

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

**ISSUES**

Temporary Wildlife Special Action WSA21-01b, submitted by the Northwest Arctic Subsistence Regional Advisory Council (Council), requests closing Federal public lands in Units 23 and 26A to moose hunting by non-Federally qualified users from August 1 to September 30, 2022. Originally, the request was submitted for the 2021 hunting season.

**DISCUSSION**

The proponent requested a closure to moose hunting by non-Federally qualified users August 1 to September 30, 2021 because of declining moose populations. In a June 16, 2021 public teleconference, the Federal Subsistence Board (Board) deferred WSA21-01 to the 2022 season. The Board asked OSM staff to include comparisons of moose harvest by survey area within Unit 23 in their analysis. If adopted, this special action would now apply to the 2022 hunting season.

**Note:** Temporary Wildlife Special Action WSA21-01 has been separated into two analyses: WSA21-01a (caribou) and WSA21-01b (moose) for simplicity. WSA21-01a requests closing Federal public lands in Units 23 and 26A to caribou hunting by non-Federally qualified users from August 1 to September 30, 2022.

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—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—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—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, 2022 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, 2022 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, 2022 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, 2022 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, 2022 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, 2022 except by Federally qualified subsistence users hunting under these regulations.***

## Existing State Regulation

### 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—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 (**Map 1**).

### Unit 26A

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

National Parks and Monuments, which includes Kobuk Valley National Park, Cape Krusenstern National Monument in Unit 23, and a portion of Gates of the Arctic National Park in Units 23 and 26A, are already closed to hunting by all but resident zone communities as determined by National Park Service regulations.

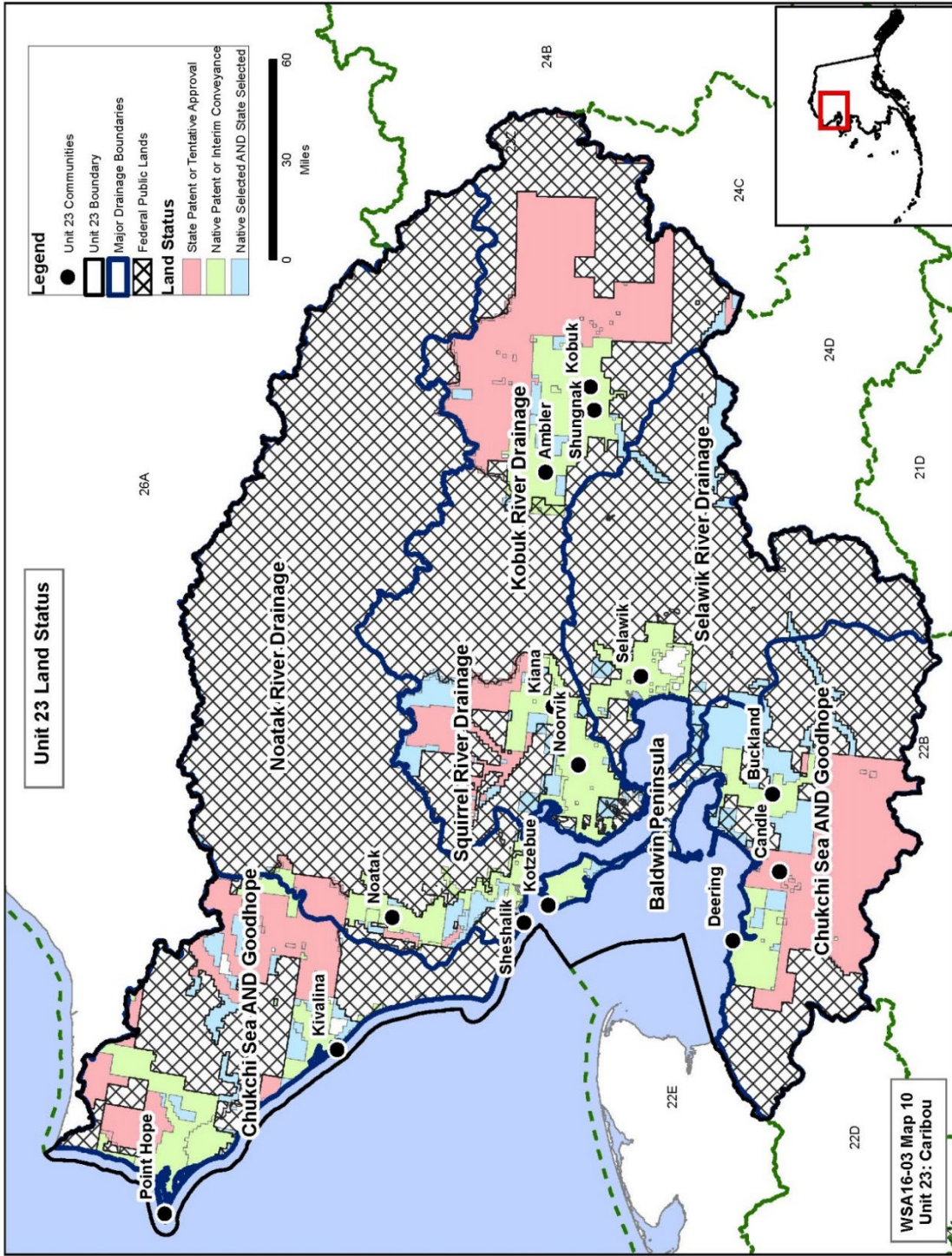
The Federal lands in question for this proposed closure include Noatak National Preserve, Selawik National Wildlife Refuge, most of Gates of the Arctic National Preserve, the National Petroleum Reserve-Alaska, a portion of Bering Land Bridge National Preserve, and other smaller BLM and FWS land in Units 23 and 26A.

## **Customary and Traditional Use Determinations**

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

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 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. The Alaska Board of Game (BOG) approved amended Proposal 15 (effective starting with the 2004/05 regulatory year). The proposal created four registration hunts in the unit with permits (RM880). The permits allowed for better tracking of harvest and made it more difficult for nonlocal residents to hunt moose. The permits were only available at licensed vendors in Unit 23 villages from Jun. 1-Jul. 15, before the start of the season. Therefore, nonlocal hunters had to make a special trip to a Unit 23 village to receive a permit.

In 2005, Proposal WP05-18, submitted by the Northwest Arctic Council, requested four changes: 1) prohibiting the harvest of calves, 2) reducing the season for moose in most of Unit 23 from Jul. 1 (or Aug. 1)-Mar. 31 to Aug. 1-Dec. 31, 3) combining the Noatak drainage and remainder hunt areas, and 4) 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.

<b>Proposal</b>	<b>Proposed Action</b>	<b>Proponent Rationale</b>	<b>Board Action</b>
<b>WSA17-02</b> (Northwest Arctic Council)	Close to NFQUs for 2017/18 regulatory year	Decline in moose population	Reject
<b>WSA18-04</b> (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.
<b>WSA19-04</b> (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.
<b>WP20-47</b> (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. 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 hunts in August and September in Units 23 and 26A. Y = Yes; N = No; FQSUs = Federally qualified subsistence users; NFQUs = non-Federally qualified users.

