-250 *in* P. Harper, editor. Caribou management report of survey and inventory activities July 1, 2008–30 June 30, 2010. ADF&G. Juneau, AK.
- Dau, J. 2013. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A caribou management report. Pages 201-280 *in* P. Harper, editor. Caribou management report of survey and inventory activities July 1, 2010–30 June 30, 2012. ADF&G. Juneau, AK.
- Dau, J. 2014. Wildlife Biologist. Western Arctic Caribou herd presentation. Western Arctic Caribou Herd (WACH) Working Group Meeting, December 17-18, 2014. Anchorage, Alaska. ADF&G. Nome, AK.
- Dau, J. 2015. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24 and 26A. Chapter 14, pages 14-1 through 14-89 *in* P. Harper, and Laura A. McCarthy, eds. Caribou management report of survey and inventory activities 1 July 2012–30 June 2014. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2015-4, Juneau, AK.
- Dau, J. 2016a. Memorandum to S. Machida dated June 21, 2016. 2016 Western arctic caribou herd calving survey: 4-12 June. ADF&G Division of Wildlife Conservation, Fairbanks, AK.
- Dau, J. 2016b. Memorandum to S. Machida dated April 26, 2016. 2016 Western Arctic caribou herd recruitment survey: 31 March and 5, 19, and 21 April. ADF&G Division of Wildlife Conservation, Fairbanks, AK.
- Deur, D.D., J. Hebert and H. Atkinson. 2019. Noatak National Preserve: traditional use study. Draft phase I report (unpublished). Portland State University Department of Anthropology and the National Park Service.
- Fall, J.A. 1990. The Division of Subsistence of the Alaska Department of Fish and Game: An overview of its research program and findings: 1980-1990. *Arctic Anthropology* 27(2): 68-92.
- Fix, P.J. and A. Ackerman. 2015. Noatak National Preserve sport hunter survey. Caribou hunters from 2010-2013. Natural resources report. National Park Service.
- Fronstin, R. 2018. Wildlife Biologist. Personal communication: e-mail. Western Arctic National Parklands. National Park Service. Kotzebue, AK.
- Fronstin, R. 2021. Wildlife Biologist. Personal communication: e-mail. Western Arctic National Parklands. National Park Service. Kotzebue, AK.
- Fullman, T.J., K. Joly, A. Ackerman. 2017. Effects of environmental features and sport hunting on caribou migration in northwestern Alaska. *Movement Ecology* 5(1): 1-11.

USFWS. 2011. Selawik National Wildlife Refuge. Revised comprehensive conservation plan. National Wildlife Refuge System. Alaska Region of the U.S. Fish and Wildlife.

Service.https://www.fws.gov/uploadedFiles/Region_7/NWRS/Zone_2/Selawik/PDF/CCP_Full_Final_Document.pdf. Retrieved: March 28, 2017.

USFWS. 2014. FY2014 annual report reply to the Norwest Arctic Subsistence Regional Advisory Council. Office of Subsistence Management, USFWS. Anchorage, AK.

Gasaway, W. C., R. D. Boertje, D. V Grangaard, D. G. Kelleyhouse, R. O. Stephenson, and D. G. Larsen. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. wildlife monographs. Wildlife Monographs No. 120: 3-59.

Georgette, S., and H. Loon. 1988. The Noatak River: Fall caribou hunting and airplane use. ADF&G Div. of Subsistence Tech. Paper No. 162. Kotzebue, AK.

Georgette, S., and H. Loon. 1993. Subsistence use of fish and wildlife in Kotzebue, a Northwest Alaska regional center. ADF&G, Div. of Subsistence Tech. Paper No. 167. Fairbanks, AK.

Georgette, S. 2017. Selawik National Wildlife Refuge Manager. Personal communication: email. USFWS, Kotzebue, AK.

