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MEMORANDUM

TO: Todd Rinaldi
Regional Management Coordinator

DATE: 13 December 2024

SUBJECT: 2024 Mulchatna Caribou Herd Photo Survey

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Introduction

The Mulchatna Caribou Herd (MCH) is named for its traditional calving ground in the upper Mulchatna River region in Game Management Unit (Unit) 17B. Historical records suggest that the herd reached a peak in the 1860s followed by a 60-year decline (Van Lanen et al. 2018). During the latter half of the 20 century the MCH herd grew sizably again, expanding its range into units 9C and 18 in the late 1980s to mid-1990s (Perry 2009 Woolington 2009, Van Lanen et al. 2018, Crowley 2019). The MCH population peaked and declined substantially again in the late 1990s.

Throughout most of the year, caribou within the previous MCH range are spread out in several groups across portions of Units 9, 17, 18, and 19 (Figure 1). However, between June and July, the MCH and outlying groups aggregate in post-calving groups allowing for observation of a large percentage of the animals to obtain a population estimate. The degree to which the various groups aggregate is variable across the historic MCH range. The core segments of the MCH referred to as east MCH (EMCH) and west MCH (WMCH) aggregate in two geographically separate areas. The EMCH range is comprised of rolling hills and tundra habitat with limited residual snow patches where caribou aggregate in a core area of the mid-Mulchatna River country (i.e., Mosquito & Koktuli rivers, Old Man Creek). Whereas the WMCH (i.e., west of the Wood-Tikchik Lakes) aggregates in steep mountainous terrain at greater elevation on persistent snowfields. A smaller group referenced as the central group overlaps with EMCH winter range, but their calving grounds are at higher elevations in the Tikchik mountains between Nuyakuk and Kulik lakes closer to the WMCH calving grounds. Due to proximity of central and west calving grounds, and Department Intensive Management efforts, the central MCH counts have been combined with WMCH counts since 2022. Within the MCH historic range, department staff are monitoring two additional outlying groups. This includes caribou on Cape Newenham and north in the Goodnews Drainage of Unit 18 referred to as the Cape Caribou Group (Figure 1) and are monitored collaboratively

with Togiak National Wildlife Refuge (TNWR-USFWS). The second group is located around Battle, Kukaklek, and Nonvianuk lakes in Unit 9C and 9B and is referred to as the Kukaklek caribou group (Figure 1). Prior to the MCH's late 20th century expansion, the Kukaklek group occupied this same portion of the Northern Alaska Peninsula's (NAP) historic range and was managed as part of the NAP herd. This group resides most of the year on federal land and will continue to be managed as a portion of the NAP. Those populations estimates will continue to be excluded in the estimates for the MCH but are reported here.

Annual population estimates of the MCH are important to monitor for growth towards population objectives. Since 2019 the combined EMCH and WMCH population estimate has been relatively stable at a low-level ranging between 12,500–13,450 animals; below the population objective of 30,000–80,000 caribou. This year we continued following the Rivest photo survey method to estimate the MCH population in Units 9, 17, 18, and 19.

