



MEMORANDUM

TO: Tim Peltier, Regional Supervisor

FROM: Todd Rinaldi, Regional Management Coordinator

DATE: October 2024

SUBJECT: 2024 Spring MCH Intensive Management Activities

Introduction

In 2022, the Board of Game directed the Division of Wildlife Conservation to conduct predation control activities to benefit the Mulchatna Caribou Herd (MCH) as a component of Intensive Management (IM) of Caribou (*Rangifer tarandus*) in Game Management Units (Unit) 9B, 17, 18, 19A, and 19B. The predator control objective is to eliminate all wolves and bears from the western segment of the Mulchatna Caribou Herd (MCH) calving area and does not specify numerical reduction goals. The calving area consists of a small portion of the affected Units, which have robust predator populations that ensures the removals will be sustainable at the Unit level. Department staff conducted a second year of lethal predator removal of bears and wolves, the primary predators of MCH neonate calves within Units 17B, 18, and 19B (ADFG 2023). The 2024 removal occurred over 2 periods with a broadened search area during the first period of 11–14 April (5,955 km²; Figure 1) and the principal period of 10 May–5 June 2024 (853 km²; Figure 1). In addition, radio collars were put on neonate calves to assess calf survival.

The western MCH segment (WMCH) has historically initiated an eastbound spring migration around 10 May. Between 2013 and 2022, WMCH migrated from wintering grounds in the eastern portion of Unit 18 near the Eek Mountains to calving grounds in the Tikchik Basin in western Unit 17B. A major shift in migration occurred in 2023 when WMCH calved in the upper Kisaralik River drainage in eastern Unit 18. This year, WMCH initiated their eastward migration in early May and calved again in the Kisaralik River drainage arriving on state land around 8 May.

The 2 periods of predator control were scheduled for optimal detection of target predators or to coincide with historic peak caribou calving dates. The April period focused on wolves while adequate tracking conditions existed to reduce adult mortality from wolves during migration from WMCH winter range to the likely calving grounds as well as to reduce predation on newborn

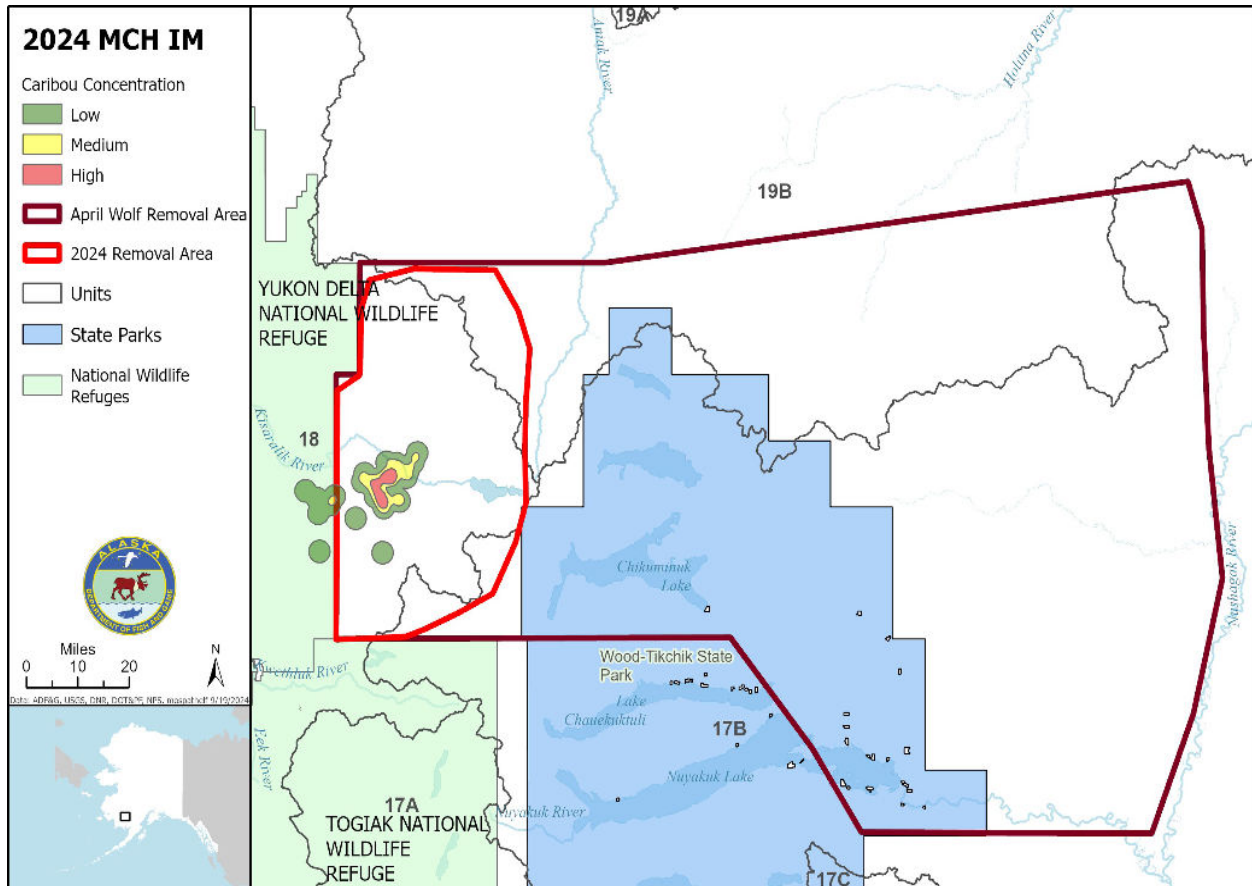


Figure 1. Location of predator removal program to benefit the Mulchatna caribou herd (MCH) showing the west calving area, and distribution of 35 GPS radiomarked MCH adult females, spring 2024.