	<b>FQSUs (rural residents with C&amp;T) hunting under Federal regulations</b>	<b>Residents of Alaska (includes both FQSUs and NFQUs) hunting under State regulations</b>	<b>Nonresidents of Alaska (NFQUs) hunting under State regulations</b>
<b>Unit 23 moose</b>	Y	Y	N
<b>Unit 26A moose</b>	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) where the use of aircraft in any manner for big game hunting would be restricted from 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 (USFWS 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 2020. 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, the refuge no longer receives many fly-in hunters (NWARAC 2021). Since 2017, commercial services have brought only two to seven hunters each year to the refuge.

#### *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

##### *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 pertaining to moose in Units 23 and 26A, with aircraft closure periods noted.

Controlled Use Area	Time Period	Aircraft closure
<b>Unit 23</b>		
Noatak Controlled Use Area (State and Federal regulations)	Aug. 15-Sep. 30	To transportation of hunters or harvested <b>species</b> .
Selawik National Wildlife Refuge Area Not Authorized for Commercial Transporters and Guides	Year-round	To <b>big game</b> hunting by commercial guides and transporters
<b>Unit 26A</b>		
Unit 26A Controlled Use Area (State regulations)	Jul. 1-Sep. 30, Jan. 1-Mar. 31	To the use of aircraft for hunting <b>moose</b> , including the transportation of moose hunters, their hunting gear, or parts of moose.

## Biological Background

### 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).

In cooperation with ADF&G, The NPS, 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/mi<sup>2</sup> while adult moose densities ranged from 0.03-0.59 moose/mi<sup>2</sup> (**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, 2016, 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). These are also the areas that have experienced the most substantial population declines (**Figure 7**). (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**). ADF&G and the NPS plan to survey the Lower Kobuk area in spring 2022.

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, 2016 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 thus could be biased toward higher bull:cow ratios. This is because moose habitat selection is affected by sex and maternal status. For example, cows, particularly cows with calves, prefer more enclosed habitat for predator protection, which can also make 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, 2016 pers. comm., 2018 pers. comm.). These low calf:cow ratios suggest that the Unit 23 moose population is declining. 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 2016, 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.

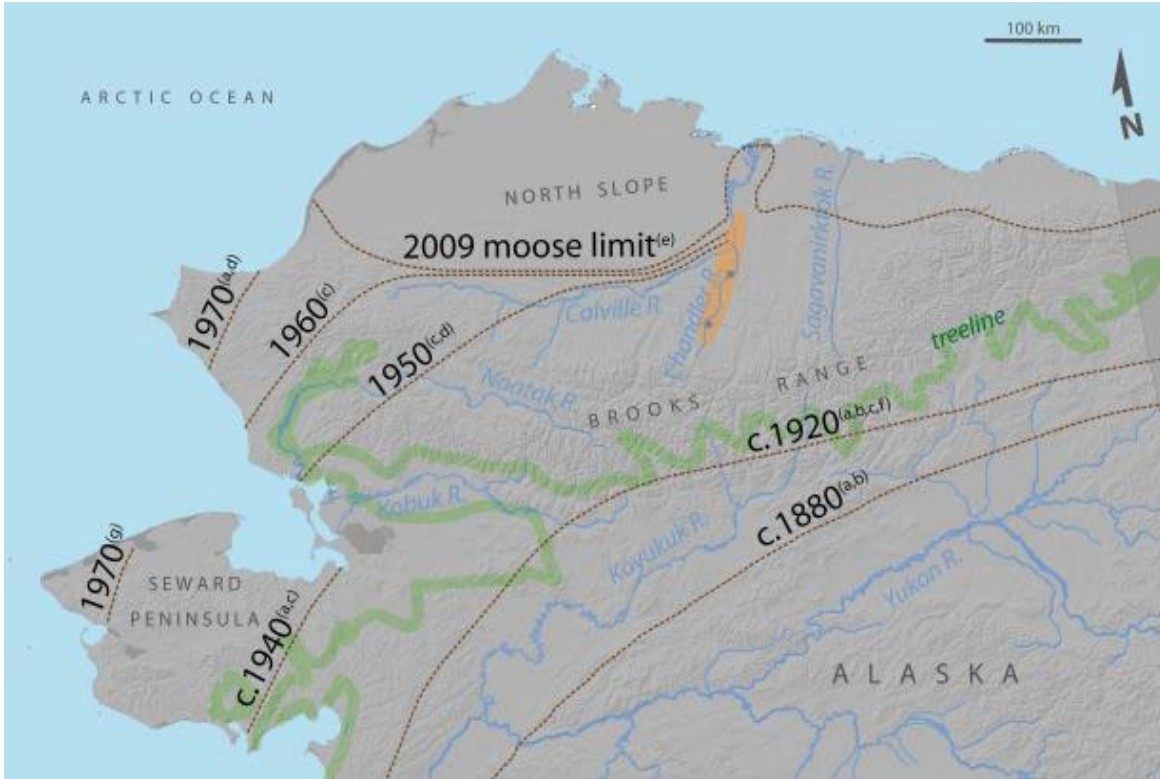
While predation by brown bears, black bears, and wolves affects moose population dynamics in Unit 23, the overall level of impact of predators in relation to other factors such as weather, snow depth, disease, and human harvest is unknown, although deep snow and icing events limit moose movements, increasing 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).

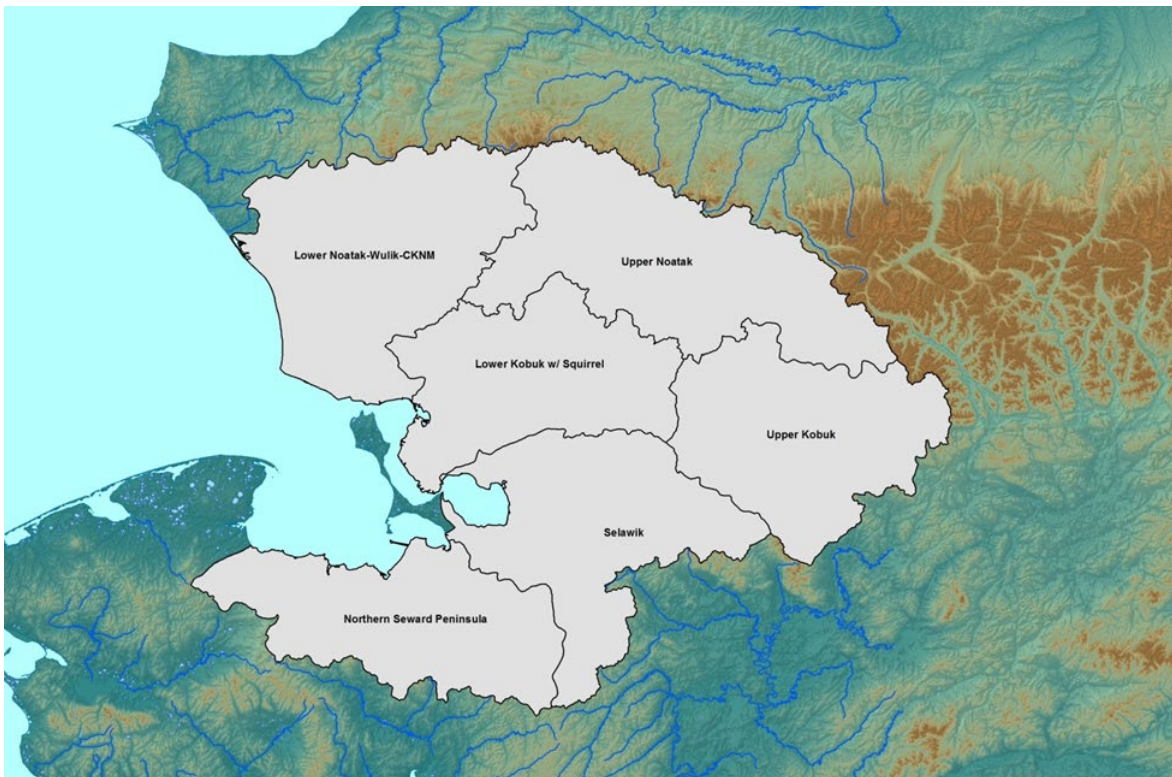
As moose are on the edge of their range in Unit 23, lower moose densities and habitat limitation are expected. However, the Unit 23 moose population does not appear to be nutritionally limited in the lower Kobuk survey area (Hansen 2021). A 2017 browse survey, completed in the Lower Kobuk, suggested 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 browse 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).