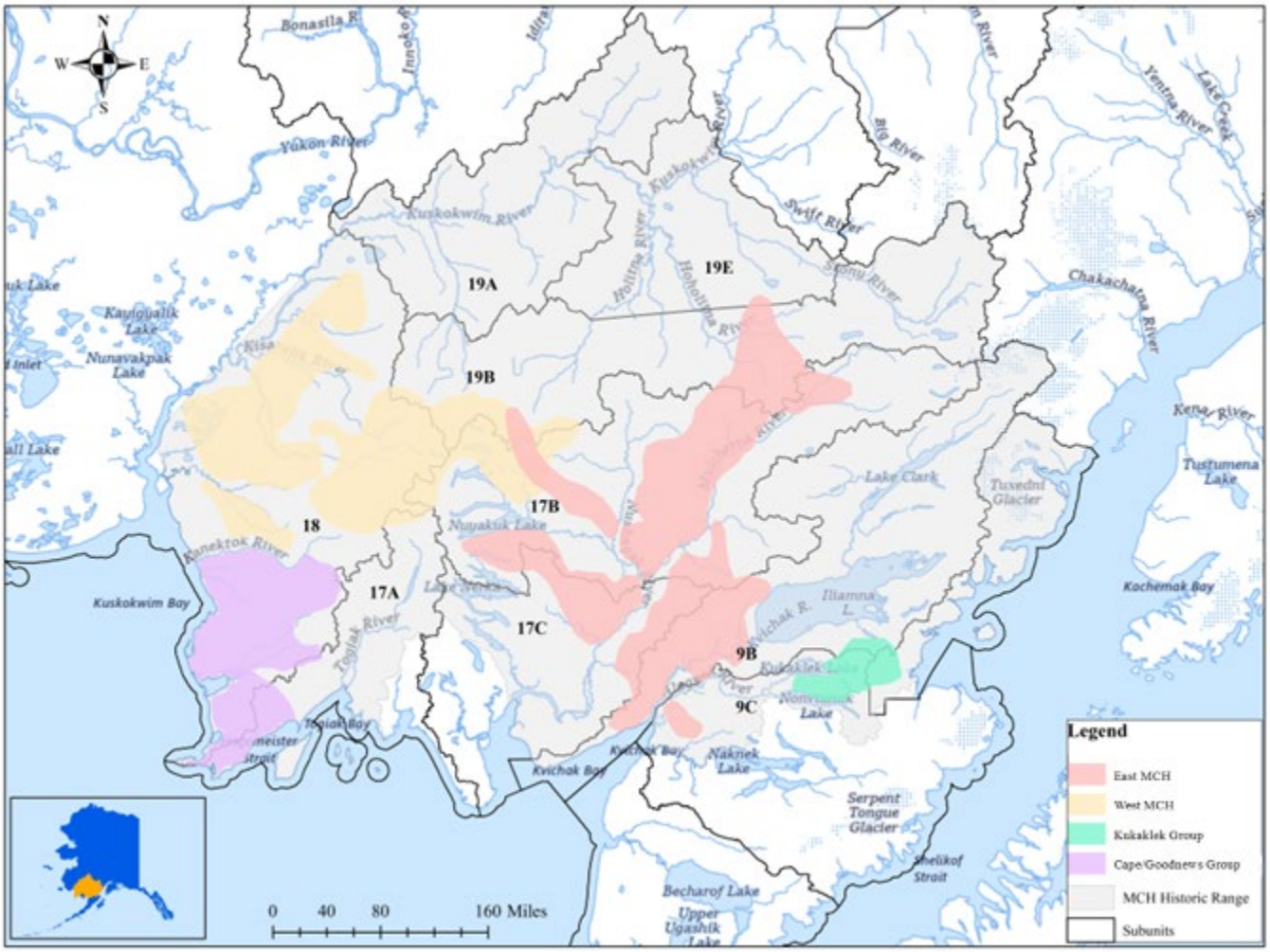

Figure 1. 2021 Annual ranges of the Mulchatna caribou herd and outlying groups in portions of Game Management Units 9, 17, 18, and 19.

Methods

Pre-Survey Flights

We initiated pre-survey flights on 21 June. The pre-survey flights help to determine the status and availability of radio-collared caribou prior to the population survey, with our objectives being to:

- locate and determine the status (e.g., alive, dead, or unheard for several months) of each radio collared caribou,
- monitor insect activity,
- monitor caribou aggregation behavior, and
- determine when the proportion of collars to groups would be optimized for a population survey.

Population Survey

We conducted a photo survey to obtain a population estimate for the MCH following the Rivest method protocol, which is best utilized during strong post calving aggregations. Once there is sufficient aggregation, caribou groups are located through radiotelemetry to be photographed. This method may underestimate the herd size because groups without collared animals are likely to be missed and groups with radio collared animals that are not detected may also contribute to this bias (Rivest et al. 1998). The precision of the Rivest estimate is influenced by the aggregation of caribou, randomness of collared animal distribution within groups, and number of radio collared animals found (Rivest et al. 1998).