calves. The April search area encompassed both the current and recent calving grounds. The search area during the May period encompassed WMCH calving grounds and focused on lethally removing all bears to increase calf survival when calves are most vulnerable. The May period was to precede peak parturition which historically has been 17–18 May (ADF&G unpublished data) and continue for 2 weeks thereafter. The WMCH predator control efforts are intended to increase calf survival to support population growth by reducing predation of newborn calves.

Methods

April

Each day three aircraft (R44 helicopter, C185, and PA-18 Super Cub fixed-wings) searched for wolf tracks, kills, or wolves in a 9,582 km² area. The search area was expanded from the primary effort of 2023 due to large home ranges, the great distance wolves may travel in search of food, and the potential to encounter dispersing wolves. Historic pack locations and den sites were used to estimate high-use areas. Wolves were primarily located by fixed-wing aircraft and locations were relayed to the helicopter, while another fixed-wing followed additional individuals from a

pack. Two department staff were on board the helicopter. Upon completion of wolf removal, all wolves were fitted with CITES¹ locking tags and brought to a single location where they remained until they could be transferred for further processing.

May–June

Each day fixed-wing aircraft (C185 and Maule M7) departed ahead of the helicopter to search for predators and neonatal calves to capture. Calves were opportunistically captured to reduce bias on size, perceived strength, and/or sex. Pursuit and handling times <20 seconds. Scent control was addressed by wearing Tyvek suits and fresh rubber gloves, and no bears were handled or transported in the helicopter prior to handling calves that day. Collars were stored in gallon Zip-loc bags with aromatic vegetation from the area. Calves were captured by hand, sexed, and fitted with a radio collar. Calves were monitored daily by a fixed-wing pilot for mortality signals. Within the helicopter, one person was designated for calf capture, and the other for predator removal. In situations where predators were detected prior to calf capture operations, the predator was removed, and one department staff member began processing the bear while the second department employee proceeded to capture calves. When target predators were located, calf captures ceased, and the helicopter was called in to the location to remove bears or wolves. After the target individual was killed, the field crew salvaged the hide and removed the skull for sealing. Locking seals (CITES) were attached to bear hides and skulls in the field and identification number, species, sex, age, and location (including unit) were recorded. When possible, a tooth from independent bears was collected for aging, and Nobuto blood strips were collected for *Brucella* exposure monitoring. No bear meat was salvaged due to lack of interest from surrounding communities. Wolf hides were not salvaged in May or June due to poor hide quality from wolves rubbing their winter coats and one instance of lice infestation. If staff opportunistically encountered a calf carcass that was not apparently the result of predation, it was collected whole, bagged, and either set or buried in snow to remain cool until it could be transferred to a fixed-wing aircraft. Details recorded for each calf carcass included age and sex, location, date of retrieval, estimated date of death, and physical condition.

Multiple, small tundra ridges provided areas for fixed-wing aircraft to land, refuel, and load bear hides, skulls, and calf carcasses. Fuel drums were flown to the cache site with a small battery, portable pump, and spill-containment bib. Additional fuel bags were left at the site to aid with fuel loading and unloading. One primary site was used, but at least 2 other landing strips were available which increased flexibility and safety due to variable winds and runway direction.

¹ Convention on International Trade in Endangered Species (CITES)

Calf captures and radio-marking to be dispersed around peak parturition (i.e., 50–60% of the collars deployed at peak parturition). Minimal new calf detections and low mortality detections (presumably from a high removal rate of predators) limited turnover of calf collars and did not allow for large-scale calf capture during 21–30 May. Weekly telemetry flights will be continued to monitor survival to 2 months. After calves reach 2 months of age, monthly telemetry flights will be conducted through August.

Hides were shipped as often as possible to Anchorage and received by ADF&G Region IV staff from Palmer. Hides were distributed to taxidermists on the road system for fleshing and salting after quotes were received prior to the start date; these hides are stored in Region IV. Some wolf and bear skulls were retained for educational purposes, otherwise they were destroyed.

Permits, including special exemptions and commercial use for helicopter landings are required within Wood-Tikchik State Park (Park) and were received prior to any control activities taking place, although no removal activities occurred in the Park this year.

Results

A total of 95 predators (81 brown bears and 14 wolves) were removed between April and June 2024. Removal activities occurred on state lands in Units 17B, 18, and 19B.

