



Caribou Vital Sign Annual Report for the Arctic Network Inventory and Monitoring Program

September 2024–August 2025



Western Arctic Herd caribou aggregating near the Wulik River in July.

NPS / K. JOLY

Caribou Vital Sign Annual Report for the Arctic Network Inventory and Monitoring Program: September 2024–August 2025

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Abstract

Caribou (*Rangifer tarandus*) are an integral part of the ecological and cultural fabric of northwest Alaska. Western Arctic Herd (WAH) caribou roam this entire region, including all 5 Arctic Network (ARCN) Inventory and Monitoring Program National Park units. Conservation of healthy caribou populations is specifically mandated within the enabling legislation (Alaska National Interest Lands Conservation Act) for 3 of these units and is of importance to subsistence hunters. Caribou are, by far, the most abundant large mammal in northwest Alaska and are famous for their long-distance migrations and large population oscillations. For these reasons, ARCN chose WAH caribou as a Vital Sign for long-term monitoring.

We document monitoring results of this Vital Sign during its 16th year (September 2024–August 2025). Results from the previous years are also included for ease of comparison. Periodic syntheses of these data will be performed and reported on. National Park Service (NPS) monitoring of the WAH is done in conjunction and cooperation with the Alaska Department of Fish and Game (ADFG). This report includes data funded by the ADFG dating back to September 2013. This year was chosen because it is when the ADFG started deploying a substantial number of Global Positioning System (GPS) collars on an 8-hour relocation schedule.

Monitoring of the herd relies heavily on the use of GPS collars capable of transmitting location data to a satellite. Given the extremely remote area that the WAH inhabits, this system provides the most efficient and accurate means to track individual caribou. These data are utilized to monitor the timing and location of migrations, as well as seasonal distributions of WAH caribou. Monitoring movement and its phenology is perhaps the simplest means to track the influences of climate change, natural perturbations, development, and other potential impacts—which is outside the scope of this report.

This report also documents the NPS commitment and involvement with the WAH Working Group. The group is composed of important stakeholders including representatives for rural villages, sport hunters, conservationists, hunting guides, hunting transporters, and reindeer herders. In addition, all the agencies charged with managing the WAH, including the ADFG, NPS, U.S. Fish and Wildlife Service and Bureau of Land Management, serve as advisors to the group. Information gathered by the Caribou Vital Sign monitoring program is intended to supplement and complement existing data streams gathered by the other cooperating agencies and will be important in future management decisions.

Acknowledgments

We thank ADFG biologists, especially Alex Hansen, for leading capture operations. Their continued collaboration makes our monitoring possible. We thank the NPS GIS Team for the comprehensive technical database and GIS assistance that made this report possible over the past 16 years.

Monitoring a herd that ranges over a vast and remote landscape provides numerous challenges, so we thank all our collaborators that have helped us. We thank Mat Sorum, Alex Hansen, and Eric Wald for reviewing drafts that improved this report.

List of Acronyms

ADFG: Alaska Department of Fish and Game

ANILCA: Alaska National Interest Lands Conservation Act

ARCN: Arctic Network Inventory and Monitoring Program

BELA: Bering Land Bridge National Preserve

BLM: Bureau of Land Management

CAKR: Cape Krusenstern National Monument

FWS: U.S. Fish and Wildlife Service

GAAR: Gates of the Arctic National Park and Preserve

KOVA: Kobuk Valley National Park

NOAT: Noatak National Preserve

NPS: National Park Service

WAH: Western Arctic Herd

Introduction

This report is the latest in a series of annual reports documenting long-term monitoring of the Western Arctic Herd (WAH). Caribou (*Rangifer tarandus*) were chosen to be a Vital Sign of the National Park Service's (NPS) Arctic Network (ARCN) Inventory and Monitoring Program because they: (1) are an extremely important subsistence species that occur within all ARCN park units (Gates of the Arctic National Park and Preserve (GAAR), Noatak National Preserve (NOAT), Cape Krusenstern National Monument (CAKR), Kobuk Valley National Park (KOVA) and Bering Land Bridge National Preserve (BELA)); (2) are specifically identified in the enabling legislation (Alaska National Interest Lands Conservation Act [ANILCA]) of GAAR, KOVA and NOAT to be managed for natural and healthy populations; (3) directly impact reindeer and reindeer herders in BELA; (4) are considered good indicators of the condition of park ecosystems because they consume lichens and fungi (which derive their nutrients from the atmosphere and thus are sensitive to pollutants) making them good bio-indicators of environmental toxins; (5) are of great importance to park visitors because of the opportunities to view caribou in Alaskan parks; (6) are an example of the ever more rare natural phenomenon of long-distance migration of a large land mammal; (7) are an integral part of the ecology and social fabric of northwest Alaska; and (8) can be compared with national and international caribou datasets across the Arctic region to gain insight into the ecology of the WAH or Arctic ecology in general.

Of the 4 Alaska Arctic caribou herds, only the WAH regularly utilizes all 5 ARCN park units (Figure 1). WAH caribou are of great importance to people for both consumptive and non-consumptive purposes, and to the ecosystem as a whole. At an estimated population size of over 490,000 animals in 2003 (Dau 2007), the WAH is a significant ecological force in northwest Alaska. The herd, rather steadily, declined from its 2003 apex to 121,000 in 2025 (Alex Hansen, *personal communication*, 2023). In 2024, both federal and state wildlife management boards enacted measures to help slow or reverse this 20-year decline, including reducing harvest limits for bulls and especially for cows. The heritage and traditions of Alaska Natives in approximately 40 subsistence-based communities in the region have been shaped by the availability of WAH caribou (Western Arctic Caribou Herd Working Group 2019). The availability of the WAH also affects the economy of this region. The presence and relative abundance of WAH caribou have substantial impacts on the populations of wolves, bears, and wolverines in the area. Caribou are indicators of regional environmental conditions in northwestern Alaska because of their migratory nature. Caribou may have substantial effects on plant and lichen communities and, by extension, to wildlife communities, either directly through browsing and grazing, or indirectly through biogeochemical cycling. While the primary objectives of this monitoring are to track the distribution and migrations of caribou, a variety of ancillary data (e.g., survival) are obtained in the monitoring process that are likely to have great value for park and wildlife management, subsistence users and management, ungulate research, and evaluating long-term changes in the WAH.

This report documents the results of ARCN caribou monitoring for the 16th year (September 2024–August 2025) of the program. The caribou monitoring protocols contain the detailed methodology

employed to obtain the results presented here (Joly et al. 2012). Periodic syntheses of these data will be performed and reported on as appropriate.

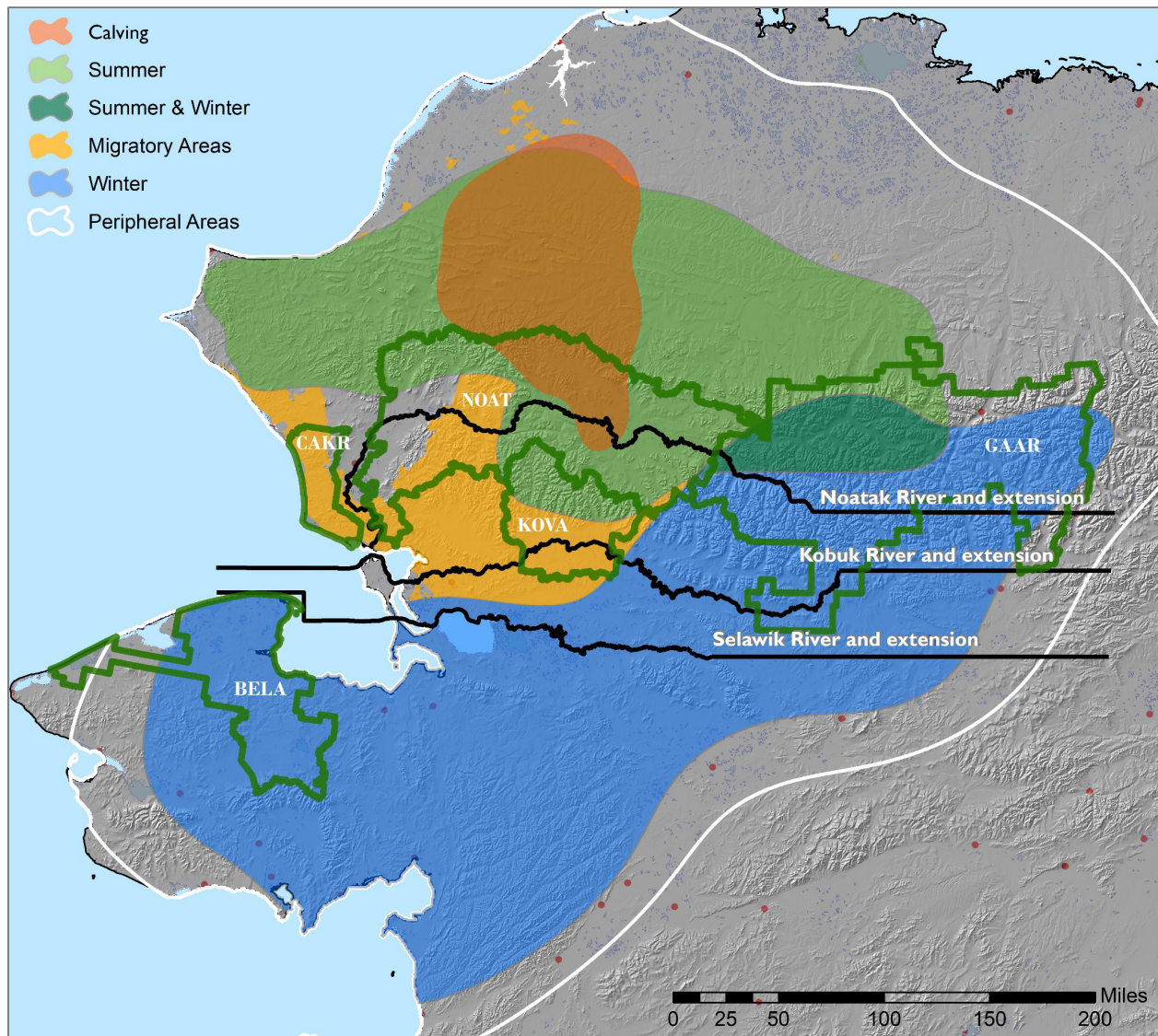


Figure 1. Study area and the range of the Western Arctic Herd. Generalized range data courtesy of the Alaska Department of Fish and Game. The red dots indicate villages and towns. Black lines depict key rivers. These rivers have been artificially extended to the east to help track the timing of caribou migratory movements. Green polygons are NPS units.

NPS

Measurable Objectives—Core Program

- Capture and radio-collar WAH caribou to maintain a sample size of 30–40 GPS collars.
- Obtain frequent (>2/day) location data via GPS-satellite telemetry.
- Membership, attendance and activity on the WAH Working Group Technical Committee.
- Attendance and involvement at WAH Working Group meetings.
- Obtain herd and environmental condition data by radio tracking.
- Define seasonal ranges (i.e., calving, insect relief, summer, winter).
- Define migratory corridors.
- Detect changes in range distribution over time.
- Detect changes in adult survivorship over time.
- Detect changes in migration routes and movement phenology over time.
- Detect changes in the location and timing of calving (using GPS data).

Methods

The methods outlined here are provided to give the reader a brief summary of the methods and analyses that were conducted to monitor the WAH. Detailed methodologies used to develop this report can be found in the ARCN Caribou Vital Sign Protocol (Joly et al. 2012, available at <https://www.nps.gov/im/arcn/caribou.htm>).

Collar Deployments

For decades, all WAH collars had been deployed at Onion Portage, KOVA, from early September to early October. Caribou were captured by hand using motorboats to intercept animals as they swam across the Kobuk River. However, in recent years there has been both a reduction and delay of fall migration in the WAH and because of this, only a combined total of 7 collars were deployed at Onion Portage in 2017 and 2018. As a result, collars have been deployed using net gun techniques in spring beginning in 2019 and annually since 2021. Both river and net gun captures used protocols approved by State of Alaska and NPS Institutional Animal Care and Use Committees (IACUC). NPS collars were only deployed on adult (>2 years old) female caribou. Capture operations are led by the ADFG, in conjunction and cooperation with the NPS. Every collar is equipped with GPS technology that transmits position data via satellites, allowing for regular downloading in an office setting. Collars are programmed to collect locations at least every 8 hours throughout the year (i.e., 1095 relocations per caribou per non-leap year for the 8-hour interval). For collars collecting relocations more frequently than every 8 hours, the data were subsampled to 8 hours for this report to provide consistency among individuals.

Year One Survivorship

Survivorship reported here merely represents how many caribou that were collared in this reporting period (i.e., September 2024–August 2025) remained alive through the end of the monitoring year (i.e., August 2025). The number that survived plus the number that died will equal 100% (i.e., collar malfunctions are not included). Survivorship of collars deployed in the spring, via netting, is not directly comparable to the survivorship of collars deployed in the fall, using motorboats, due to differences in the time until the end of the monitoring year.

Seasonal Range Use

Both 50% and 95% utilization distribution kernels (Worton 1989) were produced using ArcGIS and ArcGIS tools developed by the NPS (see Joly et al. 2012). Kernels were developed for the year (September 1–August 31) and for the following seasons: winter (December 1–March 31), calving period (May 28–June 14), insect relief (June 15–July 14), and late-summer (July 15–August 31). Kernels were created for individual caribou each season and then compiled so that individuals were evenly weighted, regardless of the number of relocations per individual (i.e., normalized to a common scale). Results from every year of monitoring are also included for ease of comparison. The Least Squares Cross Validation (LSCV) smoothing parameter (Worton 1989) was utilized for all kernels (Joly et al. 2012). In fall, all collars were deployed at Onion Portage in KOVA, while in spring, collar deployments were via net gunning and clustered in areas relatively near aviation bases. As a result, their initial distribution was not considered representative of the entire herd. At calving,

the collared caribou were considered mixed with the herd based on the distribution of collars deployed in previous years (Prichard et al. 2023). Range use and distribution analyses only considered collared caribou that were mixed with the rest of the herd. For example, data from caribou collared in the fall of 2019 or spring of 2020 would not be used to develop kernels until the 2020 calving season.