In-Flight Photo Survey Protocol

1. Locate caribou groups from GPS collar locations or unique VHF signals of all active collars in the MCH.
2. Take multiple photos of each group with a DSLR camera with a telephoto lens. (If a group is too large for an oblique angle photograph from a handheld DSLR camera, or if terrain features prevent all caribou within the same group from being counted amongst one or two photos, the ADFG photo plane equipped with belly mounted cameras will be radioed into the group for a vertical photograph).
3. Scan through all available frequencies at least twice while circling over groups and record the frequencies found in those groups.
4. Record waypoints for all observed caribou groups (with or without radio collars) and assign each waypoint a group number.
5. Broadcast to other survey aircraft the frequencies that were located, so teams can focus their efforts on finding undetected animals.
6. Complete steps 2–5 if a random group is found.

Caribou in photos taken during the survey are enumerated in ArcMap 10.8.1 and/or QGIS desktop 3.6.1. Photo series taken with the DeHavilland Beaver or Cessna 206-photo plane due to size or topography are stitched together by Nate Pamperin (ADF&G Fairbanks) using ArcMap 10.8.1. Once all photos are

enumerated, groups with their respective counts and number of collars present are sent to the Region IV biometrician for analysis in R Statistical Software.
The homogeneity model is used, which assumes each group has the same probability of detection and does not depend on group size (Rivest et al 1998). Photo survey data for EMCH and WMCH are analyzed separately and have been combined since 2019 because EMCH and WMCH have independent calving and seasonal ranges. Based on the movements of radio-collared animals and telemetry flights, mixing between EMCH and WMCH is low, but occurs annually, and there is range overlap within the northern half of Wood-Tikchik State Park and surrounding areas in western Unit 17B (Figure 1).

Results

Pre-Survey Flights
Pre-survey flights were conducted on 21 June for EMCH and WMCH, which found caribou scattered over a large area and no new mortalities detected. A second pre-survey flight was completed on 2 July which determined the caribou groups were ready to be surveyed the next day on 3 July. After pre-survey flights, we determined 5 collars to be censored in EMCH, 1 in the central group, and 6 in WMCH due to not meeting model assumptions of being equally detectable. This resulted in 50 collars available for detection in EMCH, 8 in the central group, and 65 in WMCH for the photo survey (Table 1).

A presurvey flight was conducted on 22 June for the Kukaklek segment in Unit 9, which found caribou scattered in many small groups with one mortality found, leaving 5 active collars, and no collars were censored for the Kukaklek segment after removal of the mortality. Wildfire smoke prevented a complete search in the Kukaklek range during the presurvey. No pre-surveys were flown for the Cape group.

Population Survey
On 3 July, 2 crews surveyed WMCH and EMCH. An additional crew in the DeHavilland Beaver photo-plane photographed one EMCH group. Overall, we located 118 of 123 available collars (96%) during the survey between EMCH, central, and WMCH. The next good weather window, on 18 and 19 July the Cape and Kukaklek segments were flown, respectively, for a minimum count by the Department in which 14 of 18 collars (77%) were detected on the Cape, and 4 out of 5 collars (80%) were detected in the Kukaklek group. No new mortalities were detected during the survey for any segment.

Caribou aggregations varied from 1 to >6,000 animals (Figure 2). The WMCH caribou were more dispersed across the landscape than the EMCH animals, inhabiting mountainous terrain split between Unit 17A and Unit 18 ranging from Pegati Lake in the southernmost groups to the northernmost group near the Kipchuk River in Unit 19B, west to the great ridge in Unit 18, with the bulk of the WMCH centered around the Sawtooth Mountains. The WMCH were photographed in 23 groups. The EMCH was much more aggregated in upper Old Man creek along the Mulchatna River, and McGreary creek, a tributary of the upper Nushagak River in Unit 17B (Figure 2) and photographed in 7 groups. Central MCH animals were located between Nuyakuk and Kulik lakes in Unit 17B and photographed in 7 groups (Figure 2). The Cape segment had 20 groups in Unit 18 as far south as Cape Newenham, north to Goodnews Bay and to

the east where the Goodnews River comes to the 17A border, south of the Kanektok river (Figure 2). Kukaklek caribou were in 15 groups from Battle to Gibraltar Lake in Units 9B and 9C (Figure 2).