April

Between 11 and 14 April, 11 wolves (6 female, 5 male) from 2 packs were removed from the southwestern portion of Unit 19B (Figure 1) across four days of effort in 2 river drainages. One pack of 5 was detected in the headwaters of the Aniak river (2 females, 3 males), a primary migratory route for WMCH. A pack of 6 wolves was also detected in the upper Kogrukluks watershed (4 females, 2 males). A subsequent conversation with a local guide who was guiding bear hunters in the Kogrukluks mentioned seeing 2 wolves after the April efforts. Two sets of tracks were lost in hardpack snow on the last day of this removal effort towards the King Salmon River (Unit 17B). The April period concluded early due to poor tracking conditions after 15 April.

May–June

Removal

Most of the WMCH was in the Crooked Creek drainage, at the border of state and federal lands for a week prior to the May start date but most caribou had moved to state managed lands by 8 May within the Kisaralik River drainage. The WMCH remained in Unit 18 for the duration of the program, but the search area did include small portions of the western sections of Units 17B and 19B.

Eighty-one bears (47 female, 34 males; Figure 2) and three wolves were removed (1 female, 2 males). No black bears were observed on the calving grounds during the 2024 operations. The

skull and hide from one brown bear were not recovered due to precipitous technical terrain and diminishing weather conditions. Fifty-six brown bear hides were salvaged of 63 total adults; 7 bears were not salvaged due to poor salvage value. Age results from tooth samples, and *Brucella* exposure detection in bears from Nobuto strips are pending at the time of this memo. None of the removed bears or wolves were marked (e.g., radio collar, lip tattoo, ear tag) or showed any evidence of being handled previously.

Control efforts occurred on 21 of the 27 scheduled days; 6 of those 21 days were shortened due to low ceilings, poor visibility, high winds, or precipitation. Poor weather precluded all efforts for the additional 6 days that were scheduled but not flown.

The eastern portion of Unit 18 has little to no canopy cover, aiding in predator detections. Mountainous terrain which comprises the bulk of the 2024 calving grounds retained snow later into the spring likely increasing detections with the ability to see fresh predator tracks. However, tracking conditions deteriorated earlier than in 2023.

On average 4 brown bears, independent of age-class, were removed per day (Figure 2); the daily average of independent bears ($n = 63$) removed was 3. The age-class distribution of brown bears consisted of 63 adults, 2 two-year-old cubs (2-YO), 11 one-year-old cubs (1-YO), and 5 cubs-of-year (COY; Figure 3). Individual bear ages will be available after cementum age tooth analysis is complete (Matson's Laboratory, Three Forks, MT). Hide removal averaged roughly one-half hour per bear using 2 staff for a total of 65 hours of staff time spent skinning.

During the 2023 IM effort there was a declining catch-per-day that was offset by 2 later days of high removals prior to the project end date, this declining catch-per-day was experienced again in 2024 when 2 days of high removals occurred just before the project ceased for the year. While effort was not consistent between days (e.g., calf collaring on some of the days and inconsistent weather constraints), this pattern suggests that either more bears immigrated to the search area, or local bears had later den emergence and thus only became detectable in the latter portion of the removal period or after the program end date. An increased number of maternal sows were detected and removed in the last week of the program in both years.