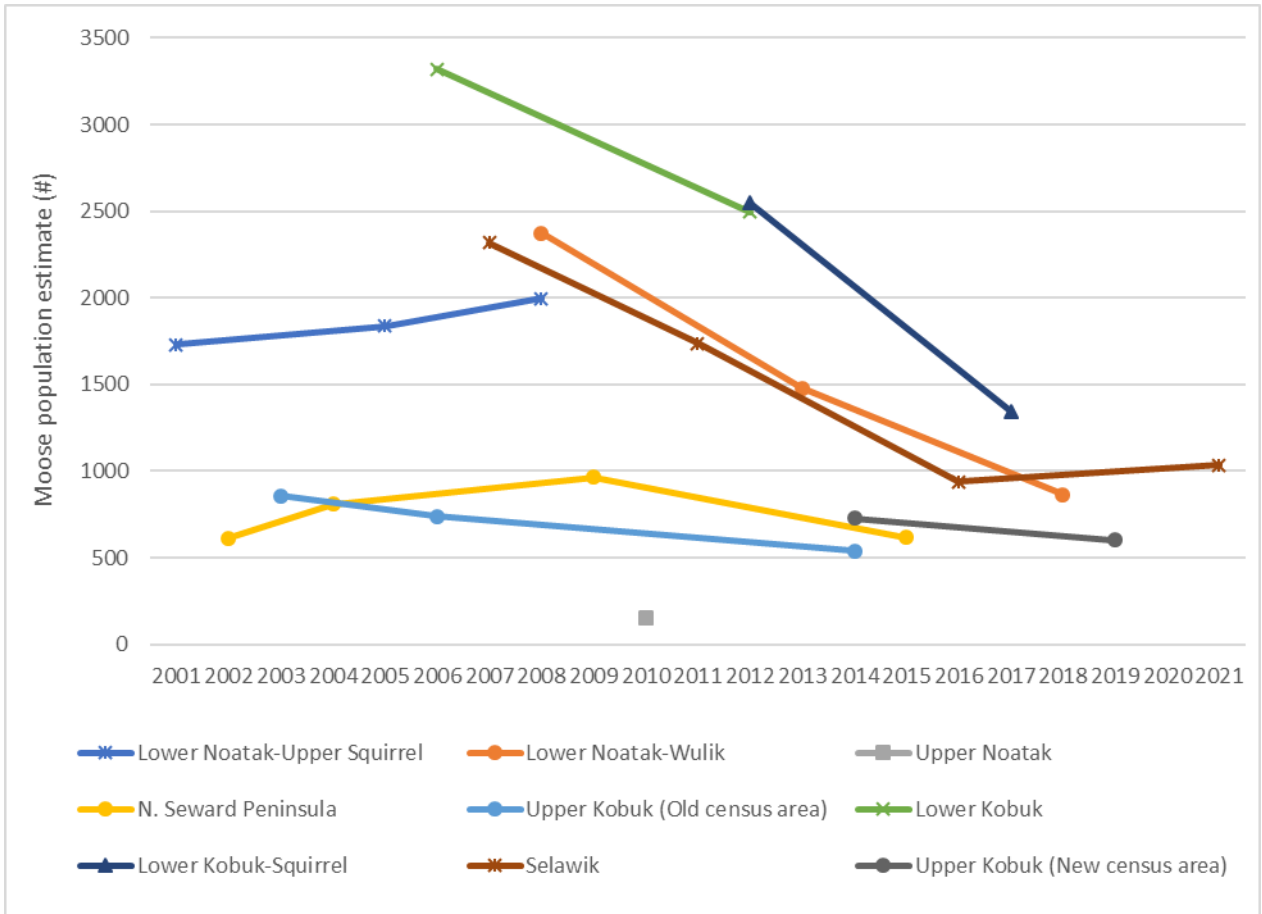




**Map 8.** Temporal moose distribution changes in northern Alaska (figure from Tape et al. 2016).



**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 <sup>2</sup> )	Area Surveyed (mi <sup>2</sup> )	Total Density (/mi <sup>2</sup> )	Adult Density (/mi <sup>2</sup> )	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	--	--	0.14	--	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 2016 pers. comm., 2018 pers. comm., NWARAC 2018a, 2019a, Fronstin 2021, pers. comm.).

<b>Unit 23 Study Area</b>	<b>Most recent survey year</b>	<b>Population Estimate</b>	<b>Population Objective</b>	<b>Estimated Harvestable Surplus</b>
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
<b>Total</b>		<b>4,619</b>		<b>277</b>
<b>Extrapolated 2017 Total</b>		<b>7,500</b>		<b>450</b>
<b>Extrapolated 2018 Total</b>		<b>6,300</b>		<b>378</b>
<b>Extrapolated 2019 Total</b>		<b>5,600</b>		<b>336</b>

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

<b>Survey Area</b>	<b>Year</b>	<b>Bulls:100 Cows</b>	<b>Calves:100 Cows</b>
Selawik	2008	54	18
	2010	47	19
	2015	43	20
Lower Kobuk	2011	45	15
	2016	38	24
	2021	34	14
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 include the Itkillik 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 2014, Klimstra and Daggett 2020, Daggett 2021, pers. comm.).

Year	Moose observed			% Short yearlings
	Adults	Short yearlings	Total <sup>a</sup>	
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 <sup>b</sup>	545	64	609	11
2014	290	4	294	1
2017	285	63	348	17
2021	349	88	437	20

<sup>a</sup> 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).

<sup>b</sup> 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 (Carroll 2010).