Distribution and Movements

The GPS radiocollar data were used to determine what percentage of GPS-collared caribou were found in each ARCN park unit during summer (June, July and August), fall (September, October and November), winter (December, January, February and March) and spring (April and May). ArcGIS Pro was used to determine distances and velocities between successive GPS relocations. Annual distance moved was the sum of the distances between successive GPS relocations.

Migration Phenology

ArcGIS Pro was used to analyze the GPS data to determine when individual caribou crossed the Selawik, Kobuk and Noatak Rivers on their northward (“spring”; typically, April 1–June 15) and southward (“fall”; typically, September 1–November 30) migrations. The percentage of GPS-collared caribou that crossed each specified river and the average date they crossed were calculated.

Migration Routes

A histogram of the longitudes at which the collared caribou crossed the Noatak River (the first major river crossed) heading southward was developed as a visual aid to understand the geographic distribution of the fall migration. Categories of longitudes are based on equal numbers of river miles rather than equal distribution of longitudes to account for the primarily north-south direction of the river at its mouth. The minimum distance, and its date of occurrence, between individual GPS-collared caribou and the villages of Noatak, Shungnak and Selawik, and Onion Portage, were calculated using ArcGIS Pro for spring (April 1–May 31) and fall (September 1–November 30) migrations.

Results

Collar Deployments

With continued late migrations and relatively few caribou crossing the Kobuk River in fall, we again relied upon net gunning to deploy collars. An additional 34 GPS collars were deployed via net gunning in the Kauk River drainage and Selawik Hills from March 28 through April 1, 2025. Since the inception of this project, over 1.1 million GPS locations have been gathered at an 8-hour interval (Table 1). It is expected that about 12–15 NPS collars will need to be deployed annually to maintain an adequate sample size due to mortalities and the lifespan of GPS collars (~8 years). We do not collect calf-at-heel data during spring captures.

Table 1. Collar deployment overview. Number (N) and first-year survivorship (%) of GPS-satellite collars deployed on adult (>2 years old) female caribou, number of collared caribou that appeared to be accompanied by a calf, and number of GPS locations acquired at an 8-hour interval. The percentage of caribou that survived plus those that died will equal 100% (i.e., percent failures not included). Data on calf presence is not collected during spring net gunning (i.e., reported as Not Available (N/A)).

Monitoring Years	Season Deployed	N	Survived (%)	Died (%)	Failures (%)	With Calf (%)	# Collars W/ Complete Year of Data	Total GPS Locations
2024–2025	Spring	34	34 (100%)	0 (0%)	0 (0%)	N/A	62	108,555
2023–2024	Spring	46	40 (87.0%)	6 (13.0%)	0 (0%)	N/A	67	111,540
2022–2023	Spring	56	40 (72.7%)	15 (27.3%)	1 (1.8%)	N/A	65	103,094
2021–2022	Spring	33	32 (100%)	0 (0%)	1 (3.0%)	N/A	56	90,619
2020–2021	Spring	48	38 (79.2%)	10 (20.8%)	0 (0%)	N/A	51	79,517
2019–2020	Fall	42	35 (85.4%)	6 (14.6%)	1 (2.4%)	18 (42.9%)	70	79,161
2018–2019	Combined	33	–	–	–	–	32	52,044
2018–2019 ^A	Spring	30	18 (90.0%)	2 (10.0%)	10 (33.3%)	6 (20.0%)	–	–
2018–2019 ^A	Fall	3	3 (100%)	0 (0%)	0 (0%)	2 (66.7%)	–	–
2017–2018	Fall	4	3 (75.0%)	1 (25.0%)	0 (0%)	3 (75.0%)	52	63,277
2016–2017	Fall	25	22 (88.0%)	3 (12.0%)	0 (0%)	19 (76.0%)	77	86,651
2015–2016	Fall	38	35 (92.1%)	3 (7.9%)	0 (0%)	28 (73.7%)	79	76,284

^A Indicates row containing a partial year's worth of data.

Table 1 (continued). Collar deployment overview. Number (N) and first-year survivorship (%) of GPS-satellite collars deployed on adult (>2 years old) female caribou, number of collared caribou that appeared to be accompanied by a calf, and number of GPS locations acquired at an 8-hour interval. The percentage of caribou that survived plus those that died will equal 100% (i.e., percent failures not included). Data on calf presence is not collected during spring net gunning (i.e., reported as Not Available (N/A)).

Monitoring Years	Season Deployed	N	Survived (%)	Died (%)	Failures (%)	With Calf (%)	# Collars W/ Complete Year of Data	Total GPS Locations
2014–2015	Fall	35	28 (80.0%)	7 (20.0%)	0 (0%)	24 (68.6%)	52	62,076
2013–2014	Fall	25	19 (76.0%)	6 (24.0%)	0 (0%)	11 (44.0%)	46	55,971
2012–2013	Fall	12	8 (66.7%)	4 (33.3%)	0 (0%)	7 (58.3%)	34	42,965
2011–2012	Fall	14	10 (76.9%)	3 (23.1%)	1 (7.1%)	10 (71.4%)	36	46,706
2010–2011	Fall	15	13 (86.7%)	2 (13.3%)	0 (0%)	10 (66.7%)	39	48,892
2009–2010	Fall	39	31 (81.6%)	7 (18.4%)	1 (2.6%)	25 (64.1%)	31	39,086
Total	–	499	–	–	–	157 (62.3%)	849	1,146,438

^A Indicates row containing a partial year's worth of data.

Year One Survivorship

Survival of the caribou collared in spring 2025 through the end of August was 100%. Spring capture cohorts only have to survive 5 months to reach the end of the reporting year, as opposed to 12 months for fall captures, thus, one would expect survival of spring capture cohorts to be greater than that of fall capture cohorts. For the past 16 years of monitoring, there are about 850 datasets that contain a complete year of locations.

Seasonal Range Use

The 50% and 95% utilization distributions (kernels) are depicted for the annual range (Table 2; Figure 2 and Figure 3), winter range (Table 3; Figure 4 and Figure 5), calving grounds (Table 4; Figure 6 and Figure 7), insect relief areas (Table 5; Figure 8 and Figure 9), and late-summer range (Table 6; Figure 10 and Figure 11). The 50% kernels are also referred to as “core areas”. CAKR, GAAR, KOVA, and NOAT were utilized by collared WAH caribou during this reporting period, but BELA was not. Due to heavy use of the western portion of the herd's range, the annual distribution was most similar to 2012–2013 and 2023–2024. The core area was primarily in the northern Nulato Hills, where much of the herd wintered. The 2024–2025 winter distribution was centered on two areas: the northern Nulato Hills and Purcell Mountains in the south, and the coast around and to the southwest of Wainwright in the north. During calving, collared caribou were primarily north of the park units and within the general traditional calving grounds of the WAH in the National Petroleum

Reserve–Alaska (NPRA-A). Similar to 2024, caribou were generally further west at calving than most years. The 2025 insect relief area was generally consistent with past years, but its extent was smaller than almost every year, which implies tighter aggregation this year. Insect relief displays the most consistent distribution pattern among all seasons and years. Caribou distribution during late summer was constrained, resulting in the second smallest area since monitoring began. It was focused along the northern slopes of the western Brooks Range.

Table 2. Annual range areas of Western Arctic Herd caribou (95% and 50% kernels for September 1–August 31).

Years	Sample Size	95% kernel area (km²)	50% kernel area (km²)
2024–2025	62	97,045	4,644
2023–2024	67	98,546	1,949
2022–2023	65	100,510	6,419
2021–2022	51	32,118	1,081
2020–2021	51	102,321	4,468
2019–2020	37	174,149	16,045
2018–2019	32	129,884	5,523
2017–2018	52	129,123	5,758
2016–2017	55	100,312	2,493
2015–2016	44	101,094	6,387
2014–2015	22	48,860	3,375
2013–2014	25	46,678	1,618
2012–2013	34	72,778	2,169
2011–2012	36	125,906	4,374
2010–2011	26	136,415	6,058

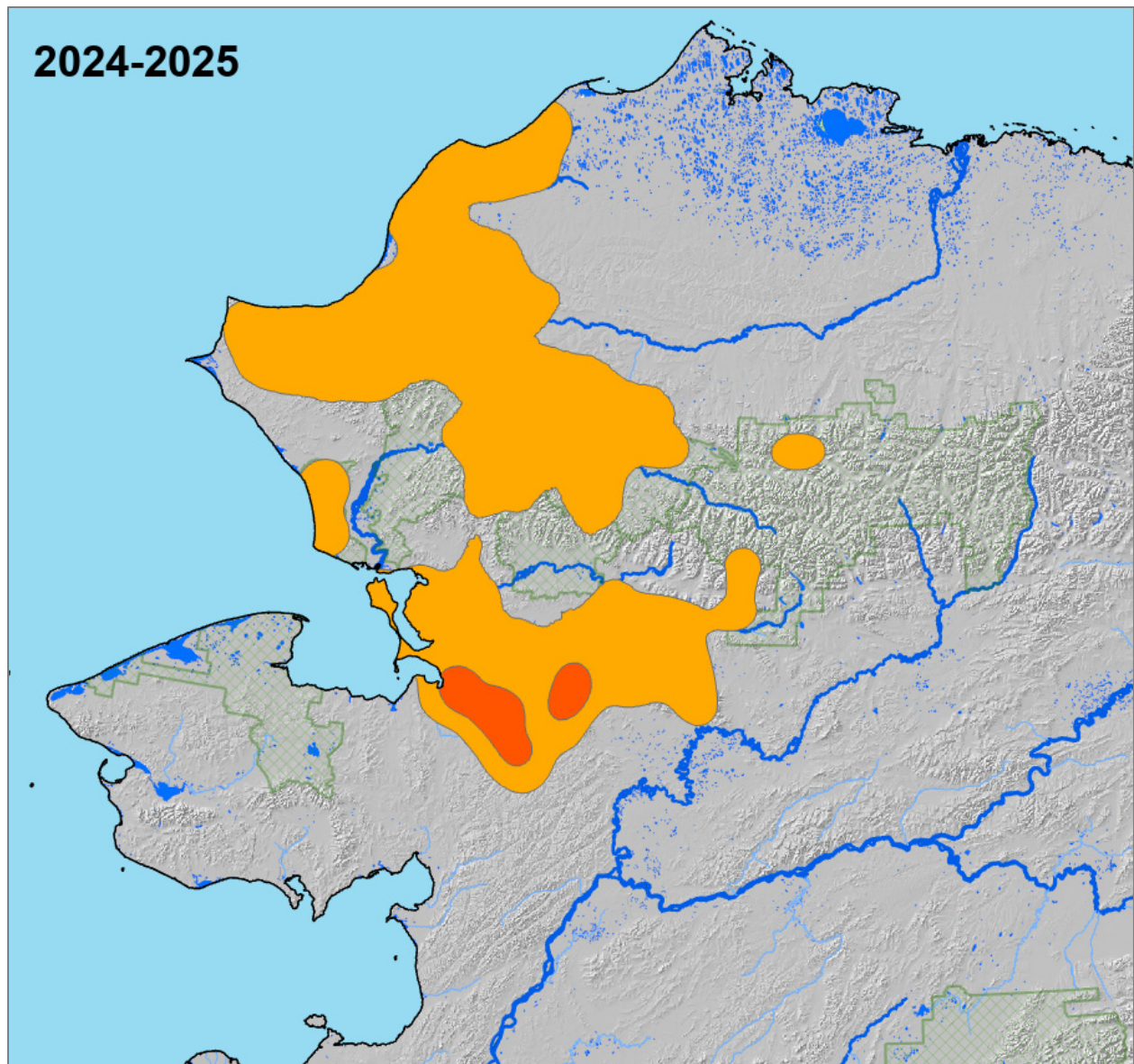


Figure 2. 2024–2025 annual (September 1–August 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are NPS units.