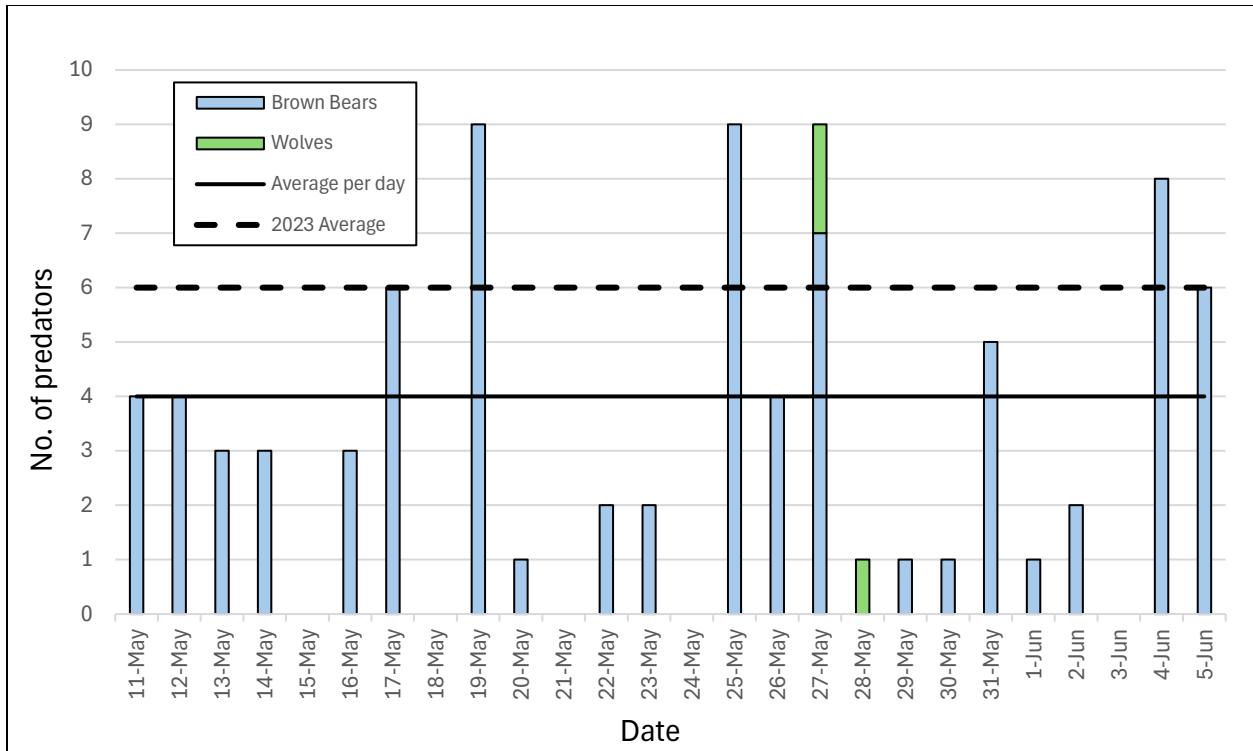


Figure 2. Total predators removed by date and average number of brown bears removed per day during the Mulchatna intensive management predator control program 2024.

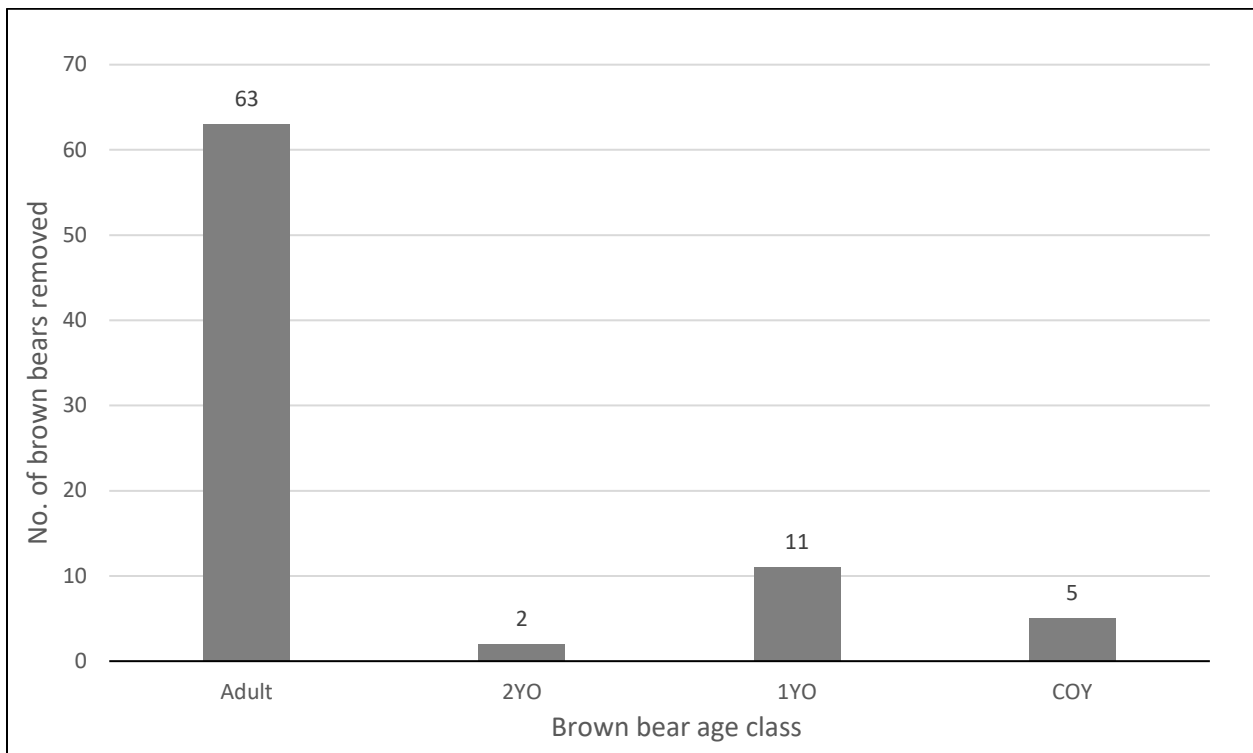


Figure 3. Brown bear age composition of removed brown bears during the Mulchatna Intensive Management predator reduction program 2024. No black bears were lethally removed in 2024.

During parturition flights, tracks of at least 3 wolves were observed in Unit 18 near the primary search area just prior to the IM program May removal period. All 3 wolves observed during the May period were removed from Unit 18 from 2 groups; 1 adult male and female on a fresh adult caribou carcass, and 1 juvenile male feeding on a removed brown bear carcass. The first male had extremely lice-infested fur and was in poor body condition as determined by both the pelvis and lumbar vertebrae apparent through the hide. The female showed no signs of reproduction (e.g., no swollen teats or vulva), and neither male had enlarged testes. The wolf den detected on the calving grounds in 2023 was monitored periodically and no wolf activity was observed in 2024.