Gonzalez, D., E. H. Mikow, and M. L Kostick. 2018. Subsistence wildlife harvests in Buckland, Koyuk, and Noatak, Alaska 2016-2017. ADF&G, Div. of Subsistence Special Publication SP2018-05. Fairbanks, AK.

Gunn, A. 2001. Voles, lemmings and caribou – population cycles revisited? Rangifer, Special Issue 14: 105-111.

Gurarie, E., P.R. Thompson, A.P. Kelly, N.C. Larter, W.F. Fagan, and K. Joly. 2020. For everything there is a season: estimating periodic hazard functions with the cyclomort R package. *Methods in Ecology and Evolution* 11 (1): 129-138. DOI: 10.1111/2041-210X.13305.

Halas, G. 2015. Caribou migration, subsistence hunting, and user group conflicts in Northwest Alaska: A traditional knowledge perspective. University of Fairbanks-Alaska. Fairbanks, AK.

Hall E.S. 1973. Archaeological and recent evidence for expansion of moose range in northern Alaska. *Journal of Mammalogy* 54: 294–295.

Hansen, D.A. 2019a. 2019 Western Arctic Caribou Herd – herd population status, other metrics. Presentation to Western Arctic Caribou Herd Working Group Technical Committee. December 10, 2019. <https://westernarcticcaribou.net/>.

Hansen, D.A. 2019b. Wildlife Biologist. Personal communication: e-mail. Alaska Department of Fish and Game. Kotzebue, AK.

Hansen, D.A. 2020. Wildlife Biologist. Personal communication: e-mail. Alaska Department of Fish and Game. Kotzebue, AK.

Hansen, W. 2021. Unit 23 Moose Neonate Survival hand-out. Alaska Department of Fish and Game. Nome, AK.

- Holand, O., R.B. Weladji, A. Mysterud, K. Roed, E. Reimers, M. Nieminen. 2012. Induced orphaning reveals post-weaning maternal care in reindeer. *European Journal of Wildlife Research*. 58: 589-596.
- Jacobson, D. 2008. Fall hunting in game management unit 23: assessment of issues and proposals for a planning process. ADF&G. Unpublished report. Juneau, AK.
- Joly, K. 2000. Orphan caribou, *Rangifer tarandus*, calves: a re-evaluation of overwinter survival data. *The Canadian field naturalist* 114: 322-323.
- Joly, K. 2015. Wildlife Biologist, Gates of the Arctic National Park and Preserve. Personal communication: e-mail NPS. Fairbanks, AK.
- Joly, K. 2021. Wildlife Biologist, Gates of the Arctic National Park and Preserve. Personal communication: e-mail NPS. Fairbanks, AK.
- Joly, K., R.R. Jandt, C.R. Meyers, and J.M. Cole. 2007. Changes in vegetative cover on the Western Arctic herd winter range from 1981–2005: potential effects of grazing and climate change. *Rangifer Special Issue* 17:199-207.
- Joly, K., and M. D. Cameron. 2018. Early fall and late winter diets of migratory caribou in northwest Alaska. *Rangifer* 38 (1): 27-38. DOI: [10.7557/2.38.1.4107](https://doi.org/10.7557/2.38.1.4107).
- Joly, K., and M.D. Cameron. 2020. Caribou vital sign annual report for the Arctic Network Inventory and Monitoring Program, September 2019-August 2020. Natural resource report. National Park Service.
- Joly, K., T. Craig, M.D. Cameron, A.E. Gall, M.S. Sorum. 2017. Lying in wait: limiting factors on a low-density ungulate population and the latent traits that can facilitate escape from them. *Acta Oecologica* 85: 174-183. DOI: [10.1016/j.actao.2017.11.004](https://doi.org/10.1016/j.actao.2017.11.004).
- Joly, K., P.A. Duffy, and T.S. Rupp. 2012. Simulating the effects of climate change on fire regimes in Arctic biomes: implications for caribou and moose habitat. *Ecosphere* 3(5): 36.
- Joly, K., R.R. Jandt, C.R. Meyers, and J.M. Cole. 2007. Changes in vegetative cover on the Western Arctic herd winter range from 1981–2005: potential effects of grazing and climate change. *Rangifer Special Issue* 17:199-207.
- Joly, K., D.R. Klein, D.L. Verbyla, T.S. Rupp, and F.S. Chapin, III. 2011. Linkages between large-scale climate patterns and the dynamics of Arctic caribou populations. *Ecography* 34: 345-352.
- Klimstra, R. and C. Daggett. 2020. Moose management report and plan, Game Management Unit 26A: report period 1 July 2010–30 June 2015, and plan period 1 July 2015–30 June 2020. Species management report and plan ADF&G/DWC/SMR&P–2020–9. ADF&G. Juneau, AK.
- LeResche, R.E., R.H. Bishop, and J.W. Coady. 1974. Distribution and habitats of moose in Alaska. *Le Naturaliste Canadian*, Vol. 101: 143-178.
- Lenart, E. A. 2011. Units 26B and 26C caribou. Pages 315-345 in P. Harper, ed. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. ADF&G. Project 3.0. Juneau, AK.
- Mikow, E.H. and M.L. Kostick. 2016. Subsistence Wildlife Harvests in Kotzebue, Alaska, 2013-2014. ADF&G, Div. of Subsistence Special Publication No. 2016-02. Fairbanks, AK.