## **Harvest History**

### 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 2020, total reported moose harvest in Unit 23 ranged from 94-189 moose, averaging 142 moose (**Table 12**) (Osburn 2021, pers. comm.). 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). Over the same time period, local resident (residents of Unit 23), nonlocal resident, and nonresident reported harvest averaged 81 moose (57%), 42 moose (30%), and 18 moose (13%) per year, respectively (**Table 12**) (Osburn 2021, pers. comm.). However, after the nonresident season closed under State regulations in 2017, the percentage of the reported harvest has averaged 76% by local residents and 24% by nonlocal residents. Collectively, the nonlocal resident and nonresident harvest equals the non-Federally qualified user harvest. As the nonresident season is closed, harvest by nonlocal residents currently accounts for all of the non-Federally qualified user harvest.

Between 2005 and 2020, cows have comprised 6% of the annual reported harvest on average, with 0-23 cows being harvested each year (**Table 12**, Osburn 2021, pers. comm.), although the actual cow harvest may be double what is reported (Alaska Board of Game 2017). Currently, no legal harvest of cows occurs as the cow season closed under State regulations in 2017 and under Federal regulations in 2020 due to conservation concerns.

The vast majority of reported harvest (86%) occurs during August and September, the proposed months of the closure (**Figure 11**) (Osburn 2021, pers. comm.). Moose hunting is the primary activity by nonlocal users on Selawik National Wildlife Refuge (Georgette 2017, pers. comm.).

In their deferral of WSA21-01, the Board asked OSM to compare moose harvest by survey area in its revised analysis. This comparison relies on data collected by ADF&G through harvest reports. ADF&G provided OSM with Unit 23 moose harvest data by river drainage, but explained that parsing data to the biological survey area was not possible. (Osburn 2021, pers. comm., Burch 2021, pers. comm.).

Between 1992 and 2020, an average of 39% of reported moose harvest occurred in the Kobuk River drainage, with 23% in the Noatak River drainage, 21% in the Selawik River drainage, 10% on the Northern Seward Peninsula, and 3% in the Wulik-Kivalina River drainages (**Figure 12**, Osburn 2021, pers. comm.). Between 2005 and 2020, the percentage of the reported harvest by nonlocal residents, specifically averaged 13% in the Kobuk River drainage, 8% each in the Noatak and Selawik River drainages, 4% on the Northern Seward Peninsula, and 1% in the Wulik-Kivalina River drainages (**Figures 13-14**, Osburn 2021, pers. comm.). These long-term averages of reported harvest demonstrate a positive correlation with areas of relatively higher moose population and density in Unit 23.

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 2016). 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 State regulations.

Between 2000 and 2014, community household survey data has indicated an estimated 350-450 moose are harvested each year by local residents of Unit 23 (Saito 2014). In regulatory year 2012/13 specifically, ADF&G estimated moose harvest by local residents as 342 moose (Saito 2014). Using average moose harvest estimates from household harvest surveys conducted in all of the Unit 23 communities from 1986-2017 (ADF&G 2021b), local resident harvest averaged 252 moose per year (**Table 17**) with Kotzebue accounting for the most moose harvest (73), followed by Selawik (50) and Noorvik (35). The remaining Unit 23 communities averaged less than 13 moose per year. This is a coarse estimate and does not account for inter-annual variability as only a few villages are surveyed in a given year. When community harvest data is taken into account, local residents represent approximately 73% of the Unit 23 annual harvest, conservatively (NWARAC 2017b).

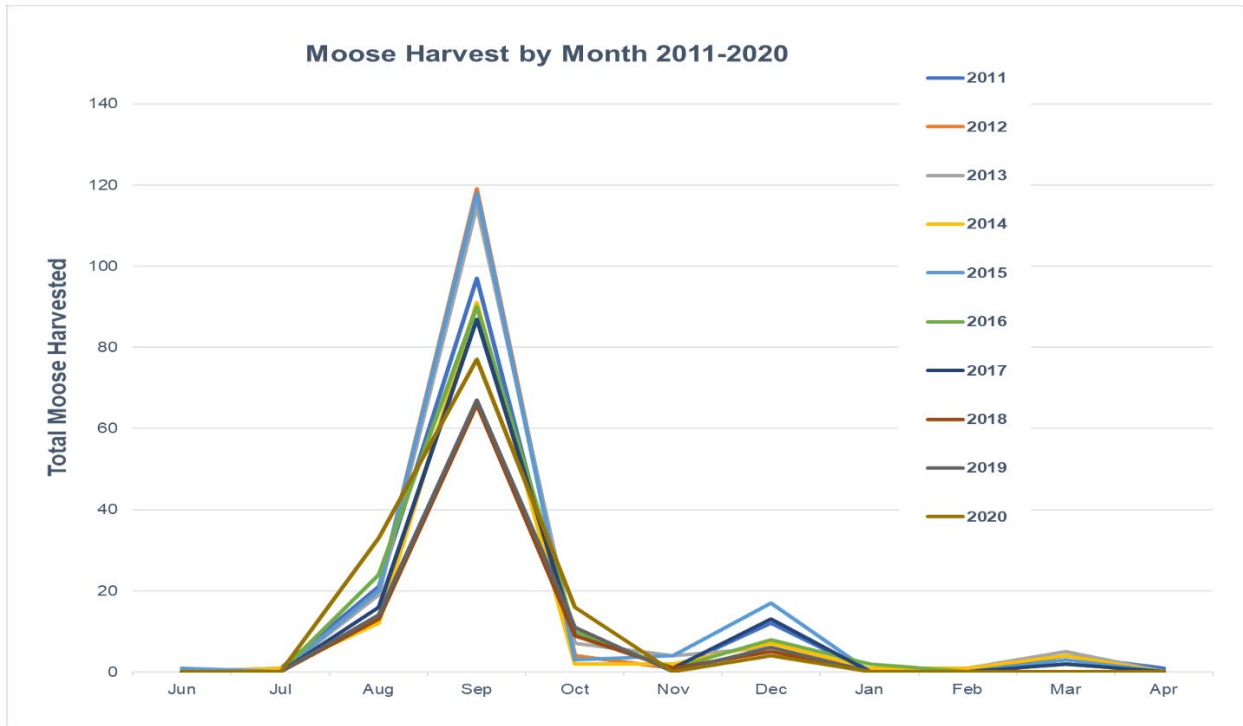
ADF&G calculates the harvestable surplus of moose in Unit 23 as 6% of the population (Saito 2016, pers. comm.). As the 2018 unit-wide population estimate was 6,300 moose, 378 moose was the estimated harvestable surplus. In 2019, the population estimate and harvestable surplus declined to 5,600 moose and 336 moose, respectively. While harvest by non-Federally qualified users averaged 72 moose per year from 2005-2016, it has only averaged 26.5 moose per year since 2017, when the nonresident season closed. Additionally, non-local resident harvest, which currently represents total harvest by non-Federally qualified users, has been declining since 2015 (**Table 12**, Osburn 2021, pers. comm.). While annual moose harvest by local residents remains uncertain, some harvest estimates by local residents alone exceed the harvestable surplus (Saito 2014).