NPS

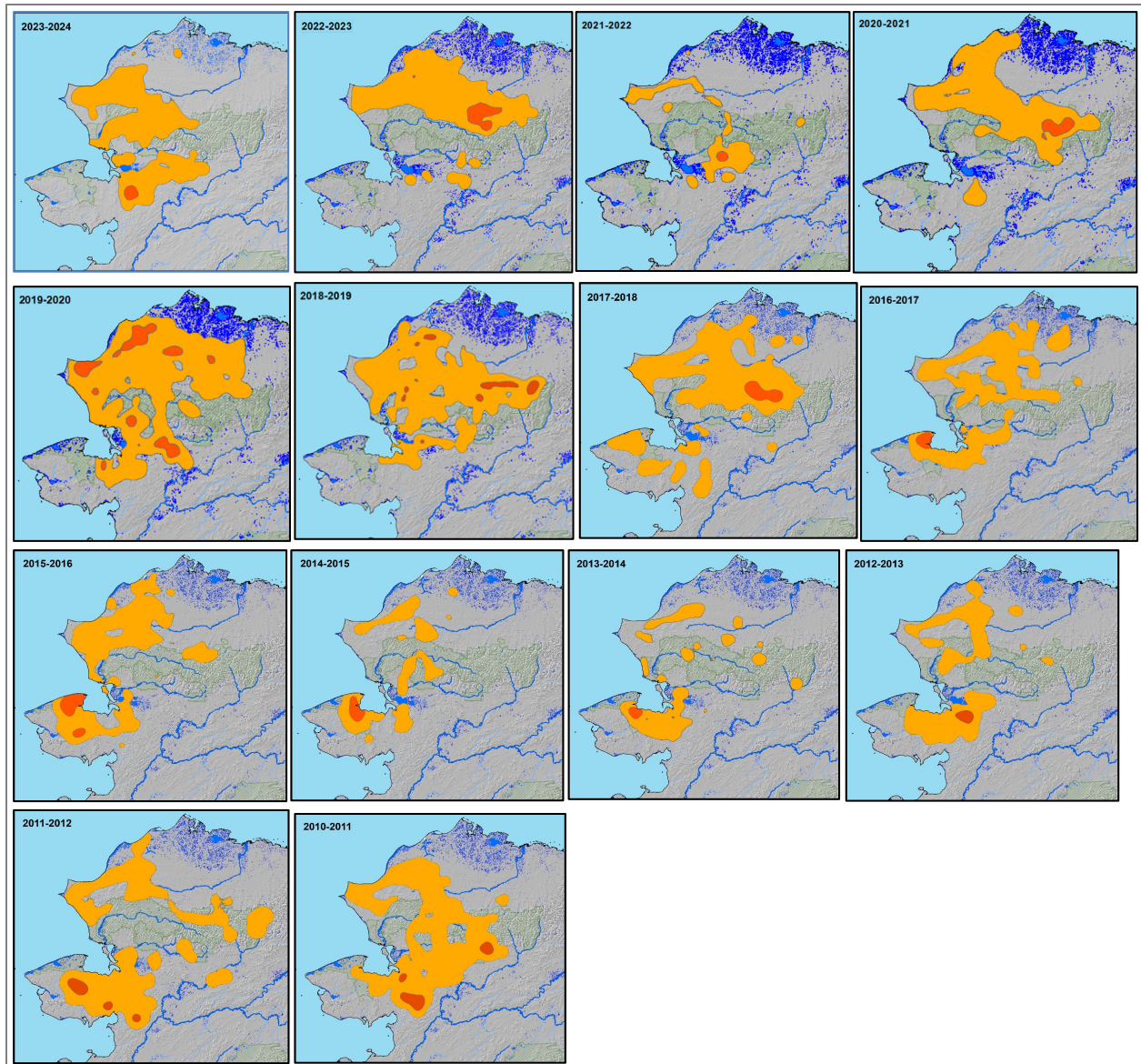


Figure 3. 2010–2024 annual (September 1–August 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are NPS units.

NPS

Table 3. Winter range areas of Western Arctic Herd caribou (95% and 50% kernels for December 1–March 31).

Years	Sample Size	95% kernel area (km²)	50% kernel area (km²)
2024–2025	85	6,587	96
2023–2024	84	4,704	40
2022–2023	76	21,316	334
2021–2022	68	1,913	82
2020–2021	58	5,002	23
2019–2020	40	11,757	274
2018–2019	40	8,191	84
2017–2018	63	9,814	67
2016–2017	67	10,321	538
2015–2016	48	6,210	151
2014–2015	36	5,386	133
2013–2014	35	4,338	105
2012–2013	30	5,801	131
2011–2012	40	3,933	86
2010–2011	27	9,170	274

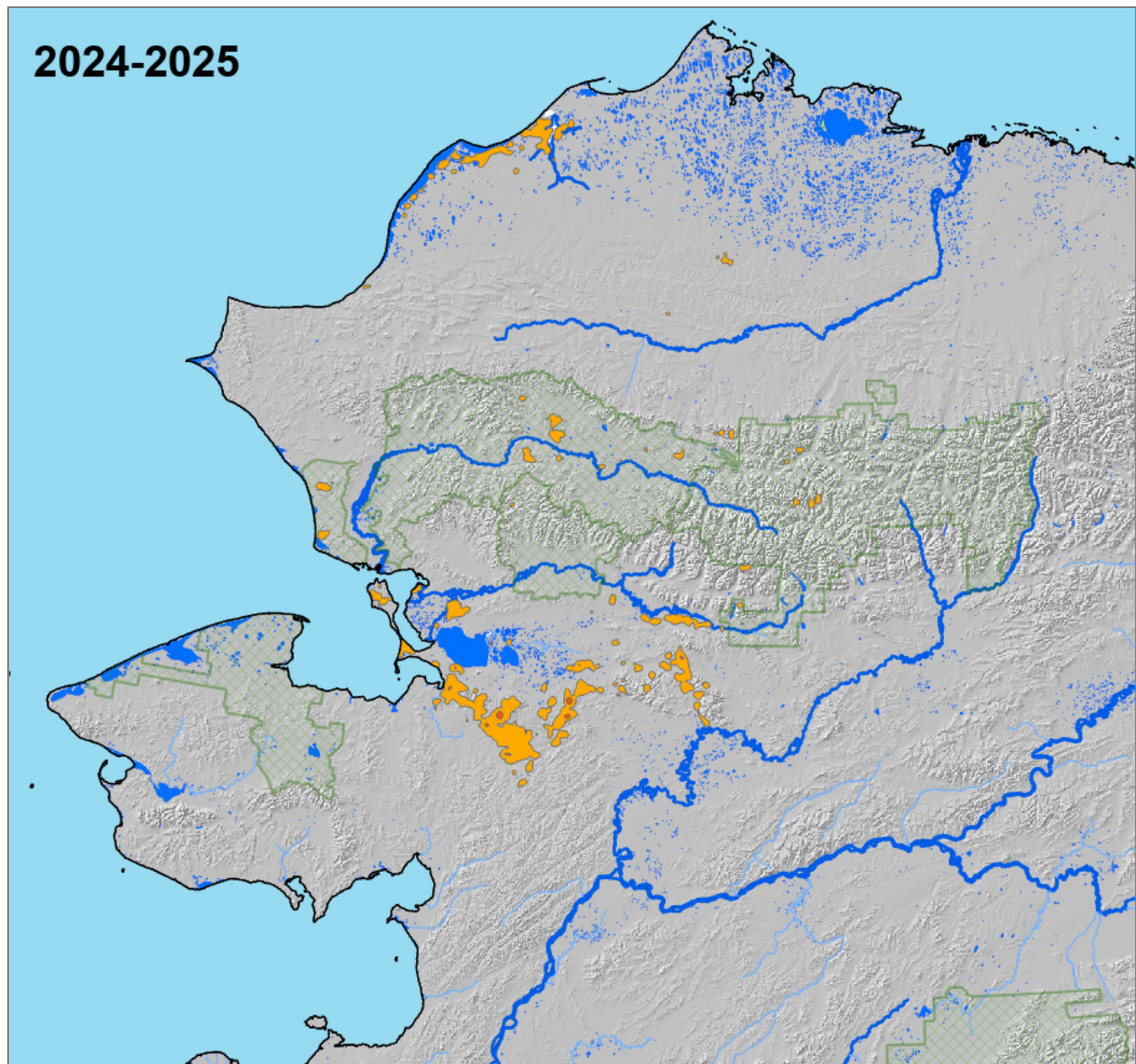


Figure 4. 2024–2025 winter (December 1–March 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.
NPS

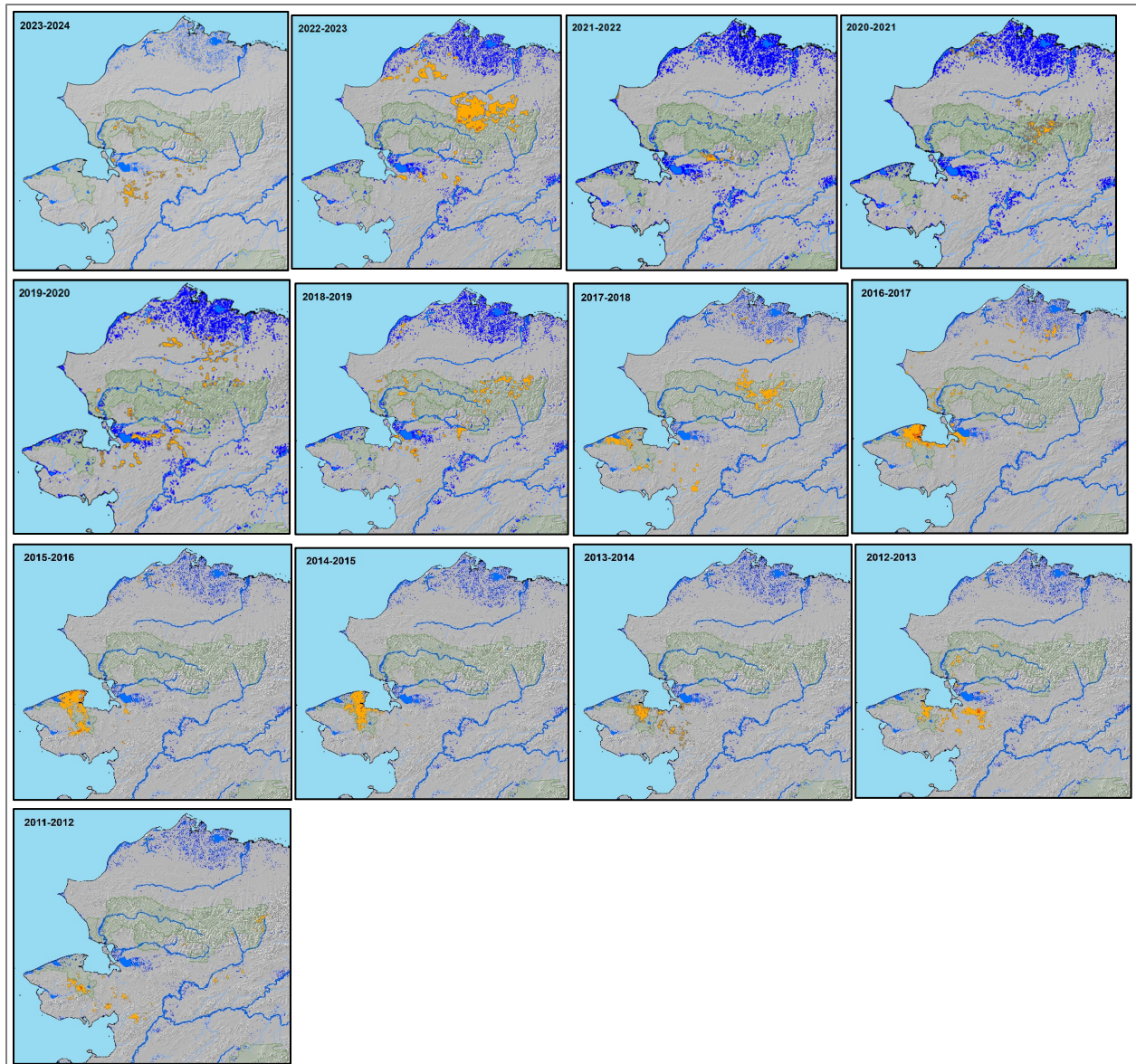


Figure 5. 2010–2024 winter (December 1–March 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.

NPS

Table 4. Calving period areas of the Western Arctic Herd (95% and 50% kernels for May 28–June 14).

Year	Sample Size	95% kernel area (km²)	50% kernel area (km²)
2025	101	8,988	563
2024	117	6,445	265
2023	109	17,613	714
2022	101	13,660	460
2021	78	8,654	505
2020	70	14,370	651
2019	58	4,712	355
2018	54	9,996	375
2017	84	7,511	364
2016	82	6,790	806
2015	54	5,127	193
2014	56	4,514	111
2013	40	21,870	749
2012	38	31,219	2,118
2011	42	11,429	291
2010	33	18,362	707

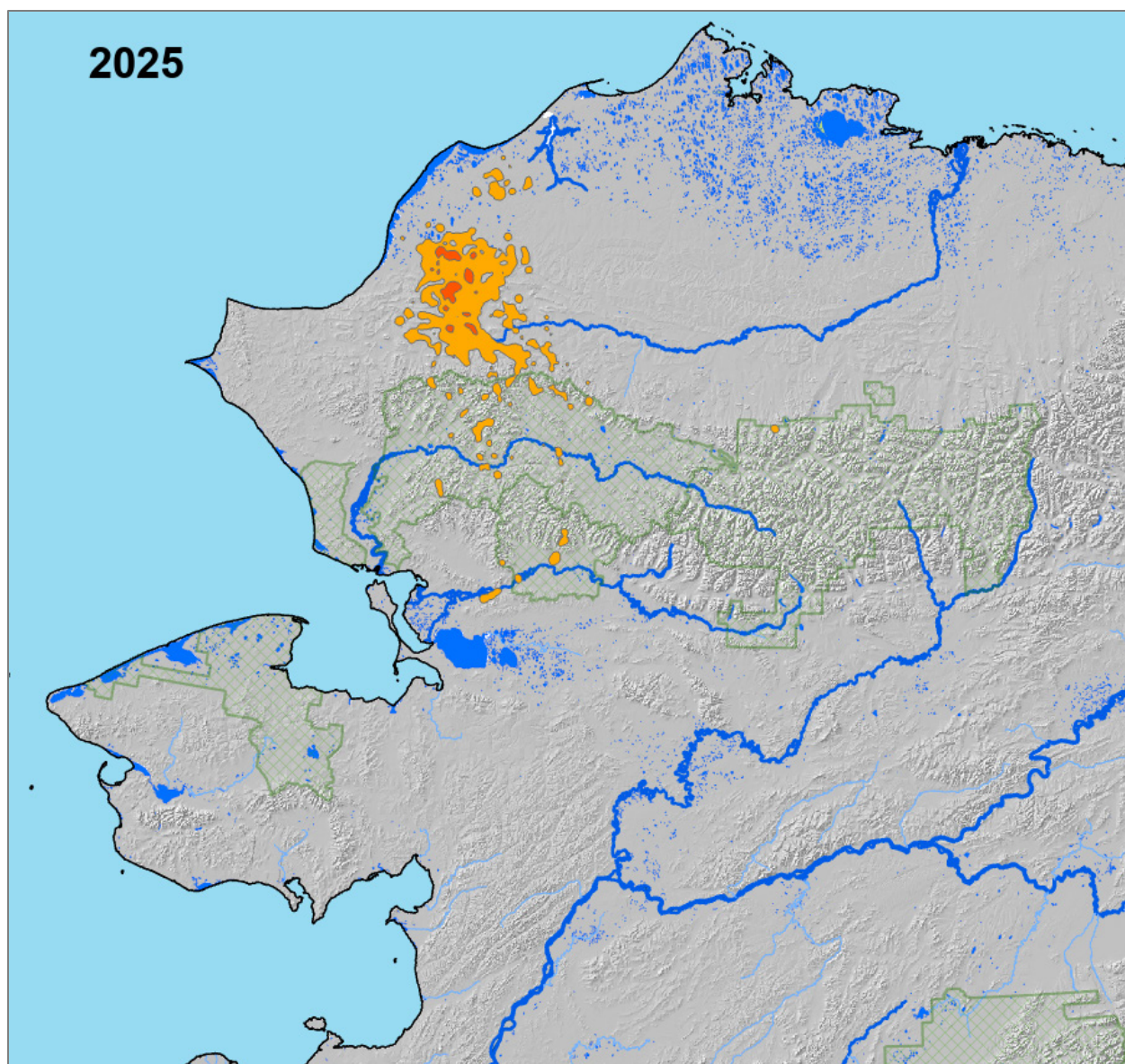


Figure 6. 2025 calving period (May 28–June 14) area use by Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units. These kernels include all (both parturient and non-parturient) GPS-collared cows.