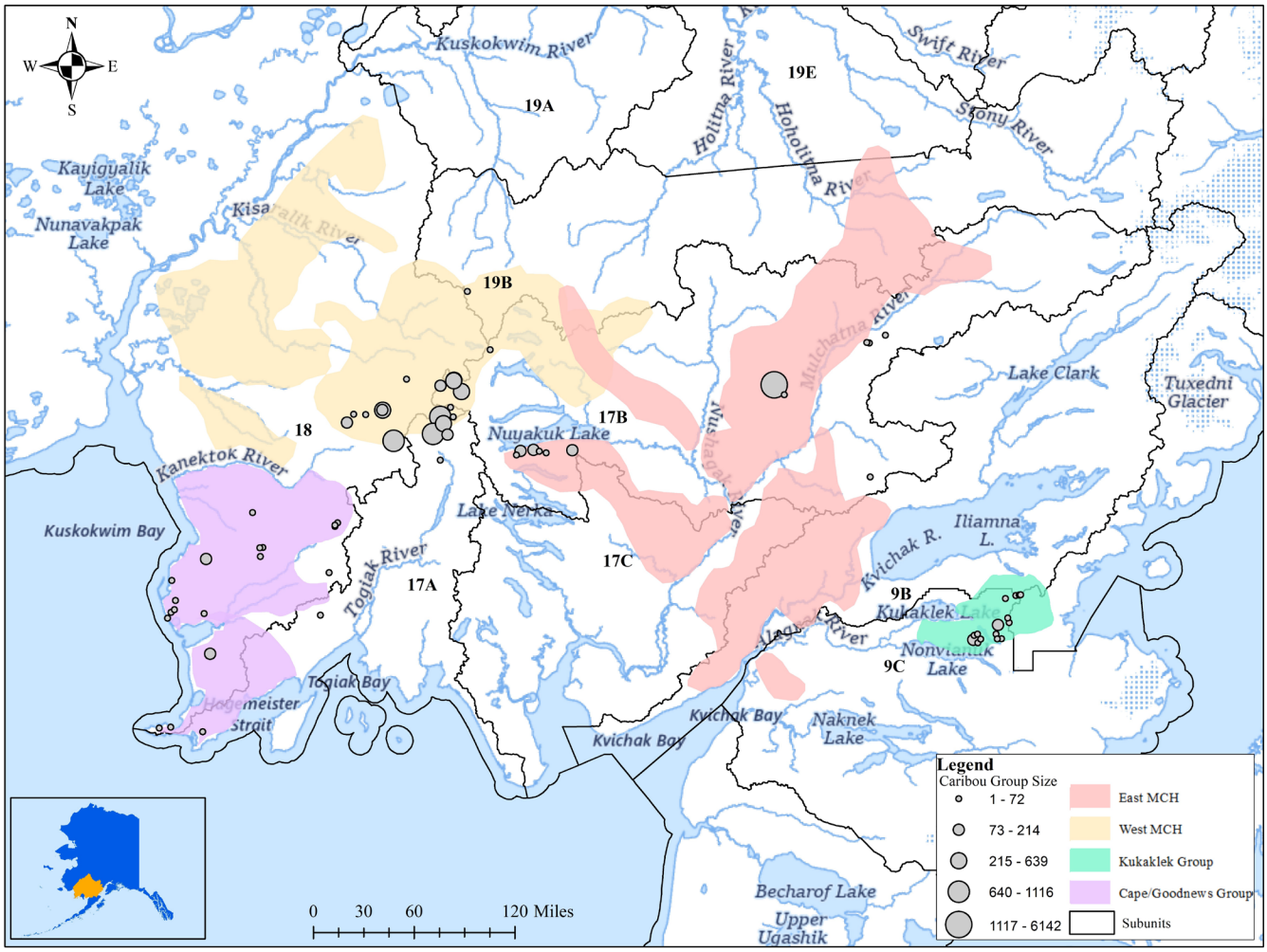

Figure 2. Mulchatna caribou group locations across the range of Mulchatna Caribou Herd 2024 photo survey in context with their calendar year 2021 annual range.