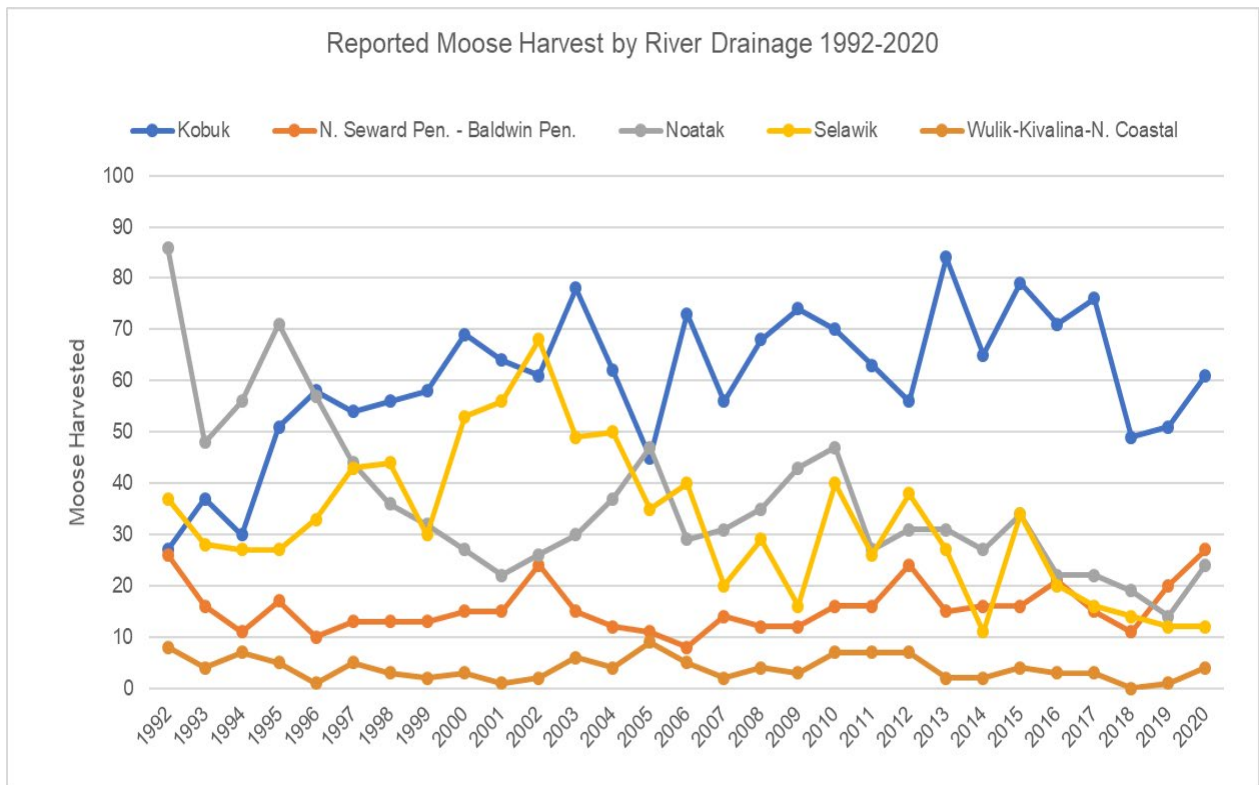
Although recent restrictions to State regulations have decreased reported moose harvest, decline of the Western Arctic Caribou Herd has likely increased moose harvest by local residents trying to meet their subsistence needs (Saito 2014, NWARAC 2017a, 2018a). During recent Council meetings, subsistence 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 by residency in Unit 23 from 2005-2020. Harvest includes all hunt types, including harvest tickets, registration permit and drawing permit hunts (Osburn 2021, pers. comm.).

Year	Local Resident Harvest	Nonlocal Resident Harvest	Nonresident Harvest	Total Harvest	Male	Female	Unknown
2005	65	41	41	148	137	10	0
2006	80	49	31	160	151	7	2
2007	64	29	25	123	116	7	0
2008	62	48	40	151	143	7	0
2009	80	50	23	155	144	10	0
2010	102	63	22	189	169	17	2
2011	72	45	26	144	133	11	0
2012	75	57	24	156	146	10	0
2013	88	53	21	164	151	12	0
2014	74	40	10	124	109	14	0
2015	87	60	20	168	145	23	0
2016	91	35	11	140	132	7	0
2017	98	35	0	133	126	6	1
2018	65	29	0	94	93	1	0
2019	75	24	0	99	99	0	0
2020	112	18	0	130	129	1	0
<b>Average</b>	<b>81</b>	<b>42</b>	<b>18</b>	<b>142</b>	<b>133</b>	<b>9</b>	<b>0</b>



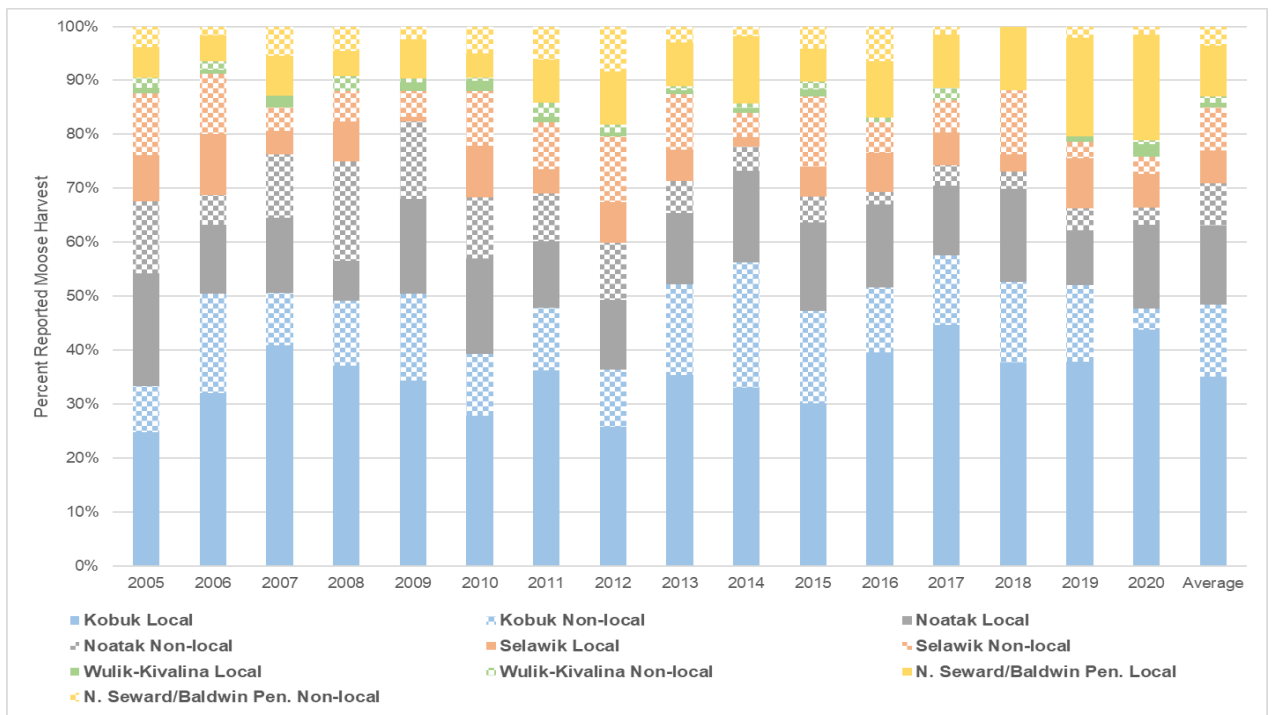
**Figure 11.** Moose harvest, by month, among users of Unit 23 from 2011-2020 according to State harvest reports (Osburn 2021, pers. comm.).