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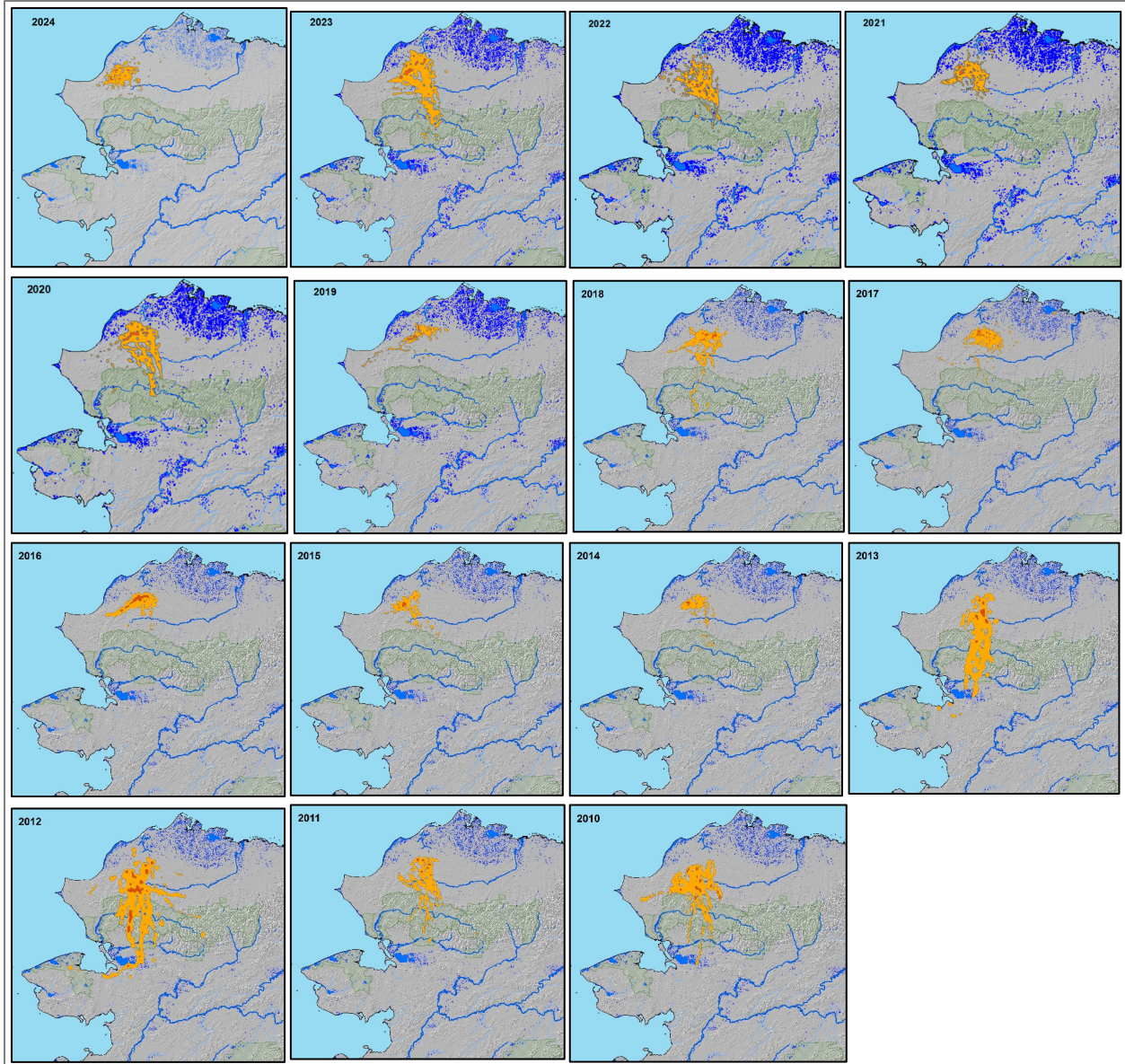


Figure 7. 2010–2024 calving period (May 28–June 14) area use by Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units. These kernels include all (both parturient and non-parturient) GPS-collared cows.

NPS

Table 5. Insect relief areas of Western Arctic Herd caribou (95% and 50% kernels for June 15–July 14).

Year	Sample Size	95% kernel area (km²)	50% kernel area (km²)
2025	101	14,774	2,366
2024	117	21,034	2,964
2023	107	18,644	3,566
2022	98	18,256	3,241
2021	77	19,924	3,616
2020	70	16,457	1,938
2019	57	19,746	3,465
2018	54	22,787	6,033
2017	80	25,874	4,858
2016	82	24,722	7,190
2015	52	20,537	3,834
2014	47	17,214	4,226
2013	36	22,043	3,688
2012	38	24,476	5,505
2011	40	20,734	2,737
2010	33	31,142	3,468

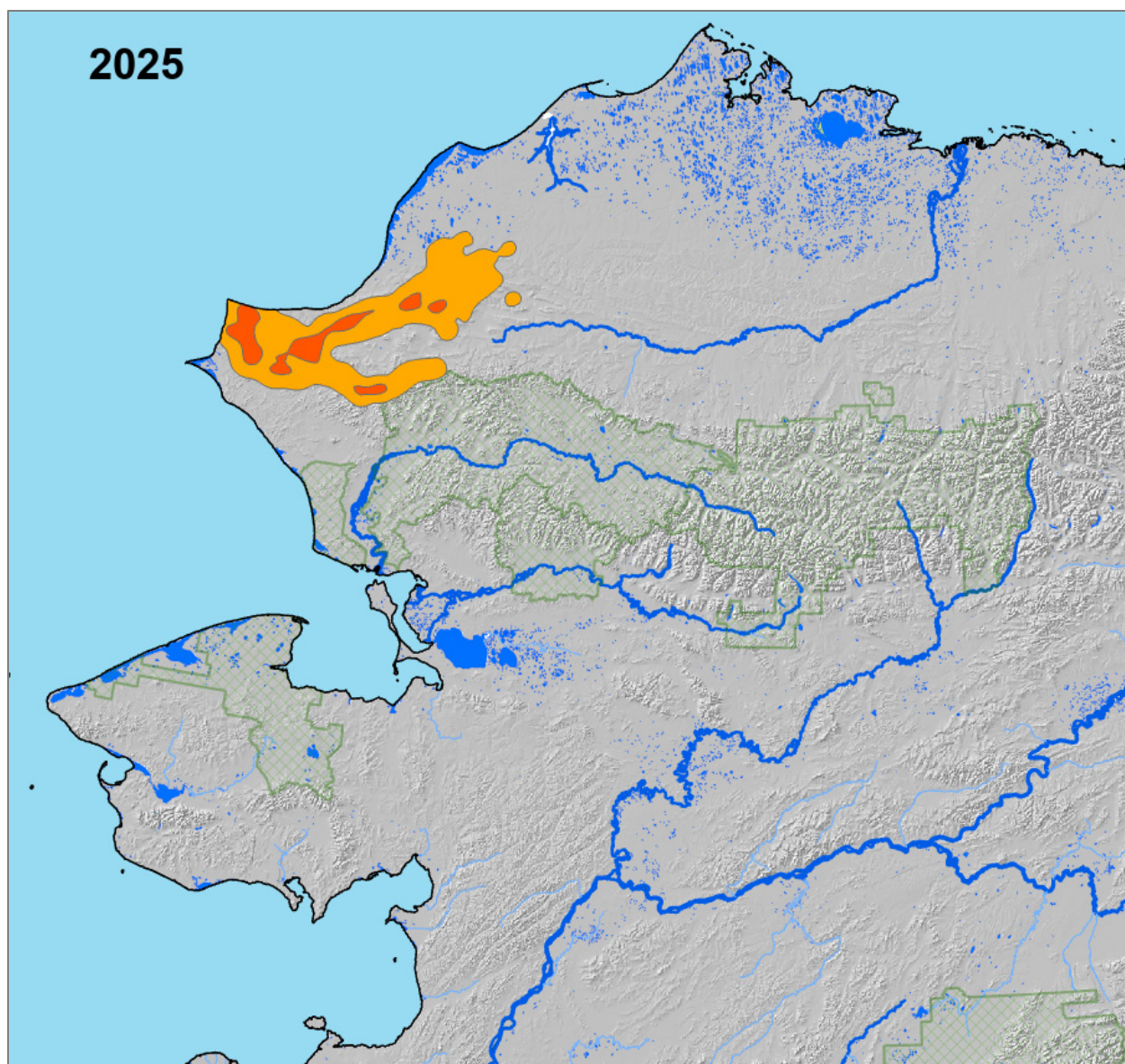


Figure 8. 2025 insect relief (June 15–July 14) area use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.

NPS

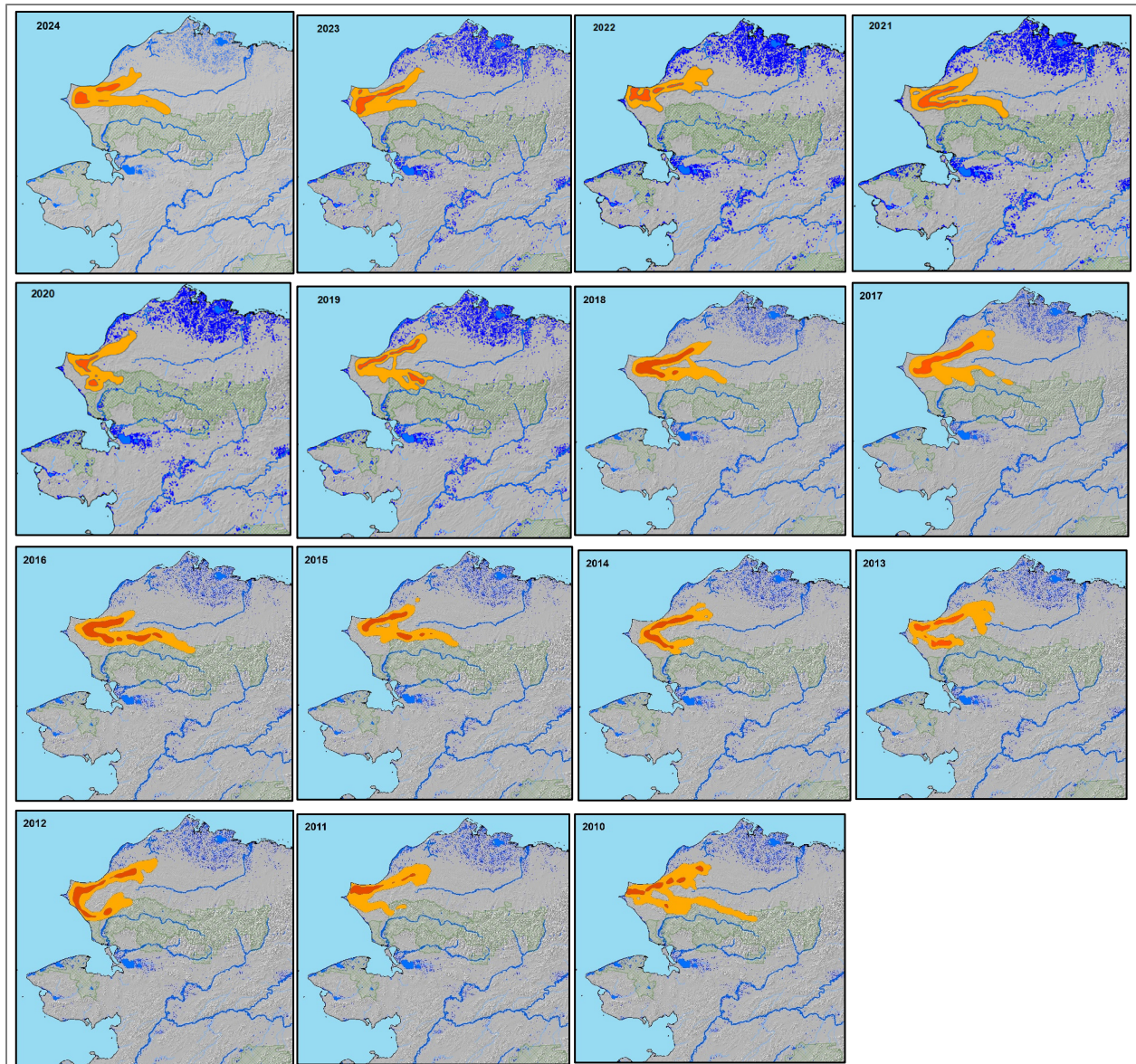


Figure 9. 2010–2024 insect relief (June 15–July 14) area use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.
NPS

Table 6. Late-summer areas of Western Arctic Herd caribou (95% and 50% kernels for July 15–August 31).