We counted 6,811 caribou in the East, and 6,005 caribou from the WMCH and central combined for a total minimum count of 12,816 caribou in the core segments of MCH (Table 1). A Rivest estimate (Rivest et al 1998) was run for EMCH and central/WMCH. The other segments did not aggregate strongly enough or have enough collars, or both, for a Rivest estimate to be appropriate and are reported as minimum counts (Table 1). The combined 2024 core MCH Rivest population estimate is 14,846 ±619 (Figure 3, Table 1). The estimated populations in the EMCH and central/WMCH are 7,393 ±320 and 7,453 ±530, respectively (Figure 3, Table 1). The Cape segment yielded a minimum count of 466, and Kukaklek, 486 caribou (Table 1).

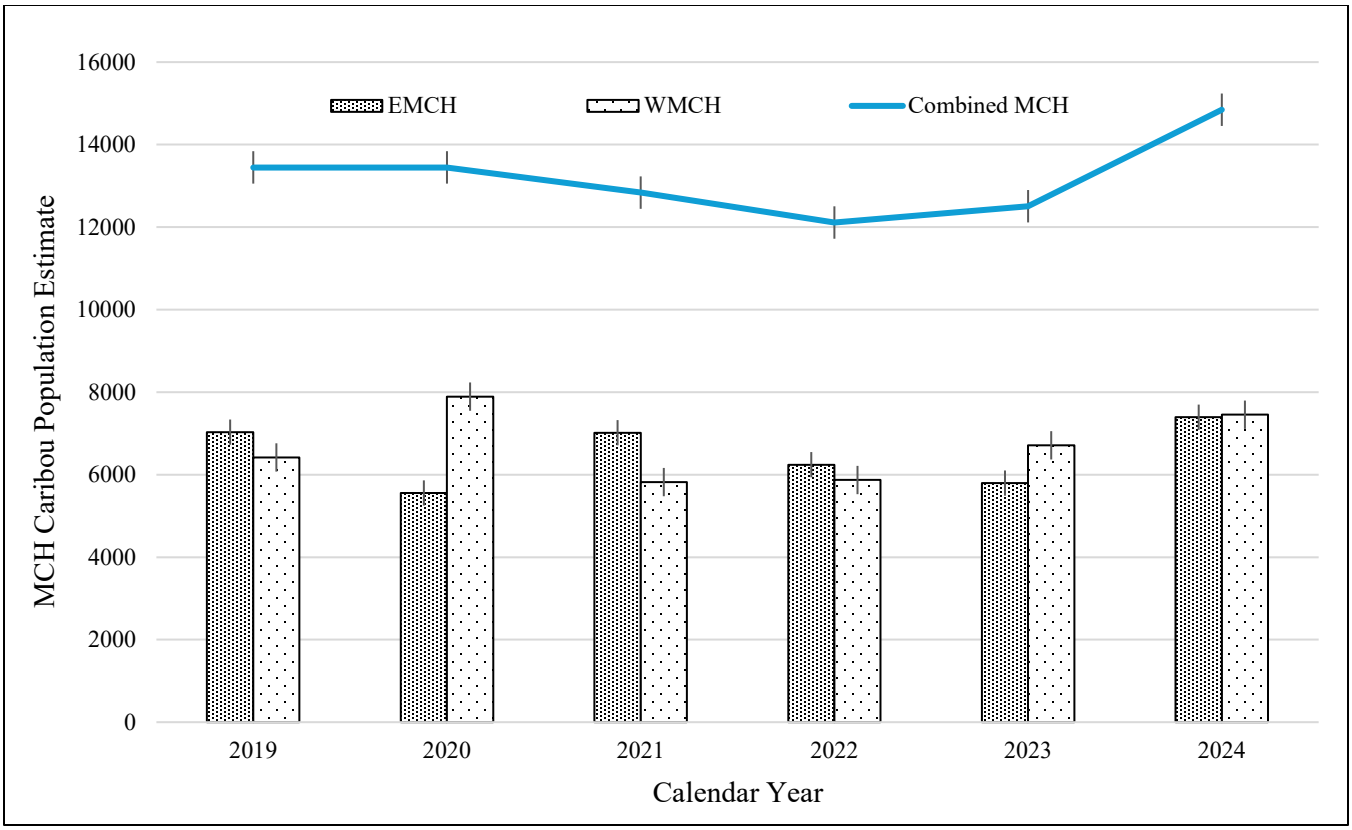

Figure 3. Core Mulchatna Caribou herd population Rivest estimate 2019–2024. Black bars represent the standard error.