**Figure 12.** Reported moose harvest, by river drainage, among all hunters (local, non-local, nonresident) and all hunt types (harvest ticket, registration permit, draw permit) in Unit 23 from 1992-2020 according to State harvest reports (Osburn 2021, pers. comm.).



**Figure 13.** Reported moose harvest by local residents (residents of Unit 23) and nonlocal residents by major river drainage, 2005-2020 (Osburn 2021, pers. comm.).



**Figure 14.** Percent of reported moose harvest by local residents (residents of Unit 23) and nonlocal residents by major river drainage, 2005-2020 (Osburn 2021, pers. comm.).

## Unit 26A Moose

Reported moose harvest in all of Unit 26A averaged 57 per year (1985-1994) 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 decreased 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 2020, the average reported moose harvest was 3.5 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.). Non-local resident reported moose harvest from 2015 to 2020 averaged 0.67 moose per year, while local resident reported harvest averaged 1.3 moose per year (ADF&G 2021a).

**Table 13.** Reported moose harvest in Unit 26A from 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
2020	1	0	0	0	1	0	1	0
<b>Average</b>	<b>1.67</b>	<b>0.92</b>	<b>0.25</b>	<b>0.58</b>	<b>3.50</b>	<b>3.08</b>	<b>0.42</b>	<b>0</b>

## Cultural Knowledge and Traditional Practices

The present-day human population in Unit 23 includes 11 regional Iñupiaq nations that were intact in the mid-19<sup>th</sup> century (Burch 1998). The estimated population of the Northwest Arctic Borough was 7,715 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. The estimated population of the Northwest Slope Borough was 9,886 in 2019 (ADLWD 2019).

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-20<sup>th</sup> century. This is consistent with historical accounts and minor representation in Iñupiat culture (Hall 1973, Coady 1980, Tape et al. 2016). Expansion of moose into the Northwest Arctic region began in the 1920s and was complete by the 1980s (Tape et al. 2016, **Map 8**).

Since expanding into the region, moose have become an important secondary resource. A subsistence survey in the 1990s found that Kotzebue residents considered moose as secondary to caribou in their importance and desirability as a subsistence food; they were taken to add dietary variety (Georgette and Loon 1993). Residents hunted moose primarily in the fall, but also 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).

**Table 17** shows the estimated number of moose harvested by communities with a customary and traditional use determination for moose in Unit 23 as well as pounds of moose per capita harvested by surveyed households between 1986 and 2017. This data derives from subsistence surveys (ADF&G 2021b). The average pounds per capita moose harvest across survey years ranges from a high of 35.2 pounds in Selawik and 30.8 pounds in Noorvik to a low of 6.8 pounds in Noatak (**Table 17**). For comparison, the average estimated annual pounds per person caribou harvested across survey years ranges from a high of 266 pounds in Deering and 255.3 pounds in Ambler to a low of 50.5 pounds in Point Hope (ADF&G 2021b).

Because moose harvest increases and decreases in response to the availability of other resources such as caribou and marine mammals (Georgette and Loon 1993), 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 more or less readily available.

**Table 17.** Two measures of moose harvest between 1986 and 2017 in communities with a customary and traditional use determination for moose in Unit 23 (ADF&G 2021b).

<b>Community</b>	<b>Year</b>	<b>Estimated Number Harvested</b>	<b>Pounds of Moose per Capita</b>
<b>Kotzebue</b>	2014	81	14.6
	2013	74	13
	2012	71	12.5
	1986	65	13
	<b>Avg</b>	<b>72.8</b>	<b>13.3</b>

Community	Year	Estimated Number Harvested	Pounds of Moose per Capita
<b>Selawik</b>	2011	40	24.8
	2006	46	32.4
	1999	64	48.5
	<b>Avg</b>	<b>50.0</b>	<b>35.2</b>
<b>Kivalina</b>	2010	13	18.8
	2007	4	4.8
	1992	17	26.4
	<b>Avg</b>	<b>11.3</b>	<b>16.7</b>
<b>Noatak</b>	2016	9	8.4
	2010	9	8.6
	2007	11	10.8
	2002	3	4
	1999	4	5.7
	1994	2	3.5
	<b>Avg</b>	<b>6.3</b>	<b>6.8</b>
<b>Point Hope</b>	2014	0	0
	1994	23.5	18
	<b>Avg</b>	<b>11.8</b>	<b>9</b>
<b>Lower Kobuk River</b>			
<b>Noorvik</b>	2017	36	38
	2012	24	22
	2008	25	22
	2002	56	41
	<b>Avg</b>	<b>35.3</b>	<b>30.8</b>
<b>Kiana</b>	2009	14	20.2
	2006	16	22.5
	1999	8	10.1
	<b>Avg</b>	<b>12.7</b>	<b>12.6</b>
<b>Upper Kobuk River</b>			
<b>Ambler</b>	2012	14	27.3
	2003	11	23.2
	<b>Avg</b>	<b>12.5</b>	<b>25.3</b>
<b>Shungnak</b>	2012	5	8.8
	2008	11	23.5
	2002	11	22.8
	1998	21	45.6
	<b>Avg</b>	<b>12.0</b>	<b>25.18</b>
<b>Kobuk</b>	2012	4	11.8
	2004	7	30.6
	<b>Avg</b>	<b>5.5</b>	<b>21.2</b>
<b>Northern Seward Peninsula</b>			
<b>Buckland</b>	2016	13	13.5

Community	Year	Estimated Number Harvested	Pounds of Moose per Capita
	2003	17	22.4
	<b>Avg</b>	<b>15.0</b>	<b>18</b>
<b>Deering</b>	2017	5	13.5
	2013	1	5.8
	1994	15	56.4
	<b>Avg</b>	<b>7.0</b>	<b>18.9</b>

**Table 18** shows the estimated number of moose harvested by communities with a customary and traditional use determination for moose in Unit 26A, as well as pounds of moose per capita harvested by surveyed households between 1985 and 2014. This data derives from subsistence surveys (ADF&G 2021b) The average pounds per capita moose harvested across survey years ranges from a high of 9.2 pounds in Nuiqsut to a low of 2.4 pounds in Wainwright (**Table 18**). For comparison, the average estimated annual pounds of caribou harvested per person across survey years ranges from a high of 212 pounds in Anaktuvuk Pass to a low of 64 pounds in Utqiagvik (ADF&G 2021b).