Year	Sample Size	95% kernel area (km²)	50% kernel area (km²)
2025	96	24,432	970
2024	108	47,475	3,033
2023	106	32,230	1,034
2022	88	41,671	2,368
2021	72	46,120	936
2020	68	19,945	1,104
2019	53	27,437	243
2018	52	32,126	432
2017	78	58,281	4,807
2016	81	47,168	937
2015	51	44,808	888
2014	46	53,809	2,687
2013	36	35,253	359
2012	38	49,736	2,236
2011	39	64,807	4,373
2010	31	43,859	2,914

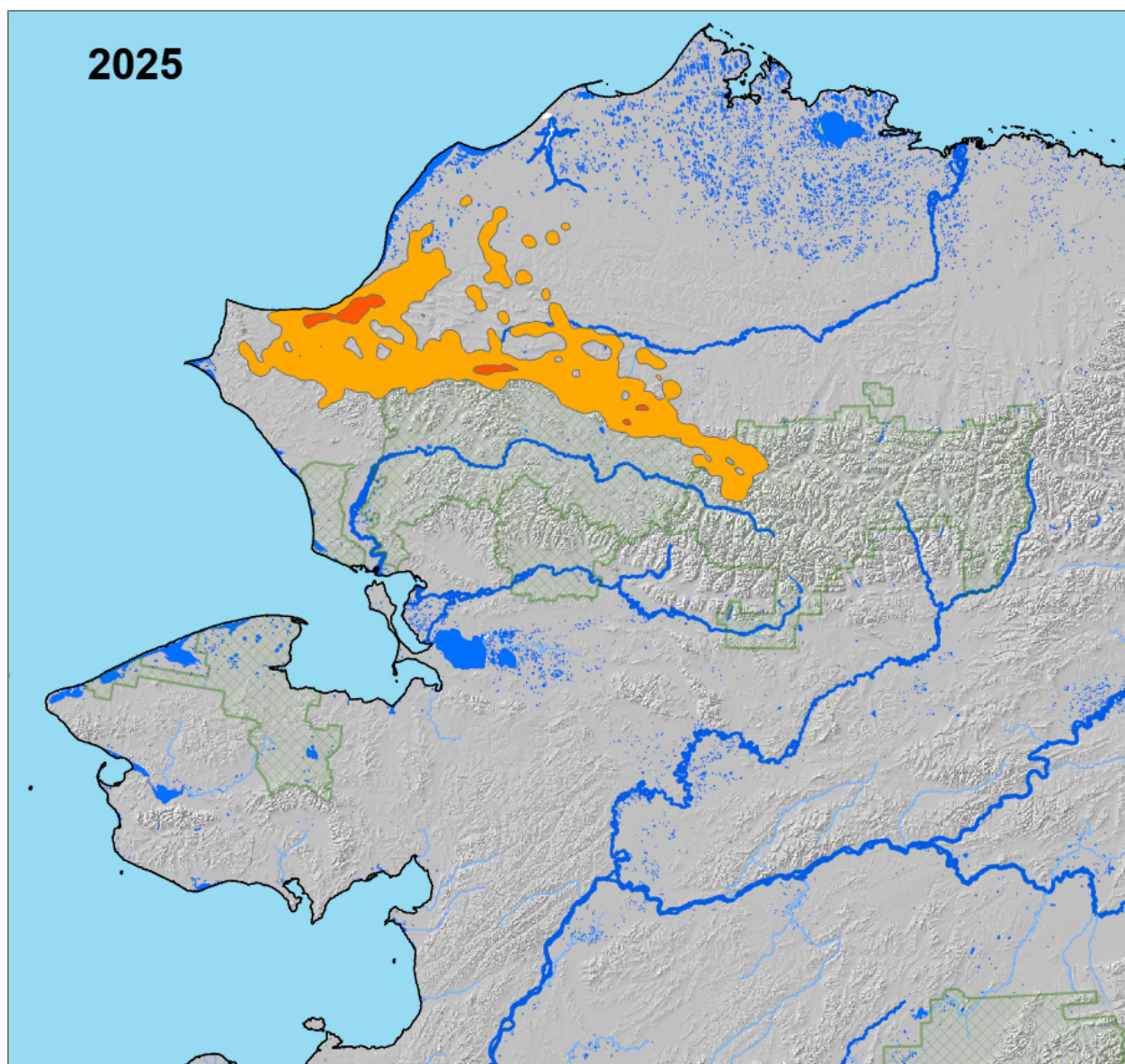


Figure 10. 2025 late-summer (July 15–August 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.
NPS

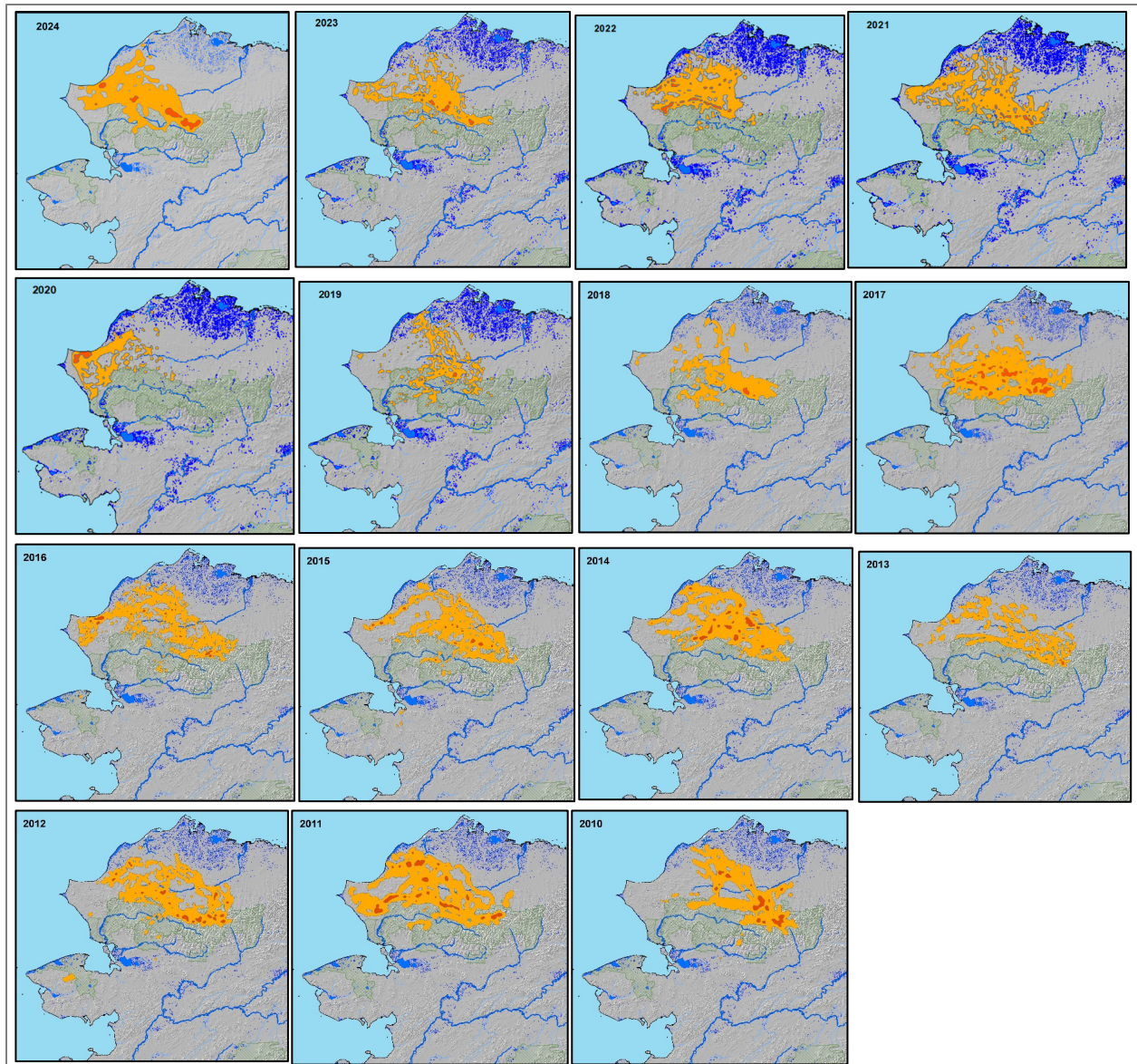


Figure 11. 2010–2024 late-summer (July 15–August 31) range use of Western Arctic Herd caribou. Light orange depicts the 95% kernel and dark orange the 50% kernel. Green hatched areas are Park units.

NPS

Distribution and Movements

Usage of the 5 ARCN Parks is detailed in Tables 7–10. For the 7th year in a row, no collared caribou migrated south to BELA. The herd’s distribution tended to be further west than most years, which led to relatively low use of GAAR in all seasons. NOAT again recorded the highest percentage of use compared to other parks in fall, spring, and summer. Interestingly, it also had the highest use in winter, which was a first. Fall use of CAKR and GAAR were notably low. Winter use of GAAR was below average but near the long-term averages for CAKR, KOVA, and NOAT. NOAT had the highest use of any park in spring 2025, which is typical. Spring use of CAKR, KOVA, and NOAT were slightly above their long-term averages but was low in GAAR. Summertime use of ARCN Parks was

variable. Use of GAAR was the third lowest ever reported. Use of KOVA in the summer was also below average. No caribou were found in BELA or CAKR during summer 2025, which is typical. WAH caribou continued to exhibit some of the longest migrations and movements of any terrestrial mammal. The mean annual distance traveled by collared caribou this reporting year decreased from last year and was below the long-term average (Table 11). It was the lowest in 5 years (since 2020–2021).

Table 7. Fall caribou use of parks. Percent of Western Arctic Herd (WAH) collars that entered Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT) in fall (September, October, and November). Averages are for all years.

Season	Sample Size	BELA	CAKR	GAAR	KOVA	NOAT
Fall 2024	107	0.0	0.9	4.7	43.0	82.2
Fall 2023	105	0.0	25.7	12.4	72.4	84.8
Fall 2022	89	0.0	0.0	27.0	14.6	32.6
Fall 2021	88	0.0	9.1	15.9	69.3	79.5
Fall 2020	70	0.0	0.0	65.7	22.9	74.3
Fall 2019	52	0.0	13.5	1.9	25.0	38.5
Fall 2018	52	0.0	17.3	40.4	32.7	73.1
Fall 2017	82	15.9	20.7	35.4	41.5	58.5
Fall 2016	77	42.9	11.7	10.4	45.4	63.6
Fall 2015	50	70.0	22.0	4.0	58.0	60.0
Fall 2014	46	82.6	8.7	19.6	50.0	71.7
Fall 2013	35	0.0	8.6	20.0	57.1	88.6
Fall 2012	38	26.3	7.9	10.5	36.8	84.2
Fall 2011	39	12.8	28.2	33.3	33.3	46.2
Fall 2010	29	3.6	0.0	51.7	62.1	89.7
Fall Average	64	16.9	11.6	23.5	44.3	68.5

Table 8. Winter caribou use of parks. Percent of Western Arctic Herd (WAH) collars that entered Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT) in winter (December, January, February, and March). Averages are for all years.

Season	Sample Size	BELA	CAKR	GAAR	KOVA	NOAT
Winter 2024–2025	97	0.0	4.1	7.2	1.0	9.3
Winter 2023–2024	96	0.0	0.0	15.6	5.2	14.6
Winter 2022–2023	88	0.0	0.0	64.8	0.0	19.3
Winter 2021–2022	79	0.0	1.3	16.5	41.8	6.3
Winter 2020–2021	65	0.0	0.0	70.8	1.5	4.6
Winter 2019–2020	46	0.0	2.2	17.4	2.2	4.3
Winter 2018–2019	47	0.0	2.1	46.8	4.3	25.5
Winter 2017–2018	72	23.6	6.9	33.3	0.0	12.5
Winter 2016–2017	72	47.2	11.1	5.6	0.0	11.1
Winter 2015–2016	47	74.5	0.0	0.0	0.0	0.0
Winter 2014–2015	43	72.1	0.0	4.7	0.0	2.3
Winter 2013–2014	35	60.0	0.0	8.6	0.0	0.0
Winter 2012–2013	36	30.6	8.3	0.0	0.0	11.1
Winter 2011–2012	31	16.1	0.0	35.5	0.0	0.0
Winter 2010–2011	28	7.1	0.0	32.1	0.0	0.0
Winter Average	59	22.1	2.4	23.9	3.7	8.1

Table 9. Spring caribou use of parks. Percent of Western Arctic Herd (WAH) collars that entered Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT) in spring (April and May). Averages are for all years.

Season	Sample Size	BELA	CAKR	GAAR	KOVA	NOAT
Spring 2025	84	0.0	4.8	4.8	27.4	67.9
Spring 2024	84	0.0	0.0	10.7	10.7	17.9
Spring 2023	76	0.0	0.0	57.9	11.8	27.6
Spring 2022	73	0.0	1.4	11.0	53.4	86.3
Spring 2021	57	0.0	0.0	73.6	0.0	38.6
Spring 2020	41	0.0	2.4	17.1	22.0	43.9
Spring 2019	41	0.0	0.0	41.5	2.4	46.3
Spring 2018	62	25.8	0.0	32.3	12.9	51.6
Spring 2017	66	31.8	4.5	3.0	34.8	63.6
Spring 2016	46	76.1	0.0	0.0	19.6	84.8
Spring 2015	33	63.6	3.0	6.1	21.2	87.9
Spring 2014	35	45.7	0.0	8.6	14.3	88.6
Spring 2013	30	13.3	0.0	0.0	66.7	70.0
Spring 2012	29	17.2	0.0	27.6	31.0	48.3
Spring 2011	28	3.6	0.0	35.7	42.9	82.1
Spring Average	52	18.5	1.1	22.0	24.7	60.4

Table 10. Summer caribou use of parks. Percent of Western Arctic Herd (WAH) collars that entered Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT) in summer (June, July and August). Averages are for all years.