- Miller, F.L. 2003. Caribou (*Rangifer tarandus*). Pages 965-997 in Feldhamer, B.C. Thompson, and J.A. Chapman, eds. Wild mammals of North America- biology, management, and conservation. John Hopkins University Press. Baltimore, Maryland.
- Nicholson, K.L., S.M. Arthur, J.S. Horne, E.O. Garton, and P.A. Del Vecchio. 2016. Modeling caribou movements: seasonal ranges and migration routes of the Central Arctic Herd. PLoS ONE 11(4): e0150333. <https://doi.org/10.1371/journal.pone.0150333>.
- NPS. 2020. Commercial use authorization stipulations: 2020 park specific regulations—Western Arctic Parklands. <https://www.nps.gov/locations/alaska/stips-wear.htm>. Retrieved April 2, 2021.
- NWARAC. 2015a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, October 6-7, 2015 in Buckland, AK. Office of Subsistence Management, FWS. Anchorage, AK.
- NWARAC. 2015b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, March 9-10, 2015 in Kotzebue, AK. Office of Subsistence Management, FWS. Anchorage, AK.
- NWARAC. 2016a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, October 5-6, 2016 in Selawik, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2016b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, March 10, 2016 in Anchorage, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2017a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, October 25-26, 2017 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2017b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, March 1-2, 2017 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2018a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, February 28-March 1, 2018 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2018b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, October 24-25, 2018 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2019a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, April 9-10, 2019 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2019b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, October 28-29, 2019 in Kotzebue, AK. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2020a. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, November 3, 2020. Teleconference. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2020b. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, March 16, 2020. Teleconference. Office of Subsistence Management, USFWS. Anchorage, AK.
- NWARAC. 2021. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, February 18, 2021. Teleconference. Office of Subsistence Management, USFWS. Anchorage, AK.