**Table 18.** Two measures of moose harvest between 1985 and 2014 for communities with a customary and traditional use determination for moose in Unit 26A (excluding Kaktovik; Point Hope is included in **Table 17**) (ADF&G 2021b).

Community	Year	Estimated Number Harvested	Pounds of Moose per Capita
<b>Point Lay</b>	2012	0	0
	2002	1	2.2
	1987	5	20.4
	<b>Avg</b>	<b>2</b>	<b>7.5</b>
<b>Wainwright</b>	2009	3	2
	2002	4	4.5
	1989	0	0
	1988	3	3
	<b>Avg</b>	<b>2.5</b>	<b>2.4</b>
<b>Atqasuk</b>	1997	2	4.5
<b>Utqiagvik</b>	2014	12	1.2
	1989	40	6.6
	1988	53	8.7
	1987	52	8.5
	<b>Avg</b>	<b>39.3</b>	<b>6.3</b>
<b>Nuiqsut</b>	2014	6	7.2
	2000	6	7.5
	1995	2	3.1
	1994	5	6.5

Community	Year	Estimated Number Harvested	Pounds of Moose per Capita
	1993	9	12.2
	1985	13	16.6
	<b>Avg</b>	<b>6.8</b>	<b>9.2</b>
<b>Anaktuvuk Pass</b>	2014	6	9.5
	2011	5	9.6
	2002	2	3.5
	2001	7	12.5
	2000	3	5.7
	1998	2	3.5
	1994	6	11.7
	<b>Avg</b>	<b>4.2</b>	<b>8</b>

**Appendix 1** compares the percentage of surveyed households using moose, attempting to harvest, and unsuccessfully and successfully harvesting moose, according to subsistence surveys between 1986 and 2017 for communities with a customary and traditional use determination for moose in Units 23 and 26A (ADF&G 2021b). Data points are not recent enough nor sufficient in number to substantiate any current trends in the percent of surveyed households unsuccessful in their attempts to harvest moose.

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.

### **Current Events**

In a June 16, 2021 public teleconference, the Board deferred WSA21-01 to the 2022 season. When deferring, the Board asked OSM staff to include comparisons of moose harvest by survey area within Unit 23 in their analysis. If approved, this special action would now apply to the 2022 hunting season.

### Written Comments and Public Hearing

Written public comments were 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 the public, and were in opposition to the requested closure. Most comments focused on caribou or did not distinguish between moose and caribou. These written comments are summarized in the analysis of WSA21-01a.

The State of Alaska Big Game Commercial Services submitted a letter on April 20, 2021 in opposition to the proposed closure. They noted that moose hunting opportunities are already extremely limited in both Units 23 and 26A, with no nonresident hunt. Resident moose hunters in Unit 23 have a short general season, limited to bulls with > 50” antlers. They further stated that hunters may not use aircraft for access under State hunting regulations in the Colville River Drainage (the area that contains most of the moose



in 26A) and that this essentially limits moose hunting to hunters from Nuiqsut who can access the area via boat on the Colville River.

Alaska Department of Fish and Game (ADF&G) submitted a written memorandum opposing this special action request on April 22, 2021. In the memorandum, ADF&G stated that the rationale given does not meet the requirements for such a closure under the provisions of Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) for the conservation of healthy populations of moose. ADF&G further stated that closing federal lands to moose hunting will concentrate non-Federally qualified users on state managed lands near local communities.

OSM held three public hearings to solicit comments on WSA21-01. The first public was held on April 23, 2021 by teleconference. Over 300 people called in from throughout Alaska and the United States, and approximately 120 people gave comments. Most of the comments were from non-rural and non-Alaskan residents in opposition the requested closure.

Two comments made at the April 23 hearing spoke directly to the moose closure request. One individual representing the Northwest Arctic Borough Subsistence Committee supported the request, stating: “There are not enough moose available for the local residents to meet their subsistence needs” (OSM 2021a). Another individual opposed to the closure stated: “As far as moose go, there's already no aircraft allowed [in Unit 26 CUA and within the Noatak CUA in Unit 23] and no non-resident season permit” (OSM 2021a).

Most comments at the April 23 public hearing focused on caribou or did not distinguish between moose and caribou. Because of the focus on caribou, and because the Board specifically requested additional feedback on caribou, a breakdown of the reasons for opposition and support are included in WSA21-01a only.

Following Board deferral of WSA21-01, OSM held two additional public hearings to seek input on the proposed closure and concerns related to caribou on November 17 and December 2, 2021. On November 17, 64 people gave comments. On December 2, 41 people gave comments. As with the April 23 public hearing, most comments at the two subsequent public hearings focused on caribou or did not distinguish between moose and caribou and were in opposition to the requested closure.

In her comment on November 17, the Vice President of Lands for NANA Regional Corporation said, “When the herd is impacted and access to caribou declines, there is an increased pressure to harvest moose, which experience a decline as well” (OSM 2021b). A non-local Alaska residents said, “The moose population, your own documents suggest that, you know, moose were scarce prior to 1940 and probably before 1900 weren't even in the area at all. So they were living on the edge regardless of hunting pressure” (OSM 2021b). No comments specific to moose were made at the December 2 public hearing.

### **Other Alternatives Considered**

The Board directed OSM to compare moose harvest by survey area for the Board’s consideration. OSM utilized this data (see **Figures 13-14**) to consider whether a partial Federal lands closure would be

effective and appropriate. Analysis of harvest by local and nonlocal residents by major river drainage in Unit 23 revealed that moose harvest correlates directly with moose abundance. The Kobuk River drainage contained the highest moose population and harvest levels by both user groups, and cannot be separated into the Upper and Lower Kobuk biological survey areas (**Map 9**).

While the moose population within the Upper Kobuk survey area (601 moose) just barely meets the lower bound of the State population objective (600 moose), the moose population estimate in the Lower Kobuk survey area (1,346 moose) is well below State objectives (2,800-3,400 moose) and has declined precipitously since 2012 (**Table 8**). Given the substantial moose population declines across Unit 23, poor composition metrics (low cow:calf ratios, declining bull:cow ratios), the relatively high harvest pressure within the Kobuk River Drainage, and the positive correlation between non-Federally qualified harvest and moose abundance, OSM does not consider a partial or targeted closure to be an effective alternative. Closure of only some Federal public lands to non-Federally qualified users would also increase regulatory complexity and user confusion.

### **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.”

### Unit 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 to September 30, 2022. 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 Unit 23 moose population. Surveys indicate substantial declines in almost every survey area, and population estimates are below State objectives. Additionally, the harvestable surplus may be exceeded. Regulatory changes made to reduce moose harvest since 2017 under State regulations include ending the hunt for nonresidents of Alaska and elimination of the antlerless moose season. Regulatory restrictions made under Federal regulations since 2018 include 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 (see regulatory history), 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. Moose are an important secondary subsistence resource. 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. However, non-Federally qualified users only harvest around 27 moose each year from Unit 23, and it is uncertain how many of these are harvested on Federal public lands or if a Federal lands closure would substantially reduce harvest by this user group in the region overall, or simply increase it on State managed lands.