Season	Sample Size	BELA	CAKR	GAAR	KOVA	NOAT
Summer 2025	109	0.0	0.0	17.4	5.5	87.2
Summer 2024	117	0.0	0.0	58.1	4.3	97.4
Summer 2023	111	0.0	0.0	31.5	7.2	86.5
Summer 2022	102	0.0	0.0	2.9	2.9	79.4
Summer 2021	97	0.0	0.0	57.7	4.1	86.6
Summer 2020	70	0.0	14.3	0.0	0.0	60.0
Summer 2019	59	0.0	0.0	18.6	15.3	93.1
Summer 2018	55	0.0	0.0	67.3	29.1	94.5
Summer 2017	86	0.0	0.0	46.5	11.6	90.7
Summer 2016	80	1.3	0.0	36.3	10.0	96.3
Summer 2015	53	3.8	0.0	50.9	9.4	96.2
Summer 2014	57	0.0	0.0	43.9	0.0	80.7
Summer 2013	41	0.0	0.0	51.2	31.7	87.8
Summer 2012	39	2.6	0.0	59.0	20.5	92.3
Summer 2011	40	0.0	0.0	37.5	10.0	65.0
Summer 2010	30	0.0	0.0	90.0	10.0	100
Summer Average	72	0.5	0.9	41.8	10.7	87.1

Table 11. Annual distance (September 1–August 31) moved by GPS-collared Western Arctic Herd caribou cows. Average is for all years.

Monitoring Year	Sample Size	Mean Distance (SD)	Maximum Distance
2024–2025	62	2,833 (326) km	3,739 km
2023–2024	67	3,074 (301) km	3,673 km
2022–2023	65	2,859 (271) km	3,299 km
2021–2022	51	3,039 (358) km	3,833 km
2020–2021	50	2,722 (322) km	3,416 km
2019–2020	37	2,538 (312) km	3,138 km
2018–2019	32	2,540 (362) km	3,126 km
2017–2018	47	2,854 (432) km	3,820 km
2016–2017	55	2,932 (523) km	3,756 km
2015–2016	35	3,110 (488) km	3,827 km
2014–2015	22	3,238 (521) km	4,076 km
2013–2014	24	3,392 (521) km	4,404 km
2012–2013	34	3,071 (304) km	3,636 km
2011–2012	36	3,085 (485) km	3,758 km
2010–2011	39	3,045 (323) km	3,747 km
2009–2010	31	3,254 (237) km	3,724 km
Average	43	2,974 (380) km	3,686 km
Total	687	–	–

No collared caribou came within about 15 km of the Delong Mountain Transportation System (DMTS, commonly referred to as the Red Dog Road) during fall 2024. However, during the 2025 northward spring migration, 4 did. Of these, 3 traced (paralleled) the road before crossing it, while the 4th traced the road east, all the way past the mine site before turning north for the calving grounds (Figure 12). A new scientific paper (Fullman et al. 2025) was published during this reporting period that analyzed the movements of WAH caribou near roads, including the DMTS, in all seasons. Please see the Discussion section, below, for more details about this work.

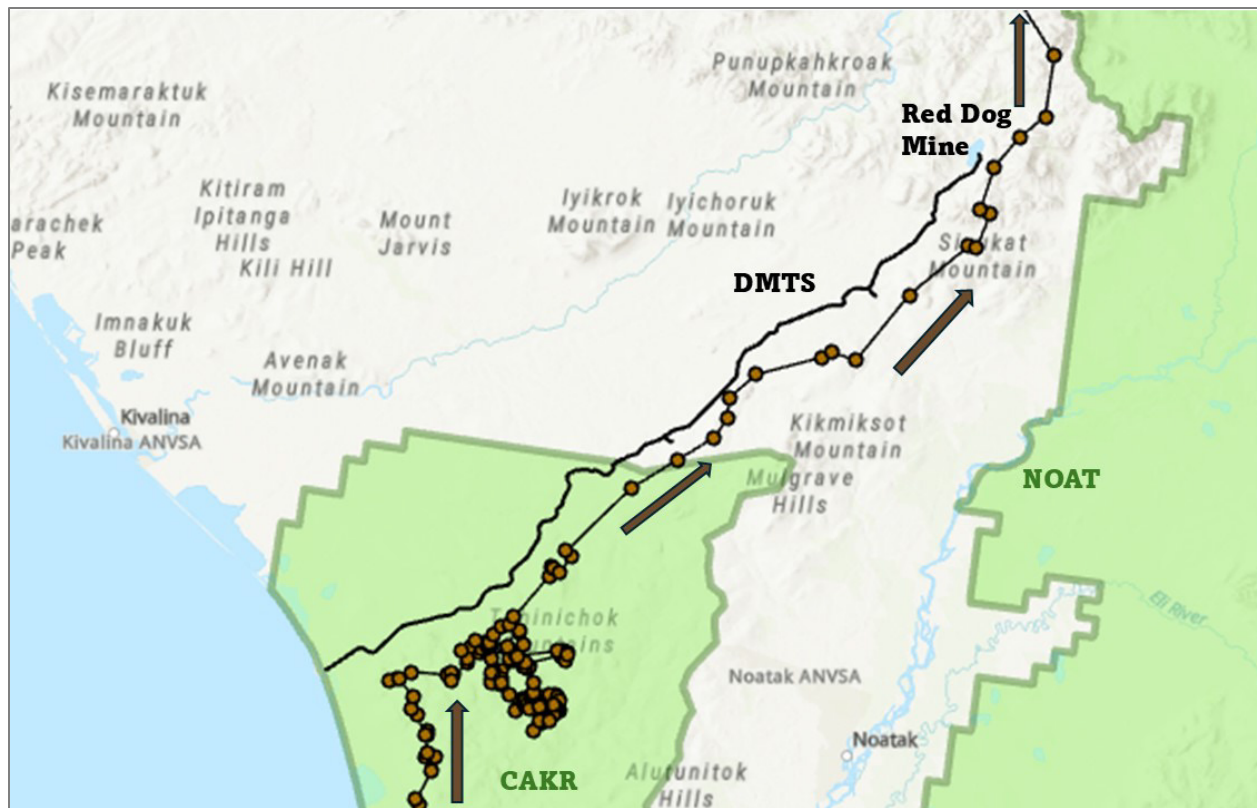


Figure 12. Caribou near the DMTS. Locations of collared caribou “1972” (brown dots, NPS data) in the spring of 2025 and its movements (thin black lines connecting the dots) near the Delong Mountain Transportation System (DMTS; black line). The directionality of her spring migration, from south to north, is noted with brown arrows. Green areas are Park units, including Cape Krusenstern National Monument (CAKR) and Noatak National Preserve (NOAT).

NPS

Migration Phenology

The results for when and how many GPS-collared caribou crossed the Noatak, Kobuk and Selawik Rivers on their annual “spring” and “fall” migrations are detailed in Tables 12 and 13. The timing of the average fall 2024 migration crossing (October 12) was more than 2 weeks later than the long-term average (September 25) for the Noatak River and just a day before the latest on record (October 13 in 2018). The average crossing date for the Kobuk River was also about 2 weeks later than the long-term average and similarly late for the Selawik River. The percentage of collared caribou crossing all 3 rivers was similar to the previous year and higher than the long-term averages. Despite above average percentages of caribou crossing key rivers in fall 2024, there is an overall trend of less caribou crossing all these key rivers in fall over the last 15 years, reflecting a shift away from the southernmost winter ranges by the herd. The duration (the number of days between the average date of crossing the Noatak and Selawik Rivers) of the fall 2024 migration (23 days) was less than the long-term average. However, it was longer than the average fall migration duration for the 7 years spanning 2010–2016 (18.4 days), a period when the herd had a more distinct southerly fall migration pattern. For the spring 2025 migration, the timing of crossing the Selawik and Kobuk Rivers was

similar to the long-term average but about a week later than the long-term average for the Noatak River. The duration of spring 2025 migration was slightly longer than the long-term average.

Table 12. 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 (N) results for generally southward “fall” migration. Dates are for the first crossing if the individual re-crosses. Duration is the average number of days between Noatak and Selawik River crossings. Average (Avg) is for all years.

Year	Noatak River			Kobuk River			Selawik River			Duration
	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	
2024	Oct 12 (15.2)	83.5%	103	Oct 29 (6.0)	74.0%	100	Nov 5 (10.6)	64.6%	99	23
2023	Sep 28 (25.0)	92.9%	99	Nov 8 (11.4)	74.5%	98	Nov 12 (8.6)	47.4%	97	45
2022	Sep 25 (20.6)	27.3%	88	Oct 12 (5.7)	20.5%	88	Oct 27 (9.2)	13.6%	88	32
2021	Sep 16 (24.2)	85.7%	84	Oct 16 (14.8)	73.2%	82	Nov 13 (12.8)	10.0%	80	58
2020	Sep 26 (23.0)	63.9%	72	Nov 3 (1.0)	5.6%	72	Nov 9 (0.6)	5.6%	72	44
2019	Sep 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	25
2017	Sep 17 (40.0)	65.9%	82	Oct 30 (22.5)	48.1%	81	Nov 10 (18.2)	42.3%	78	54
2016	Sep 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

Table 12 (continued). 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 (N) results for generally southward “fall” migration. Dates are for the first crossing if the individual re-crosses. Duration is the average number of days between Noatak and Selawik River crossings. Average (Avg) is for all years.

Year	Noatak River			Kobuk River			Selawik River			Duration
	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	
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
Avg	Sep 25 (25.4)	75.1%	62	Oct 17 (15.2)	59.9%	61	Oct 25 (14.4)	48.9%	61	31

Table 13. Spring 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 (N) results for generally northward “spring” migration. Dates are for the first crossing if the individual re-crosses. “Spring migration” is not limited to the months of April and May as some cows cross the Noatak in early June. These later crossings are included in the results. Duration is the average number of days between Noatak and Selawik River crossings. Average (Avg) is for all years.

Year	Noatak River			Kobuk River			Selawik River			Duration
	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	
2025	May 23 (7.3)	72.2%	79	May 17 (6.5)	73.4%	79	May 6 (14.6)	63.3%	79	17
2024	May 9 (8.1)	92.2%	77	May 3 (8.2)	75.6%	78	Apr 27 (7.5)	59.0%	78	12
2023	May 28 (5.3)	16.4%	67	May 18 (6.0)	13.4%	67	May 2 (14.1)	11.9%	67	26
2022	May 21 (14.3)	87.0%	69	May 8 (8.5)	54.2%	72	May 4 (7.3)	18.1%	72	17
2021	Apr 18 (27.1)	26.3%	57	May 9 (8.3)	8.8%	57	May 7 (6.7)	7.0%	57	N/A ^A
2020	May 19 (5.8)	45.9%	37	May 12 (5.3)	37.8%	37	May 3 (5.6)	27.0%	37	16
2019	May 12 (10.8)	34.1%	41	May 10 (7.4)	21.4%	42	Apr 25 (14.4)	23.3%	43	17
2018	May 24 (7.4)	36.1%	61	May 18 (8.8)	37.7%	61	May 10 (6.8)	38.1%	63	14
2017	May 11 (4.6)	65.1%	63	May 2 (10.0)	61.9%	63	Apr 25 (5.3)	59.4%	64	16
2016	May 7 (8.4)	84.8%	46	Apr 28 (8.3)	84.8%	46	Apr 24 (8.6)	84.8% ^B	46	13

^A Due to an unusual distribution, average crossing occurred on the Noatak River before the Selawik River and duration could not be calculated.

^B One caribou migrated south but stayed on the Seward Peninsula and did not migrate north in spring.

Table 13 (continued). Spring 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 (N) results for generally northward “spring” migration. Dates are for the first crossing if the individual re-crosses. “Spring migration” is not limited to the months of April and May as some cows cross the Noatak in early June. These later crossings are included in the results. Duration is the average number of days between Noatak and Selawik River crossings. Average (Avg) is for all years.

Year	Noatak River			Kobuk River			Selawik River			Duration
	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	Crossing Date (SD)	% Crossed	N	
2015	May 18 (6.5)	84.4%	32	May 9 (6.2)	81.8%	33	May 3 (4.4)	82.3%	34	15
2014	May 8 (7.3)	91.2%	34	Apr 27 (4.1)	88.2%	34	Apr 23 (3.6)	88.2%	34	15
2013	May 31 (6.2)	93.1%	29	May 26 (8.1)	79.3%	29	May 21 (10.2)	79.3%	29	10
2012	June 7 (26.7)	74.4%	43	May 29 (26.4)	69.7%	43	May 26 (27.5)	69.7% ^B	43	12
2011	May 18 (11.8)	96.3%	27	May 15 (5.8)	70.4%	27	May 9 (5.8)	55.5%	27	9
Avg	May 17 (10.5)	66.6%	51	May 12 (8.5)	57.2%	51	May 5 (9.5)	47.1%	52	15

^A Due to an unusual distribution, average crossing occurred on the Noatak River before the Selawik River and duration could not be calculated.

^B One caribou migrated south but stayed on the Seward Peninsula and did not migrate north in spring.

Migration Routes

A histogram (Figures 13 and 14) of where caribou crossed the Noatak River provides a visual depiction of the geographic spread of the fall migration. Crossings of the Noatak River continue to be variable. The 2024 migration was different from all others due to the large percentage of caribou (36% of the collars) migrating through the Noatak River segment that includes the Nakolik River (orange segment). This is twice the highest percentage previously recorded for this segment (in 2012). The bulk of the caribou (93%) crossing the Noatak River did so towards the central portion of the river (orange, light blue, and purple segments).