Table 1. Population survey data and estimate(s) for the Mulchatna Caribou Herd, July 2024.

Segment	Survey Date	Active Collars	Detected Collars	Minimum Count	Population Estimate[a]	Method
East MCH	7/3/2024	50	50	6,811	7,393 ±320	Rivest
West & Central MCH	7/3/2024	73	68	6,005	7,453 ±530	Rivest
Combined MCH	7/3/2024	123	118	12,816	14,846 ±619	Rivest
Kukaklek[b]	7/19/2024	5	4	486	-	Minimum Count
Cape/Goodnews	7/18/2024	18	14	466	-	Minimum Count

[a] - denotes no data available.
[b] Segment of Northern Alaska Peninsula caribou herd.

The total cost for the survey was $40,602.50 (for further details, see appendix A).

Discussion and Management Implications

We surveyed 5 segments within the historic MCH range in Southwest Alaska for the 2024 population estimate. This included the core groups of EMCH, central, and WMCH in units 17A, 17B, 18, and 19B. Two outlying groups currently managed with the MCH, the Cape group in Unit 18, and the Kukaklek group in Units 9B and 9C were surveyed for a minimum count. The core MCH groups see occasional mixing throughout the year, however, we believe it unlikely outlying groups will intermix with core MCH groups unless the population becomes much larger than its current state or shifts spatial distribution. For example, the current Kukaklek segment's annual range was historically referred to as Northern Alaska Peninsula Caribou Herd (NAP) wintering grounds until the late 1980s and early 1990s, when the Kvichak River watershed was also used by up to 50,000 Mulchatna caribou (Woolington 2009). The two herds always returned to their traditional calving and summer ranges and remained distinct (Hinkes et al. 2005, Butler 2009, Woolington 2009). Similarly, the MCH herd did not range into the Kilbuck mountains and other areas of Unit 18 in large numbers until 1994 (Perry 2009) when the MCH herd was ~180,000 animals. During that time, the Kilbuck herd was considered to be integrated into the MCH (Perry 2009). MCH's population plummeted shortly after 1996.

The minimum count for the core MCH groups increased by 2,672 caribou (~26%) from last year's survey effort, primarily driven by a substantial increase in the minimum count in EMCH. Both core MCH groups had a higher minimum count. EMCH minimum count increased by 29% counting a minimum of 6,811 compared to last year's 5,294. The central/WMCH had an increase of ~24% from 4,850 in 2023 to 6,005 in 2024. Overall, the core MCH population saw a 19% increase to the 2024 Rivest population estimate of 14,846 caribou. This year's central/WMCH Rivest estimate had a slight increase of 11%, while EMCH had a 28% increase in the Rivest estimate, likely driven by the strong aggregation in EMCH. Between 2010–2020 EMCH and WMCH had an average of 82% annual survival for females >48 months of age (ADFG unpublished data). During the same timeframe, MCH females 11–47 months of age, in the WMCH had a higher average annual survival of 92% while EMCH had a survival rate of 88% (ADFG unpublished data). Additionally, WMCH had higher percent calf survival between 2011–2021 than EMCH with 72% and 59% survival, respectively (ADFG unpublished data). The EMCH higher count could be attributed to better aggregation as this year their largest group was >6,000 animals and were aggregated in 6 groups, compared to last year when the EMCH was also aggregated in 6 groups, but the largest group size was half that of this year's largest. Survey pilots commented that this year was some of the best aggregations they have seen for WMCH.

The Cape group had a lower minimum count this year and the Kukaklek caribou (NAP) had a higher minimum count. However, neither the Cape nor Kukaklek groups aggregate strongly or have enough collared individuals for a Rivest estimate. It may be appropriate to discontinue summer minimum counts for these groups until the core MCH groups grow or shift seasonal ranges where intermixing may become more likely. Additionally, the minimum counts of the Cape and Kukaklek groups are not combined with the core MCH numbers when we report the MCH population estimate, and both outlying segments have received higher counts during winter conditions. Thus, it is hard to discern any trend information from summer counts. Previous winter counts for the Kukaklek group were higher than any summer survey we

have determined that it may be more appropriate to survey some caribou groups in the winter. This group will be reported in NAP survey and management reports moving forward.