Calves

Fifty-five calves were hand-captured and radio-marked (33 males, 19 females, 3 unknowns) in Unit 18 between 12 May and 1 June with over 70% (39 of 55) radio-marked prior to peak parturition, which was a departure from the intended methods (Figure 4). Sex was skewed towards males and three individual sexes were undetermined due to feces obscuring genitalia. Three collar signals were never detected after deployment (n = 52 radio-marked calves). One calf was determined to be ill at the time of capture but was marked specifically to test for disease postmortem. Twelve radio-marked calves (including the calf known to be ill at the time of capture) died of various causes from 11 May through 4 June (3 abandoned, 3 were predated [2 eagle and 1 bear], 1 failed to thrive, 1 drowned, 1 with a puncture wound to abdomen [possible antler], 3 unknown).

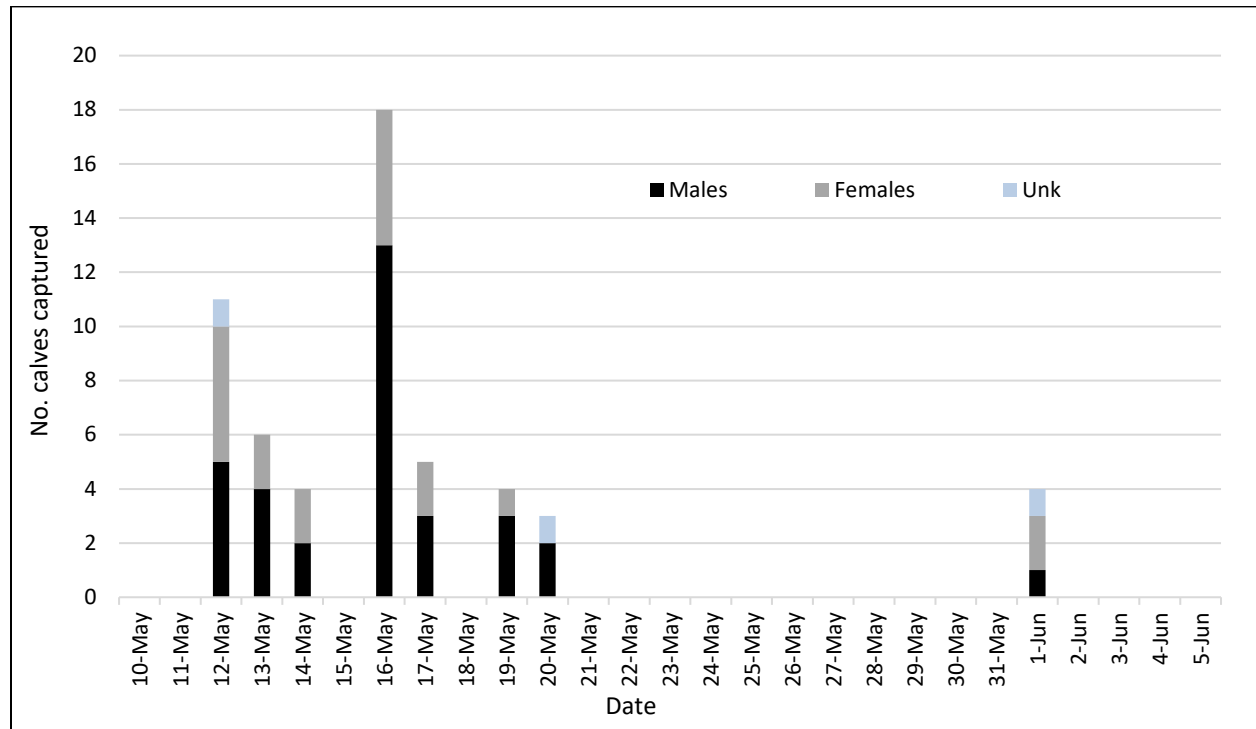


Figure 4. Total number of 2024 Western Mulchatna caribou herd (WMCH) neonate calf captures by date.

In addition to the 12 radio-marked calf mortalities, an additional 32 mortalities were found or observed opportunistically for a total of 44 identified calf mortalities detected. Of the 44 calf mortalities, 29 calf carcasses where cause of death was unclear were collected (7 radio-marked carcasses, 22 opportunistic carcass collections) and submitted for to veterinary pathologists for necropsy and diagnostic testing which included tests for *Brucella*. Twenty of those calves (69%) died from starvation and or dehydration with 7 of those mortalities presumed to indicate a failure to thrive rather than abandonments because the cow was observed with the calf. All calves submitted for necropsy had been born alive and stood but had little to no fat. All but 3 had bone marrow and a lymph node available to test for *Brucella* and were all negative and no gross lesions suggestive of brucellosis were noted. Additional respiratory pathogen testing on lung tissue was negative except that a viral pathogen, bovine coronavirus, was detected in 1 calf. Trace mineral analysis of livers showed consistent, low zinc concentrations in 33% of the calves (as well as low Cu, Zn, and Se in kidneys) in comparison to other caribou of the same age in other herds.