- OSM. 1995. Staff analysis WP95-62. OSM database. Office of Subsistence Management. Anchorage, AK.
- OSM. 2017a. Staff analysis WSA16-03. Pages 563-649 in Federal Subsistence Board Meeting Materials January 10-12, 2017. Office of Subsistence Management, USFWS. Anchorage, AK.
- OSM. 2017b. Staff analysis WSA17-03. OSM database. Office of Subsistence Management. Anchorage, AK.
- Parrett, L.S. 2011. Units 26A, Teshekpuk caribou herd. Pages 283-314 in P. Harper, ed. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. ADF&G.. Project 3.0. Juneau, AK.
- Parrett, L.S. 2015a. Western Arctic Caribou Herd Overview presentation. Presented at the Western Arctic Caribou Herd Working Group meeting. December 16-17. Anchorage, AK.
- Parrett, L.S. 2015b. Memorandum to P. Bente, Management Coordinator, dated October 29, 2015. 2015 Western Arctic Herd (WAH) captured conducted September 15-17, 2015. ADF&G Division of Wildlife Conservation, Fairbanks, AK.
- Parrett, L.S., 2015c. Unit 26A, Teshekpuk caribou herd. Chapter 17, pages 17-1 through 17-28 in P. Harper and L.A. McCarthy, eds. Caribou management report of survey and inventory activities 1 July 2012-30 June 2014. ADF&G, Species Management Report ADF&G /DWC?SMR-2015-4, Juneau, AK.
- Parrett, L.S. 2015d. Memorandum to P. Bente, Management Coordinator, dated December 31, 2015. Summary of Teshekpuk Caribou Herd photocensus conducted July 6, 2015. ADF&G Division of Wildlife Conservation. Fairbanks, AK.
- Parrett, L.S. 2016. Memorandum for distribution, dated August 25, 2016. Summary of Western Arctic Caribou Herd photocensus conducted July 1, 2016. ADF&G Division of Wildlife Conservation, Fairbanks, AK.
- Parrett, L.S. 2017a. WAH Caribou Overview. Western Arctic Caribou Herd Working Group Meeting. December 2017. <https://westernarcticcaribounet.files.wordpress.com/2017/12/2017-complete-wg-meeting-binder-dec-13-14-2017-for-webpost.pdf>. Retrieved December 20, 2017.
- Parrett, L.S. 2017b. Wildlife Biologist IV. Personal communication: phone and e-mail. Alaska Department of Fish and Game. Fairbanks, AK.
- Prichard, A.K. 2009. Development of a preliminary model for the Western Arctic Caribou Herd. ABR, Inc. – Environmental Research and Services. Fairbanks, AK.
- Prichard, A.K., K. Joly and J. Dau. 2012. Quantifying telemetry collar bias when age is unknown: a simulation study with a long-lived ungulate. *Journal of Wildlife Management* 76 (7): 1441-1449. DOI: 10.1002/jwmg.394.
- Robison, H. 2017. National Park Service wildlife update. November 2017. NPS. Kotzebue, AK.
- Rughetti, M., M. Festa-Bianchet. 2014. Effects of selective harvest of non-lactating females on chamois population dynamics. *Journal of applied ecology*. 51: 1075-1084.
- Russell, D.E., S.G. Fancy, K.R. Whitten, R.G. White. 1991. Overwinter survival of orphan caribou, *Rangifer tarandus*, calves. *Canadian field naturalist*. 105: 103-105.