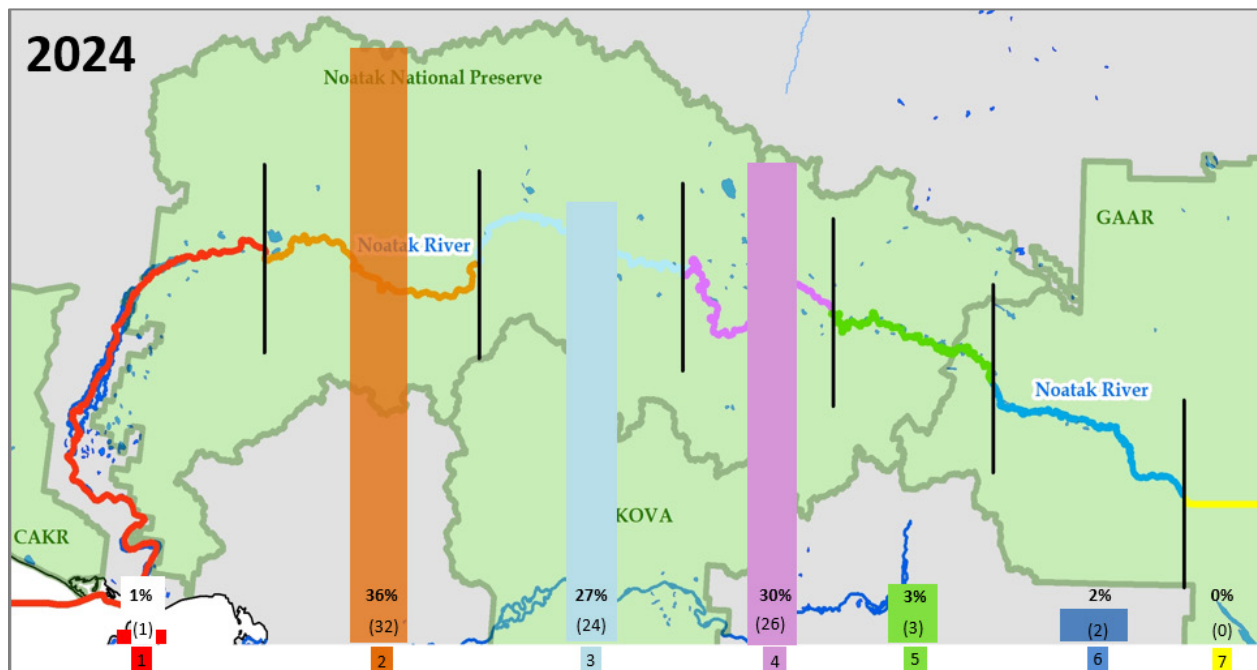


Figure 13. 2024 distribution of caribou crossing the Noatak River during fall. This histogram depicts where collared female caribou crossed the Noatak River, generally from north to south, on their fall migration. Relative percentages (top number) and absolute number (middle number) of caribou are provided. The river is divided into 7 color-coded segments (labeled with numbers in the colored boxes along the bottom of the figure). The middle 5 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 WAH caribou are known to migrate.

NPS

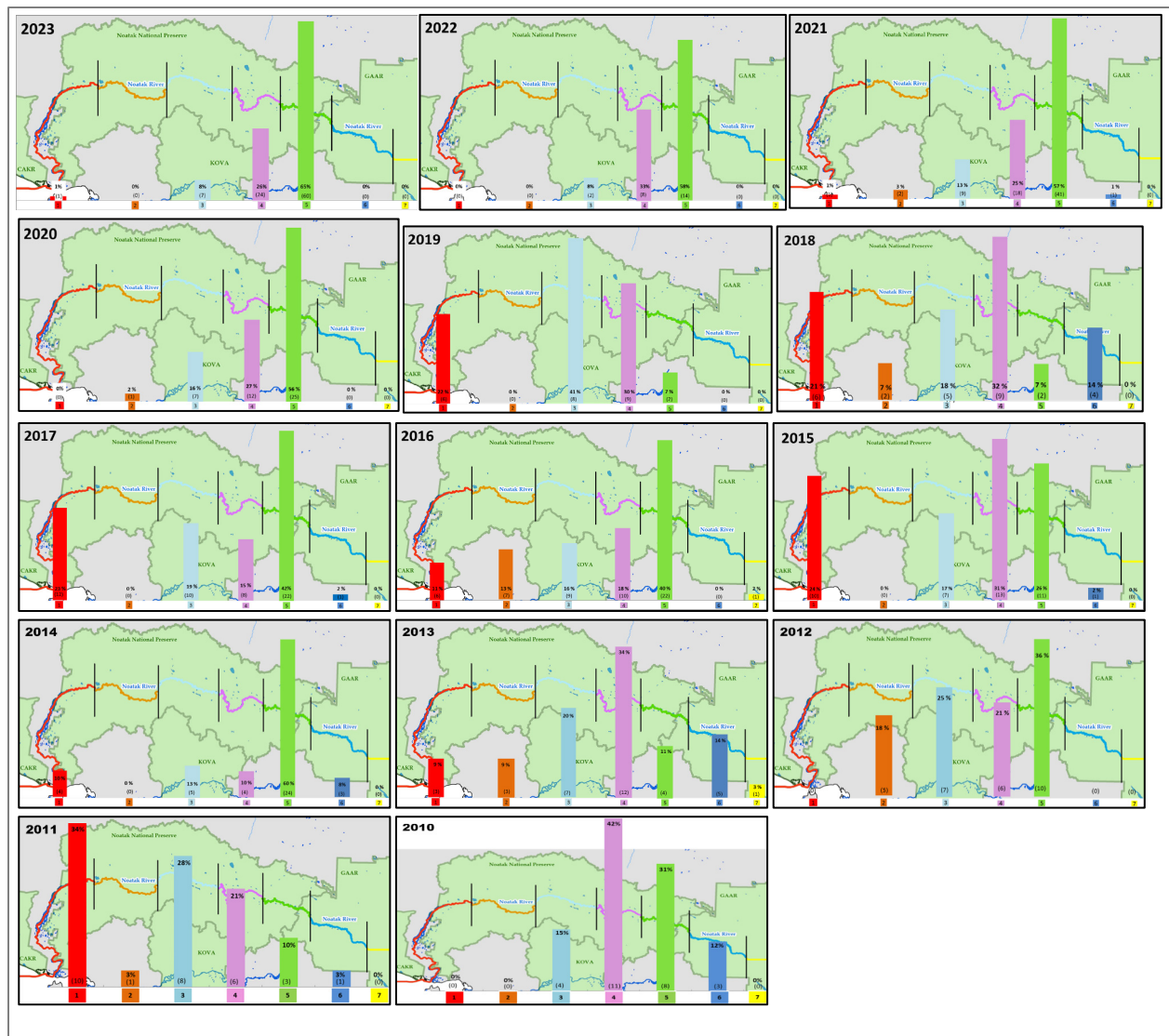


Figure 14. 2010–2023 distribution of caribou crossing the Noatak River during fall. This histogram depicts where collared female caribou crossed the Noatak River, generally from north to south, on their fall migration. Relative percentages (top number) and absolute number (middle number) of caribou are provided. The river is divided into 7 (lowest number) color-coded segments which are displayed in the background. The middle 5 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 WAH caribou are known to migrate.

NPS

The timing and distance of GPS-collared caribou when they came the closest to the villages of Noatak, Shungnak and Selawik, as well as Onion Portage, on their annual “spring” and “fall” migrations are detailed in Tables 14 and 15. Onion Portage, which has been used as a Kobuk River crossing by caribou for more than 10,000 years, is frequently utilized both during the fall and spring migrations (Anderson 1968). The fall 2024 average minimum distance to Shungnak and Onion Portage were similar to their long-term averages, while caribou were generally closer to Noatak (4th

closest) and Selawik (3rd closest) this year. The timing of when the caribou came close to these locations in fall remained later than average for all of them. The minimum distances in spring from all featured locations were generally similar to the long-term averages. The timing of when collared caribou were closest to the featured locations in spring was later than average for all locations.

Table 14. Fall season minimum distance and date that collared Western Arctic Herd caribou passed select locations. Locations include the villages of Noatak, Shungnak, and Selawik, and Onion Portage, a historical river crossing. Results are average minimum distance in kilometers (standard deviation); average date of the minimum distance (standard deviation); and sample size (N). Results are for generally southward, fall (September–November) migration. Average (Avg) is for all years.

Year	N	Noatak		Shungnak		Selawik		Onion Portage	
		Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)
2024	99	118.7 (53.2)	Oct 11 (24.3)	118.3 (88.3)	Oct 30 (20.1)	83.6 (103.7)	Nov 4 (18.6)	89.7 (81.6)	Oct 26 (19.3)
2023	96	94.4 (86.1)	Oct 20 (19.3)	96.1 (69.3)	Oct 20 (22.6)	86.9 (76.2)	Nov 10 (14.2)	71.5 (63.3)	Oct 15 (18.8)
2022	88	166.7 (59.5)	Sep 13 (13.7)	159.7 (85.8)	Nov 6 (24.8)	219.3 (88.6)	Oct 11 (29.4)	151.7 (84.5)	Nov 3 (27.3)
2021	73	144.2 (67.6)	Oct 4 (19.5)	60.1 (90.6)	Nov 9 (16.6)	90.0 (83.5)	Oct 26 (16.2)	54.5 (79.5)	Oct 19 (18.2)
2020	65	118.0 (54.4)	Sep 11 (17.8)	148.8 (101.9)	Oct 11 (20.8)	181.6 (85.0)	Oct 10 (21.7)	126.4 (92.9)	Oct 7 (16.2)
2019	46	155.5 (92.6)	Sep 27 (21.5)	169.1 (101.9)	Nov 4 (23.7)	178.4 (132.6)	Oct 16 (27.5)	145.2 (108.5)	Oct 24 (27.7)
2018	46	116.0 (85.1)	Oct 6 (27.2)	142.7 (73.0)	Oct 25 (31.9)	135.1 (82.7)	Oct 17 (34.4)	117.0 (65.1)	Oct 17 (32.8)
2017	69	135.9 (103.9)	Oct 5 (31.6)	138.6 (81.0)	Oct 30 (27.6)	138.9 (94.7)	Oct 25 (32.0)	115.5 (81.0)	Oct 27 (29.9)
2016	73	137.5 (88.3)	Oct 21 (33.4)	139.9 (100.6)	Oct 7 (28.5)	123.8 (107.5)	Oct 8 (23.6)	110.2 (97.4)	Oct 4 (26.6)
2015	49	132.7 (64.3)	Oct 23 (30.0)	132.0 (103.9)	Oct 3 (26.8)	86.3 (88.3)	Oct 6 (24.0)	93.2 (101.8)	Oct 2 (26.0)
2014	46	165.8 (76.5)	Oct 16 (26.9)	80.1 (88.2)	Oct 7 (23.6)	96.4 (95.7)	Oct 8 (18.8)	62.8 (87.6)	Oct 1 (22.5)
2013	35	146.8 (69.7)	Oct 14 (25.9)	83.8 (53.2)	Oct 11 (19.1)	63.9 (59.3)	Oct 15 (17.1)	60.4 (52.4)	Oct 9 (20.0)

Table 14 (continued). Fall season minimum distance and date that collared Western Arctic Herd caribou passed select locations. Locations include the villages of Noatak, Shungnak, and Selawik, and Onion Portage, a historical river crossing. Results are average minimum distance in kilometers (standard deviation); average date of the minimum distance (standard deviation); and sample size (N). Results are for generally southward, fall (September–November) migration. Average (Avg) is for all years.

Year	N	Noatak		Shungnak		Selawik		Onion Portage	
		Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)
2012	34	155.0 (61.1)	Oct 22 (31.7)	78.1 (87.1)	Oct 16 (19.9)	81.6 (49.9)	Oct 24 (20.0)	58.5 (71.6)	Oct 13 (19.8)
2011	39	123.8 (83.6)	Sep 30 (28.1)	140.0 (106.5)	Oct 19 (27.1)	118.4 (117.7)	Oct 12 (29.4)	122.8 (96.9)	Oct 14 (27.0)
2010	29	176.8 (54.2)	Oct 7 (17.6)	36.6 (37.3)	Oct 8 (15.5)	86.1 (53.1)	Oct 20 (12.7)	32.6 (32.7)	Oct 3 (14.6)
Avg	59	139.2 (73.3)	Oct 7 (24.6)	114.9 (84.6)	Oct 20 (23.2)	118.0 (87.9)	Oct 18 (22.6)	94.1 (79.8)	Oct 14 (23.1)

Table 15. Spring season minimum distance and date that collared Western Arctic Herd caribou passed select locations. Locations include the villages of Noatak, Shungnak, and Selawik, and Onion Portage, a historical river crossing. Results are average minimum distance in kilometers (standard deviation); average date of the minimum distance (standard deviation); and sample size (N). Results are for generally northward, spring (April and May) migration. Average (Avg) is for all years.

Year	N	Noatak		Shungnak		Selawik		Onion Portage	
		Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)
2025	75	138.8 (76.3)	May 22 (11.5)	146.3 (110.0)	May 9 (15.0)	103.7 (118.0)	May 11 (15.0)	114.0 (102.2)	May 15 (11.7)
2024	77	126.6 (73.5)	May 8 (15.4)	112.1 (80.5)	Apr 26 (13.4)	79.6 (78.5)	Apr 27 (11.5)	79.9 (72.9)	May 1 (11.9)
2023	67	205.3 (28.2)	May 19 (11.1)	164.7 (84.3)	Apr 30 (13.5)	221.7 (72.4)	May 8 (9.5)	150.1 (76.1)	May 6 (12.0)
2022	63	182.3 (50.7)	May 20 (13.2)	80.2 (96.0)	Apr 26 (17.9)	127.5 (77.4)	May 2 (15.6)	63.1 (86.6)	May 6 (14.5)

Table 15 (continued). Spring season minimum distance and date that collared Western Arctic Herd caribou passed select locations. Locations include the villages of Noatak, Shungnak, and Selawik, and Onion Portage, a historical river crossing. Results are average minimum distance in kilometers (standard deviation); average date of the minimum distance (standard deviation); and sample size (N). Results are for generally northward, spring (April and May) migration. Average (Avg) is for all years.