Calf survival to three-weeks of age included 47 of the 55 radio-marked calves. Probability of survival to each day decreased over time through 15 days of age (Figure 5). Prior Department research from 2012 – 2020 of MCH neonate survival concluded calf mortality was highest during the first two weeks of life. Predation has been documented as the leading cause of mortality of caribou calves in other systems, including the Porcupine Caribou herd (PCH) and the Denali Caribou herd (DCH) (Adams et al. 1995 , Whitten et al. 1992). Mortality was highest through 2 days of age in PCH and 8 days of age in DCH, which is similar to neonate mortality detected of WMCH in 2024.

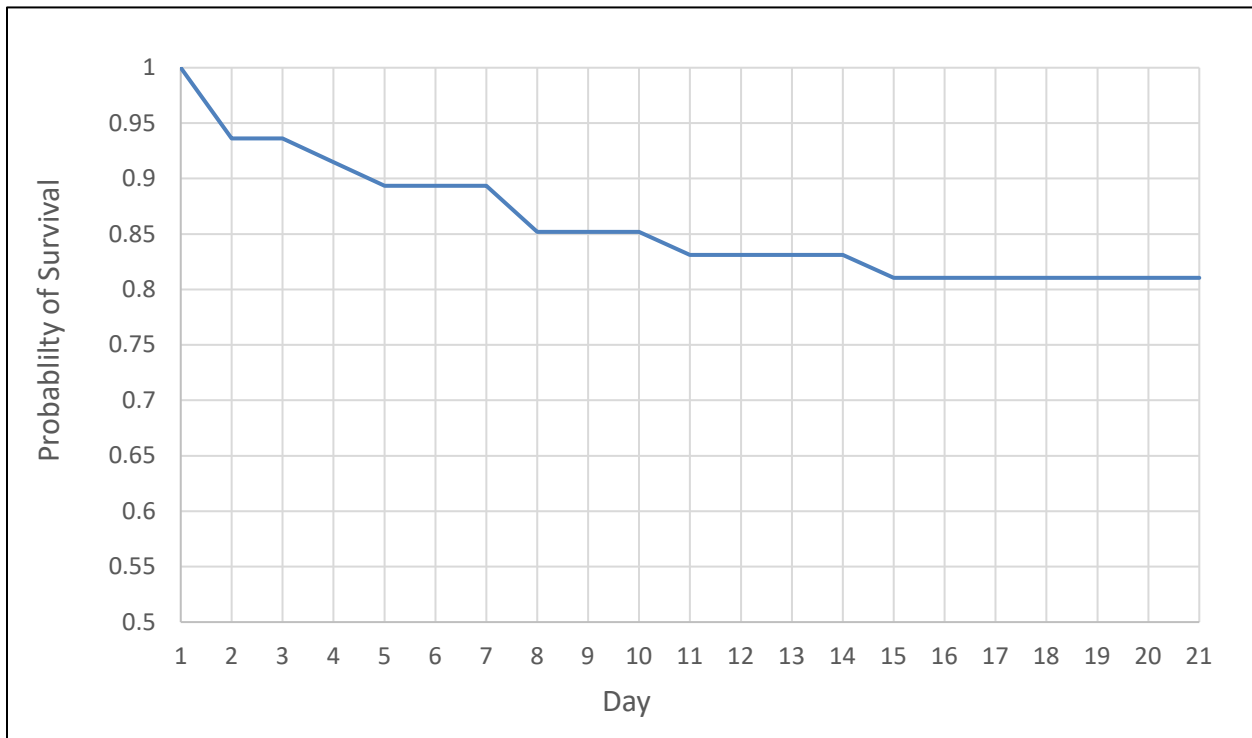


Figure 5. Probability of survival of each day to three-weeks of age (21 days) for 47 of 51 radio-marked WMCH neonate calves 2024.

Budget

Total operational costs for the removal operations and calf captures were \$507,743.65 of State of Alaska General Fund money. No federal money was used to complete operations. The primary increase in expenses relative to the 2023 program are due to increased number of adequate to good weather conditions which allowed for additional effort hours, an added wolf removal period, and calf collars and captures. Aircraft and fuel costs for the April removal period totaled \$54,530.50 and \$10,380.59, respectively (Table 1). The largest expenditure was aircraft time and fuel. One-time expenditures that will be of utility in the future include all freezers and field camp purchases. Starlink internet was required to monitor daily GPS fixes for adult caribou.

Table 1. Expenditures by category for the Mulchatna caribou herd intensive management predator reduction program.

Item	Quantity	Total
Fuel	7,577 gallons, \$10.50/gallon	\$79,650.00
Shipping (meat, hides)	12 shipments	\$1,037.36
Hide processing - April	11 wolf hides	\$3,100.00
Fixed-wing aircraft - April	2	\$27,653.50
Rotary-wing aircraft - April	1	\$26,877.00
Fixed-wing aircraft - May	2	\$197,854.50
Rotary-wing aircraft - May	1	\$125,109.00
Hide Processing	63 hides	\$6,725.00
Housing	30 nights	\$13,500.00
Field Camp	–	\$2,865.82
Disposable equipment	–	\$5,922.56
Chest freezers	1	\$699.00
Neonate expandable collar	30	\$14,226.90

*Not all invoices have been processed at the time of memo distribution (bear hides).