It is important to critically assess what the Department considers MCH given their historic and current population trends and range use for future management decisions. A caribou population has been defined as a group of herds or subpopulations that do not exchange animals with adjacent populations (Skoog 1968). If a herd experiences even minor dispersion of individuals (<10%) with other herds over the long term, the herds could then be called one population (Miller 1982). Recognition of caribou herds in Alaska since Skoog (1968) has been based on the identification of discrete calving grounds. Given the aforementioned guidelines on herd identification, although the core segments of the MCH have distinct calving grounds, East, central, and West MCH segments have annual mixing and range overlap and should be considered the same population. Through two years of monitoring collars in the Cape and Kukaklek caribou have not demonstrated dispersal into core MCH and a decade of collars on core MCH have not recorded dispersal from the core groups to outlying groups. Additionally, Cape and Iliamna groups have distinct calving and annual ranges that do not overlap with the core MCH groups. Therefore, it warrants consideration to manage them as separate populations now that the MCH has retracted. The MCH reached Iliamna Lake and Goodnews Bay when their population was at approximately 50,000 and 180,000 caribou, respectively, and it is unknown when, or if the MCH population size will reach those numbers again. Currently, these groups are all managed under one registration permit (RC503) through State regulations. Future management may have to address the current lack of intermixing of these outlying groups in Unit 18.

The first aerial surveys for MCH were conducted in 1949 in which the population was estimated to be 1,000 animals. For approximately 10 years between 1965–1974 the population is thought to have remained between 6,000–13,000 animals (Van Lanen et al. 2018). After the 1996 decline the MCH the population held relatively stable between 20,000–30,000 between 2008–2016 and has since been relatively stable at a low-level between 2018–2024 ranging between 12,500–14,800 animals. It may be appropriate to consider revising the current population objective of 30,000–80,000 given historic and recent population trends.

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Appendix A. Itemized costs for 2024 MCH population survey.

Aircraft/Other	Units	Price	Total	Comments
Cessna 185	Wet/12.9 hrs.	$600/hr.	$7,740.00	Presurvey EMCH & WMCH
	Wet/12.5 hrs.	$600/hr.	$7,500.00	EMCH & WMCH photo survey
	Dry/9.1 hrs.	$500/hr.	$4,550.00	EMCH & WMCH photo survey
Maule	Wet/7.9 hrs.	$500/hr.	$3,950.00	EMCH & WMCH photo survey
	Dry/8.3 hrs.	$425/hr.	$3,527.50	EMCH & WMCH photo survey
	Dry/11.7 hrs.	$425/hr.	$4,547.50	Cape and Kukaklek Survey
Piper	Wet/4.1 hrs.	$430/hr.	$1,763.00	Kukaklek presurvey
Avgas	485 gals	11.50/gal	$5,577.50	
FDI Software	34.5 hrs.	$35/hr.	$1,207.00	Direct flight to sat-collared animals. GPX files for all pilots. Geo-tagged imagery.
Per diem	5 days	$45-$60/day	$240.00	4 partial days at $45, 1 full day at $60
Total MCH Photo Survey Cost			$40,602.50	

Appendix B. Mulchatna Caribou Herd photosurvey data by geographic survey group, July 2024.

WMCH Survey Group			
Group No.	**No. Collars**	**Group Size**	**Location**
1	9	1116	W
2	9	726	W
3	7	994	W
4	5	291	W
5	5	214	W
6	4	334	W
7	4	548	W
8	3	283	W
9	3	184	W
10	2	358	W
11	2	35	W
12	2	141	W
13	1	72	W
14	1	1	W
15	1	7	W
16	1	21	W
17	1	179	W
18	1	2	W
19	1	2	W
20	1	2	W
21	0	12	W
22	0	35	W
23	0	24	W

Central MCH Survey Group			
Group No.	**No. Collars**	**Group Size**	**Location**
1	3	88	C
2	1	173	C
3	1	21	C
4	0	91	C
5	0	17	C
6	0	12	C
7	0	22	C

EMCH Survey Group			
Group No.	**No. Collars**	**Group Size**	**Location**
1	43	6142	E
3	3	639	E
2	1	1	E
4	1	17	E
5	1	2	E
6	1	8	E
7	0	2	E