Year	N	Noatak		Shungnak		Selawik		Onion Portage	
		Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)	Distance (SD)	Date (SD)
2021	57	222.1 (58.2)	May 17 (11.5)	181.7 (84.0)	May 1 (15.3)	238.8 (84.9)	May 7 (13.2)	172.3 (72.6)	May 5 (13.5)
2020	37	203.9 (87.3)	May 18 (11.8)	177.4 (105.0)	April 29 (18.5)	190.5 (133.0)	May 5 (16.1)	152.0 (106.8)	May 5 (17.4)
2019	36	167.2 (65.7)	May 6 (18.1)	173.1 (63.4)	Apr 23 (15.6)	184.3 (89.1)	Apr 28 (16.4)	149.6 (57.4)	Apr 27 (14.9)
2018	53	189.0 (78.2)	May 21 (6.7)	149.8 (54.6)	May 4 (17.9)	149.9 (122.9)	May 8 (12.9)	131.0 (60.6)	May 7 (15.8)
2017	61	167.8 (97.2)	Apr 30 (17.6)	164.2 (103.3)	May 1 (16.5)	126.4 (145.1)	Apr 28 (16.5)	129.5 (107.6)	May 5 (15.2)
2016	46	103.6 (78.0)	May 5 (9.6)	180.7 (68.1)	May 1 (12.7)	82.6 (107.8)	Apr 29 (12.7)	136.9 (71.2)	May 2 (12.4)
2015	37	124.4 (69.6)	May 9 (13.7)	162.9 (71.7)	May 5 (13.6)	69.5 (104.0)	May 2 (13.4)	120.7 (77.5)	May 7 (14.0)
2014	35	117.1 (81.1)	May 5 (8.5)	143.1 (28.7)	Apr 27 (7.8)	53.2 (85.5)	Apr 26 (8.3)	102.6 (45.9)	Apr 29 (7.4)
2013	30	138.5 (52.4)	May 23 (14.1)	123.9 (57.5)	May 18 (17.2)	58.3 (68.9)	May 11 (20.0)	79.4 (57.0)	May 19 (17.5)
2012	29	178.2 (97.2)	May 26 (7.7)	142.1 (69.4)	May 22 (10.3)	117.0 (116.7)	May 22 (9.8)	117.0 (72.5)	May 23 (10.3)
2011	27	202.3 (40.7)	May 20 (9.8)	74.5 (46.7)	May 9 (12.0)	110.3 (97.4)	May 12 (7.78)	64.8 (60.3)	May 15 (8.2)
Avg	49	164.5 (69.0)	May 15 (12.0)	145.1 (74.9)	May 4 (14.5)	127.6 (100.1)	May 5 (13.2)	117.5 (75.1)	May 8 (13.1)

Western Arctic Herd Working Group

Several NPS employees, including ARCN's Caribou Vital Sign Monitoring Lead, attended and presented information at the December 2024 meeting, which was held in person in Anchorage, Alaska. The Caribou Vital Sign lead acted as the NPS representative on the Technical Committee and contributed to the "Caribou Trails" newsletter. NPS, through Western Arctic Parklands and GAAR, contributed financial and logistical support to the Western Arctic Caribou Herd Working Group and the Western Arctic Caribou Herd Technical Committee meeting.

New Products Completed Prior to the End of Reporting Period

Information on the WAH was disseminated in several mediums in the current monitoring year (see below). Most of the following products can be found on ARCN's Caribou Vital Sign webpage, which is located at <https://www.nps.gov/im/arcn/caribou.htm>: use the "Find all articles, report, and data here" link.

Technical Reports

Joly, K., and M.D. Cameron. 2024. Caribou vital sign annual report for the Arctic Network Inventory and Monitoring Program: September 2023–August 2024. Science Report NPS/SR—2024/213. National Park Service, Fort Collins, Colorado. <https://doi.org/10.36967/2306687>

Scientific Journal Articles

Fullman, T.F., K. Joly, D.D. Gustine, and M.D. Cameron. 2025. Behavioral responses of migratory caribou to semi-permeable roads in Arctic Alaska. *Scientific Reports* 15: 24712. DOI: 10.1038/s41598-025-10216-6.

Gunn, A., D. Russell, K. Joly, L. Manzo, J. Pellissey, J. Tulagak, and A.V. Whiting. 2024. Migratory tundra caribou in a warmer climate. *Arctic Report Card 2024*, pages 80–86. T.A. Moon, M.L. Druckenmiller, and R.L. Thoman, editors. National Oceanic and Atmospheric Administration. DOI: 10.25923/qn4a-td90.

Gurarie, E., C. Beaupré, O. Couriot, M.D. Cameron, W.F. Fagan, and K. Joly. 2024. Evidence for an adaptive, large-scale range shift in a long-distance terrestrial migrant. *Global Change Biology* 30 (11): e17589. DOI: 10.1111/gcb.17589.

Joly, K., M.D. Cameron, and R.G. White. 2025. Behavioral adaptation to seasonal resource scarcity by caribou (*Rangifer tarandus*) and its role in partial migration. *Journal of Mammalogy* 106 (1): 96–104. DOI: 10.1093/jmammal/gyae100.

Outreach

ARC�'s Caribou Vital Sign Monitoring Team provided caribou information at grade school educational programs as well as multiple media outlets, Caribou Trails, and public presentations. Presentations were also provided to the NPS' GAAR Subsistence Resource Commission, NANA, Teck/Red Dog environmental staff, Regional Advisory Councils, University of Alaska Fairbanks, and Memorial University (Newfoundland).

Discussion

GPS collars were deployed in the WAH for the first time in 2009. Since then, over 1.1 million relocations have been collected during the 16 years of vital sign monitoring so far. During this reporting period (September 2024–August 2025), 34 additional GPS collars were deployed, and 62 complete years' worth of data were collected. Due to the decreasing trend of caribou crossing the Kobuk River and late migration, net gunning was used again to deploy collars in late March and early April 2025. Our successful spring capture efforts highlight how effective helicopter deployments can be and we expect the need to continue employing this method as long as fall migration remains irregular and unpredictable for the WAH. Collaboration with the ADFG continues to be an integral part of achieving Vital Sign objectives and greatly improves the capacity of the program.

Adult female survival this monitoring year was 100%. Given that spring-caught collared caribou only have to survive 5 months to reach the end of the monitoring year, their survival rate should be high and needs to be high to facilitate population growth in the herd. As part of the Caribou Vital Sign's periodic review, comprehensive analyses of mortalities have been undertaken. The first (Gurarie et al. 2024) has been published. The results of this work are detailed below. The second analysis, which assessed the impacts of lichens and snow on survival, has been accepted for publication and should be published during the next monitoring year. The third analysis has been submitted for review. Adult survival has the largest impact on population trajectory for this herd and lower adult female survival has the potential to slow herd growth or even contribute to population declines. The 2023 ADFG photo-census revealed a decrease in the population to 152,000 caribou (Alex Hansen, *personal communication*, 2023). ADFG completed a census in 2025 which revealed the decline has continued and the population is now 121,000 caribou. Measures to improve cow survival, such as reducing cow harvest, currently hold the most promise to improve the herd's outlook. Notably, both the federal and state wildlife management boards voted to approve and enacted harvest regulation changes in 2025 intended to reduce overall harvest of the WAH, including limiting cow harvest to one per hunter. This was the most consequential reduction in harvest for this herd since the previous population low in the 1970s.

Range use by GPS-collared cows during this reporting period was skewed to the western portion of the herd's range. The herd primarily used the northern Nulato Hills, Selawik Hills, and Purcell Mountains during winter, and this made range use most similar to last year and 2012–2013. Other areas of high use during the 2024–2025 winter were along the south side of the Kobuk River near Shungnak and around Wainwright. Calving was focused on the traditional calving grounds and the insect relief area was similar to previous years as well. The core areas of late-summer use were near Cape Beaufort and along the northern flanks of the Brooks Range. Late-summer distribution was fairly similar to the insect relief period and notably constrained (2nd smallest area since monitoring began), with the herd remaining to the west and in the Brooks Range rather than dispersing on to the coastal plain. The average annual movement (2,833 km) decreased from last year, was below average, and was the lowest since 2020–2021.

WAH caribou continued to use NOAT more consistently, over the course of the year, than other park units. This is likely due to its strategic location in relation to spring and fall migration routes as well as the summer habitat it contains. Use of NOAT was slightly above average this monitoring year and the preserve was the most used park unit in every season. Partly, this was due to below average use of the other park units. Winter use of the parks was relatively low due to the heavy use of the Nulato and Selawik Hills and Purcell Mountains by the herd. Winter use of NOAT was slightly above average but, for the first time, use of it was greater than any other park units during winter. Use of GAAR was below average in all seasons, reflecting the more westerly distribution of the herd this monitoring year. Summertime use of NOAT (87%) was average but higher than other park units. For the 7th year in a row, no collared caribou used BELA this monitoring year. This represents a sharp change from previous use of BELA which was used every winter from 2010–2011 through 2017–2018. Except for 1 caribou that crossed the southern Kotzebue Sound sea ice and wintered east of Deering, no collared caribou entered the Seward Peninsula this monitoring year. This is a remarkable turnaround from 9–10 years ago, when the Seward Peninsula represented a major winter area for the herd and 72–75% of collared caribou wintered in BELA.

No collared caribou came within the vicinity of the Red Dog Mine and the Delong Mountain Transportation System (DMTS) during the fall migration of this monitoring year. However, 4 collared caribou did on their northward, spring migration. Three of the 4 traced (paralleled) the road before crossing it and continuing on to the calving grounds. The fourth collared caribou traced the length of the road before getting around the mine site, turning north, and continuing on to the calving grounds (Figure 12). An analysis of the movements of collared caribou near roads in the region was published this monitoring year (Fullman et al. 2025; see below for details).

This monitoring year was characterized by a small decrease from last year in the percentage of caribou that migrated southward in the fall across the Noatak and Kobuk Rivers, however, the percentages were still above average. The percentage crossing the Selawik River increased again this year, making it the highest percentage of caribou to do so since 2015. While they did not travel as far south as they did in the early years of monitoring, they traveled and overwintered further south than most recent years and were found into the central portion of the Nulato Hills. Caribou remained on their summer ranges in 2024 longer than in most years and this led to the 2nd latest average crossing of the Noatak River (October 12). Average crossing of the Noatak River was only later in 2018 (October 13). We continue to see the highest variability in crossing dates for this northern-most river. Further south, the average crossing date for the Kobuk River (October 29) and Selawik River (November 5) were 10–12 days later than the long-term average. The duration of the fall 2024 migration was 23 days, which is nearly half the duration of the previous year and shorter than the long-term average. Spring 2025 migrations were 1–7 days later than the long-term averages and lasted 17 days, which is slightly above the average. The westward distribution of the herd in the fall of 2024 resulted in it being closer to Selawik and Noatak than on average, while, in spring, the herd was within long-term average proximity to all three indicator communities (Noatak, Selawik, and Shungnak).

The root causes of changing migratory and range-use patterns are unknown. Climate change is leading to snow and cold temperatures occurring later in fall, which may contribute to the delayed migration patterns we have been documenting (Cameron et al. 2021). Another potential factor for reduced migrations is the smaller size of the herd (Joly et al. 2021). After more than 20 years of population decline, the herd is about a quarter of its peak size (490,000 individuals, in 2003). Smaller populations use less space than larger ones, thus smaller populations tend to have shorter migrations than larger ones. Development and roads can also impact caribou distribution and movements (Fullman et al. 2025; Wilson et al. 2016).

Delayed migration patterns have important implications for subsistence users of caribou: later migrations can coincide with rapidly decreasing temperatures and pan ice running in the river, which can prevent hunting and make travel difficult and unsafe (Hagen 2025). Moreover, later arrival of caribou in fall can mean they arrive in some hunting areas during the rut, when the meat of males is unpalatable. This can increase harvest pressure on females and has the potential to put additional downward pressure on the herd.

Four journal articles on caribou ecology were published. The first article assessed the population status of North American migratory tundra caribou herds (Gunn et al. 2024). Overall, herds have declined by roughly 65% over the past 20–30 years. Smaller coastal herds appear to be faring better than the larger herds. The rest of the papers focused specifically on the WAH. The second paper was a long-term analysis of patterns of survival of collared, adult female caribou (Gurarie et al. 2024). Survival rates were relatively high from the start of the project (fall 2009) until about 2016. During this time, the vast majority of caribou migrated south of the Kobuk River, with many reaching the Seward Peninsula. After 2016, survival rates dropped and the caribou responded by altering their migratory patterns. Fewer caribou migrated and this helped improved their survival in subsequent years, but it was still lower than before 2016. Interestingly, fewer caribou migrated the year after survival was poor on the winter ground, which suggests the herd collectively remembered conditions of the prior year and this influenced where they went the next year. The third paper compared the wintertime movements of those caribou that did and did not migrate across the Kobuk River (Joly et al. 2025). Even during the non-migratory winter months, the caribou that migrated south of the Kobuk moved about twice as much as those caribou that stayed north of the Brooks Range. Migrants were rewarded with finding more than 2.5 times more forage (lichen) cover than those that stayed north, potentially offsetting the energetic cost of the long migration. The last article analyzed movements near 5 different roads within the range of the WAH and classified their movement as altered or unaltered (Fullman et al. 2025). While their range is largely undeveloped and has few roads, 63% of the collared caribou came within 20 km of the roads that were analyzed. About 61% of these displayed at least one altered movement behavior near a road. Looking at each road encounter individually, about 27% of the encounters resulted in altered behavior. Caribou with altered behavior stayed near roads, on average, 9 days longer than caribou with unaltered behavior. Most altered movements were associated with the Red Dog Road and took place during the fall. However, the duration of altered movements lasted the longest during winter. A large number of products and presentations, including these scientific papers, have been developed in conjunction with monitoring this Vital Sign, most of which are available on-line at <https://www.nps.gov/im/arcn/caribou.htm>.

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