Discussion

The MCH Predator Control Program is designed to increase calf survival to aid population growth. Calf mortalities due to predation were observed within the first few days in both years of the program. The results of the 2023 removals indicate the department reduced predators on the west Mulchatna calving grounds, and an increase in calf survival was observed relative to prior estimates of calf survival (e.g., see Paragi and Landsiedel 2024). The observed increased calf survival with predator reductions indicates predation being a factor potentially limiting growth of the MCH, especially if the larger cohorts of surviving calves survive through the winter and recruit into the adult population. Other factors, including disease, nutrition, and winter severity, may also simultaneously be affecting the growth of the MCH.

Predator Reductions and Predator Population Sustainability

Due to the enigmatic and wide-ranging behavior of bears, they are notoriously difficult to enumerate, especially in repeatable objective measures of density (Brockman et al. 2020). With a desire to avoid delaying the initiation of bear removal; the Department did not have an opportunity to estimate brown bear densities within the IM areas prior to removals. As such, it is prudent to use estimates from the broader region in evaluating the removal effort. The removals need to be large on the relatively small scale of the calving grounds to reduce predation on neonates considerably, while simultaneously not putting the much broader bear population in jeopardy.

There are a few estimates of brown bear density for the approximate area and adjacent to the area of the MCH historic range (Table 2.; VanDaele 2001, Walsh et al. 2010, Walsh *unpublished data*). These estimates indicate that there are potentially between 2,000–7,000 brown bears in southwestern Alaska (units 17, 18, 19), which contains greater than 100,000 km² of mostly remote, intact habitat and wilderness. In 2024, 81 brown bears were removed from a 1,350 km² area that encompassed the MCH calving grounds, which is less than 1.5% of that total area.

Table 1. Brown bear density estimates on and adjacent to the May Mulchatna caribou herd (MCH) Intensive Management program.

Years	Author	Location	Densities
1993–1997 ^a	Van Daele, ADF&G	Killbuck Mountains, Unit 18	18.2 /1,000 km ²
2003–2004 ^b	Walsh, TNWR	TNWR, Units 17A & 18	40.4 /1,000 km ²
2016–2022 ^c	Walsh, TNWR	TNWR, Units 17A & 18	69.13/1,000 km ²

^a Mark-resight methodology.

^b Dual-observer, line-transect methodology.

^c Modified geospatial-population-estimator methodology, unpublished.

The goal of the project was to increase caribou calf survival by removing all bears and wolves from the calving grounds during the spring period when calves are highly susceptible to predation. Brown bears were the predominant predator on the calving grounds. Data does not exist to evaluate whether the goal was achieved, and subsequent calf monitoring efforts detected additional brown bears in the search area post removal. However, the small overall search area and anecdotal observations, such as evidence of the presence of bears (e.g., tracks, predated neonates) typically led to finding a bear, indicating a high degree of bear removal was achieved on the calving grounds. Regardless of the actual level of reduction, it appears to have been sufficient as predation on neonates was relatively low (e.g., see Landsiedel and Paragi 2024) and fall composition surveys² indicated increased calf survival. Comparing removal density to density estimates is not appropriate for several reasons, including that the caribou calving grounds are a

seasonal concentration area for bears within a small area while the density estimates have been done over a broader area when bears are more dispersed.

The 2024 removal effort occurred within a small fraction of units 17, 18, and 19 in southwestern Alaska (<1.5%) and removed less than 5% of the total brown bear population. The area surrounding the removal area contains substantial brown bear habitat with healthy populations (e.g., high bear densities in the TNWR; Table 2). The 2024 removals are sustainable at the broader scale of the southwest Alaska bear population and at the individual unit scale.

Calf survival

The Department predator removals are associated with enhanced calf survival through six months², which may result in herd growth if the calves are surviving through the winter. In October 2023, after the first year of predator control, staff observed a WMCH calf-to-cow ratio of 46:100—the highest ratio observed in 20 years of monitoring the eastern and western portions of the herd separately. This strongly suggests that the predator removal program was successful in increasing WMCH calf survival to six months.

During calf telemetry flights after removal efforts ceased, brown bears were observed pursuing caribou and within the vicinity of WMCH. However, it would be difficult to extend removal into this time period because WMCH dissipate their calving aggregations and transition into summer range, which is primarily in federal lands in mid-June.

Composition surveys to obtain a more precise calf-to-cow ratio are scheduled for October. These surveys will assess the efficacy of the program by evaluating calf survival to six months of life. The same surveys are completed for the East Mulchatna caribou herd (EMCH) which did not receive agency predator control and may serve as a comparison in post-calving abundance and fall age-sex composition.

Marked neonate calves from 2024 will be monitored monthly and a sample will be re-captured as short-yearlings during March of 2025 and affixed with radio collars appropriate for adult caribou. These known-age animals will be monitored annually to assess age at first reproduction and their true recruitment into the population. If calves survive overwinter and recruit into the adult population at a high rate, then that will be strong evidence that Department predator control effort is leading to an increased growth rate of the WMCH.