- Saito, B. 2014. Unit 23 moose management report. Pages 32-1 through 32-21 in P. Harper, ed. Moose management report of survey and inventory activities 1 July 2009-30 June 2011. ADF&G Species Management Report ADF&G/DWC/SMR-2015-5, Juneau, AK.
- Saito, B. 2016. Wildlife biologist/Area biologist. Personal communication: e-mail. ADF&G. Kotzebue, AK.
- Saito, B. 2017. Wildlife biologist/Area biologist. Personal communication: e-mail. ADF&G. Kotzebue, AK.
- Saito, B. 2018. Wildlife biologist/Area biologist. Personal communication: e-mail. ADF&G. Kotzebue, AK.
- Stephenson, T. R., V. Van Ballenberghe, J. M. Peek, and J. G. MacCracken. 2006. Spatio-Temporal constraints on moose habitat and carrying capacity in coastal Alaska: vegetation succession and climate. *Rangeland Ecology & Management* 59(4), 359-372.
- Stinchcomb, T.R., 2017. Social-ecological soundscapes: examining aircraft-harvester-caribou conflict in arctic Alaska. University of Alaska Fairbanks.
- Stinchcomb, T. R., T. J. Brinkman, and S.A. Fritz. 2019. A review of aircraft-subsistence harvester conflict in arctic Alaska.” *Arctic* 72(2): 131–50. <https://doi.org/10.14430/arctic68228>.
- Stinchcomb, T.R., T.J. Brinkman, and D. Betchkal. 2020. Extensive aircraft activity impacts subsistence areas: acoustic evidence from arctic Alaska. *Environmental Research Letters* 15(11): 115005.
- Street, G. M., A. R. Rodgers, T. Avgar, and J. M. Fryxell. 2015. Characterizing demographic parameters across environmental gradients: a case study with Ontario moose (*Alces alces*). *Ecosphere* 6: 1-13.
- Stout, G. W. 2010. Unit 21D moose. Pages 477–521 in P. Harper, ed. Moose management report of survey and inventory activities 1 July 2007–30 June 2009. ADF&G, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Project 1.0, Juneau, AK.
- Sutherland, R. 2005. Harvest estimates of the Western Arctic caribou herd, Alaska. Proceedings of the 10th North American Caribou Workshop. Girdwood, AK. May 4-6, 2004. *Rangifer* special issue 16:177-184.
- Swanson, D.W. 2015. Environmental limits of tall shrubs in Alaska’s arctic national parks. *PLoS ONE*. 10(9): 1-34.
- Taillon, J., V. Brodeur, M. Festa-Bianchet, S.D. Cote. 2011. Variation in body condition of migratory caribou at calving and weaning: which measures should we use? *Ecoscience* 18(3): 295-303.
- Tape, K.D., D.D. Gustine, R.W. Ruess, L.G. Adams and J.A. Clark. 2016. Range expansion of moose in arctic Alaska linked to warming and increased shrub habitat. *PLoS ONE* 11(4): 1-12.
- WACH (Western Arctic Caribou Herd) Working Group. 2011. Western Arctic Caribou Herd Cooperative Management Plan – Revised December 2011. Nome, AK.
- WACH (Western Arctic Caribou Herd) Working Group. 2015. Western Arctic Caribou Herd Cooperative Management Plan. Table 1 Revision – Dec. 2015. <https://westernarcticcaribou.net/herd-management/>. Accessed June 1, 2017.

WACH (Western Arctic Caribou Herd) Working Group. 2019. Western Arctic Caribou Herd Working Group Meeting. December 10-12, 2019. Anchorage, AK.

WACH (Western Arctic Caribou Herd) Working Group. 2020. Western Arctic Caribou Herd Working Group Meeting December 9, 2020. Teleconference.

WEAR. 2017. Western Arctic Parklands commercial use authorization activity report: 2017. National Park Service, Anchorage, AK.

WEAR. 2018. Western Arctic Parklands commercial use authorization activity report: 2018. National Park Service, Anchorage, AK.

WEAR. 2019. Western Arctic Parklands commercial use authorization activity report: 2019. National Park Service, Anchorage, AK.

WEAR. 2020. Western Arctic Parklands commercial use authorization activity report: 2020. National Park Service, Anchorage, AK.

Westing, C. 2012. Unit 23 moose management report. Pages 560-582 *in* P. Harper, ed. Moose management report of survey and inventory activities 1 July 2009-30 June 2011. ADF&G species management report ADF&G/DWC/SMR-2012-5, Juneau, AK.

WINFONET. 2017. Wildlife information network. ADF&G. Anchorage, AK. <https://winfonet.alaska.gov/>. Retrieved: February 7, 2017.

WINFONET. 2018. Wildlife information network. ADF&G. Anchorage, AK. <https://winfonet.alaska.gov/>. Retrieved: November 2018.

WINFONET. 2019. Wildlife information network. ADF&G. Anchorage, AK. <https://winfonet.alaska.gov/>. Retrieved: July 2019.