Closure to non-Federally qualified users during September may also reduce disturbance to mating moose. Unit 23 has higher bull:cow ratio goals due to the low densities and wide distribution of moose. While non-Federally qualified users are limited to bulls-only, the bull:cow ratios have declined across most of Unit 23 with ratios hovering near the management objective of 40 bulls:100 cows (**Table 8**).

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, 2022, 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, State, and private 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. Therefore, approval of WSA21-01b would substantially reduce, but not eliminate hunting by non-Federally qualified users on Federal public lands during the 2022 season, as non-local residents would still be able to hunt moose with an RM880 permit October-December. However, 86% of reported moose harvest in Unit 23 has occurred in August and September.

#### Unit 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, 2022. 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 Unit 26A 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 from Aug. 1-Sep. 30, 2022, 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, State, and private lands under State regulations.

Closure to non-Federally qualified users would alleviate concerns by 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 period 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.

## **PRELIMINARY OSM CONCLUSION**

**Support WSA21-01b with modification** to close moose hunting to non-Federally qualified users on Federal public lands in Unit 23 only.

### **Justification**

#### 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 Unit 23 moose population. Surveys indicate substantial declines in almost every survey area, and population estimates are below State objectives. Composition metrics are also poor as bull:cow ratios have declined and calf:cow ratios are low and are indicative of a declining moose population.

Additionally, the harvestable surplus may be 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 and

would be an unnecessary restriction on nonsubsistence users. 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. 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. 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](https://www.adfg.alaska.gov/static/license/huntlicense/pdfs/2016-2017_draw_supplement.pdf). Retrieved: February 1, 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.

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.

Burch, Jr., E.S. 1980. Traditional Eskimo societies in northwest Alaska. *Senri Ethnological Studies* 4:253-304.

Burch, Jr., E.S. 1998. *The Inupiaq Eskimo nations of Northwest Alaska*. University of Alaska Press. Fairbanks, AK.

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. 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.
- 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.
- Fronstin, R. 2021. Wildlife Biologist. Personal communication: e-mail. Western Arctic National Parklands. National Park Service. Kotzebue, 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. 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.
- 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, W. 2021. Unit 23 Moose Neonate Survival hand-out. Alaska Department of Fish and Game. Nome, AK.
- 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.
- 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.
- 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. 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. 2021. Transcripts of the Northwest Arctic Subsistence Regional Advisory Council proceedings, February 18, 2021. Teleconference. Office of Subsistence Management, USFWS. Anchorage, AK.
- Osburn, C. 2021. Kotzebue Area Wildlife Biologist. Personal communication: e-mail. Alaska Department of Fish and Game. Kotzebue, AK.2653041
- OSM. 2014. Staff analysis WP14-53. Pages 163-173 in Federal Subsistence Board Meeting Materials April 15-17, 2014. Office of Subsistence Management, USFWS. 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.
- Robison, H. 2017. National Park Service wildlife update. November 2017. NPS. Kotzebue, AK.
- 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.

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.

Swanson, D.W. 2015. Environmental limits of tall shrubs in Alaska’s arctic national parks. *PLoS ONE*. 10(9): 1-34.

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.

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

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.



## APPENDIX 1

Percent of surveyed households in communities with a customary and traditional use determination for moose in Unit 23 using, attempting to harvest and unsuccessfully and successfully harvesting moose between 1986 and 2017 (ADF&G 2021b). Dashes indicate that no data are available.

<b>Community</b>	<b>Year</b>	<b>Percent Using Moose</b>	<b>Percent Attempting to Harvest Moose</b>	<b>Percent Attempting but Unsuccessful</b>	<b>Percent Harvesting Moose</b>
<b>Kotzebue</b>	2014	52%	22%	12%	10%
	2013	43%	15%	8%	7%
	2012	37%	18%	9%	9%
	1991	62%	33%	5%	27%
	1986	42%	27%	19%	8%
<b>Selawik</b>	2011	75%	50%	27%	23%
	2006	--	25%	1%	24%
	1999	55%	33%	3%	30%
<b>Kivalina</b>	2010	49%	35%	22%	13%
	2007	31%	14%	4%	10%
	1992	48%	30%	7%	23%
<b>Noatak</b>	2016	24%	15%	9%	6%
	2010	27%	12%	7%	5%
	2007	46%	16%	7%	9%
	2002	22%	8%	5%	3%
	1999	18%	4%	1%	3%
	1994	12%	7%	4%	3%
<b>Point Hope</b>	2014	7%	2%	2%	0%
<b>Lower Kobuk River</b>					
<b>Noorvik</b>	2017	54%	38%	15%	23%
	2012	66%	23%	6%	17%
	2008	37%	18%	3%	15%
	2002	68%	44%	16%	28%
<b>Kiana</b>	2009	16%	16%	0%	16%
	2006	40%	21%	7%	14%
	1999	30%	13%	5%	8%
<b>Upper Kobuk River</b>					
<b>Ambler</b>	2012	52%	28%	9%	19%
	2003	52%	30%	15%	15%
<b>Shungnak</b>	2012	55%	11%	4%	7%
	2008	73%	27%	4%	23%

<b>Community</b>	<b>Year</b>	<b>Percent Using Moose</b>	<b>Percent Attempting to Harvest Moose</b>	<b>Percent Attempting but Unsuccessful</b>	<b>Percent Harvesting Moose</b>
	1998	50%	32%	2%	30%
<b>Kobuk</b>	2012	50%	30%	20%	10%
	2004	64%	70%	48%	22%
<b>Northern Seward Peninsula</b>					
<b>Buckland</b>	2016	14%	11%	4%	7%
	2003	43%	17%	4%	13%
<b>Deering</b>	2017	32%	9%	3%	6%
	2013	40%	9%	6%	3%
	1994	80%	41%	9%	32%

Percent of surveyed households in communities with a customary and traditional use determination for moose in Unit 26A (excluding Kaktovik) using, attempting to harvest and unsuccessfully and successfully harvesting moose between 1985 and 2014 (ADF&G 2021b). Point Hope is included in the table above.

<b>Community</b>	<b>Year</b>	<b>Percent Using Moose</b>	<b>Percent Attempting to Harvest Moose</b>	<b>Percent Attempting but Unsuccessful</b>	<b>Percent Harvesting Moose</b>
<b>Point Lay</b>	2012	5%	0%	0%	0
	1987	40%	19%	3%	16%
<b>Wainwright</b>	2009	4%	2%	0%	2%
<b>Utqiagvik</b>	2014	14%	2%	1.2%	0.8%
<b>Nuiqsut</b>	2014	40%	33%	28%	5%
	1993	70%	47%	37%	10%
	1985	40%	40%	22%	18%
<b>Anaktuvuk Pass</b>	2014	28%	13%	7%	6%
	2011	29%	6%	0%	6%