² John Landsiedel & Evelyn Lichwa, Area Wildlife Biologists, ADF&G, Dillingham, 2023 Fall MCH Composition Survey Memo, 25 October 2023.

Other Factors

While the increased early calf survival associated with Department predator control indicates that predation may be an important factor helping limit MCH growth, other factors, such as disease and nutrition, may also be affecting MCH growth. Many of the necropsies of calves from a subset of the mortalities found had little to no internal fat and nutritional (essential trace mineral) deficiencies, which may indicate the cow was nutritionally stressed or weakened by disease. Interpretation of these results to the WMCH as a whole is difficult, because not all mortalities were necropsied, scavenging was likely relatively low due to the 2 years of predation control, and the predator control effort resulted in very high search effort that is atypical for a calf mortality study. However, the necropsy results paired with continued active spread of brucellosis being documented in other monitoring and relatively low body fat measured in cows, indicate that nutrition and disease may also be affecting MCH growth.

Conducting predator control may still be prudent even when multiple factors (stressors) are simultaneously affecting the population. Having multiple factors simultaneously affecting a population is not unusual and if other stressors increase susceptibility to predation, or if the population is in a predator pit that it cannot break free of unaided, the role of predator control is likely more important. If it is the combination of factors together that forestalls population growth, then removing one of those factors may allow a population to switch to a positive growth rate. In the case of the MCH, multiple factors appear to be affecting the population. Decreasing the influence of predation on the MCH is one of the only tools available to the Department, especially as harvest has already been curtailed. Increased early calf survival and indications that the WMCH may be starting to grow are measures we would expect to see if the predator control effort was effective. However, we are in the early stages of studying the response of the caribou population to predator control and do not fully understand the long-term ramifications of predator removal and interactions with nutrition and disease, but those are currently being investigated.

Staff Operational and Monitoring Recommendations

Calf collaring took significant effort with at least 2 calf capture days being called off due to predator detections. Calf captures did not represent a net loss to predator search efforts; however, they did require daily time from the helicopter. With less time but the same intensity, helicopter searches for predators during calf captures were reduced to a smaller area. However, this search intensity is far greater than what is typically expended in calf mortality studies, so we located a disproportionate number of dead calves in the removal area. Fixed-wing pilots also searched for research caribou VIT (vaginal implant transmitters) expulsions to detect the birth of calves and their disposition (alive or dead). Again, this took effort away from high-intensity predator searching, but also allowed for monitoring calves that otherwise may have gone undetected. Some predators were found and removed while completing these other tasks, so it

is unclear how collecting additional data may have impacted the effectiveness of the program. Participating biologists recommend continuing calf collaring and monitoring efforts. Neonate VHF collars are inexpensive and with a large effort by dedicated staff it is not unreasonable to collar more than 50 calves over the course of the project. Frequency overlap may be an issue, so department biologists recommend using coded collars and receivers, allowing multiple animals to be on the same frequency.

The WMCH calved in nearly the same location as in 2023, giving staff and contractors a year of experience to draw upon. During the second-year, staff were able to spend more days afield, likely due to shifting the operating location from Dillingham to Bethel, which put the crew 40 miles closer to the calving grounds and removed mountainous terrain between the calving grounds and the base of operation. Modifications from the first year included shifting primary operations to Bethel; adding a third fixed-wing aircraft for staff, gear, hauling fuel, and EMCH calf monitoring; establishing fuel caches in the field, and having excess fuel available in Koliganek prior to the start date. The importance of fuel logistics during a remote project cannot be overstated. The fuel cache was replenished most days by excess fuel in a C185 belly tank and portable pump but was also aided by extra fuel bags carried at the beginning of the day and dropped off mid-morning. Occasionally, a sole fuel flight occurred to maintain a full fuel cache using the C185. Finding an adequate crosswind runway with additional fuel would provide an increased safety margin for both pilots and staff.

Skinning adult bears was very labor and time intensive. It is important to have 2 experienced staff who are willing, capable, and proficient both in shooting from the helicopter and skinning as it increases productivity and flexibility. The department also recommends increasing the number of days each staff member is participating. Lower turnover rates would increase efficiency and create reduced workloads for the pilot.

It is recommended to continue the efforts on WMCH calving grounds for a third year, including the additional wolf removal period in early to mid-April lasting 7–10 days. Although this would require the closure of the public permitted same-day-airborne (SDA) program, the Department has not received negative feedback from any permitted pilot for doing so in 2024. Due to the remote nature and lack of participation among most of the SDA permittees, department removal will be more success in the targeted area. Wolf removal is highly dependent on adequate snow and light conditions which are typically deteriorating by mid to late April. It can be reasonably expected that wolf removal would be more effective during that time frame due to the strong likelihood of increased snow cover. While tracking wolves in the upper Kogrukluuk, staff encountered 1 guided bear hunter and immediately left the area to avoid conflict and interruptions to their hunt.

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