Caribou Management Report and Plan, Game Management Units 9B, 9C, 17A, 17B, 17C, 18, 19A, 19B: Mulchatna Caribou Herd

Report Period 1 July 2012–30 June 2017, and Plan Period 1 July 2017–30 June 2022

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Alaska Department of Fish and Game

Division of Wildlife Conservation

2020

Caribou Management Report and Plan, Game Management Units 9B, 9C, 17, 18, 19A, 19B: Mulchatna Caribou Herd.

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Funding for survey and inventory project 3.0 was provided through the Federal Aid in Wildlife Restoration grant program.

Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and through state hunting license and tag fees.

Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every five years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next five years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's (ADF&G) public website.

This species management report and plan was reviewed and approved for publication by Todd A. Rinaldi, Management Coordinator for the Division of Wildlife Conservation (DWC).

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This document, published in PDF format only, should be cited as:

Barten, N. L., and L. N. Watine. 2020. Caribou management report and plan, Game Management Units 9B, 9C, 17, 18, 19A, 19B: Report period 1 July 2012–30 June 2017, and plan period 1 July 17–30 June 2022. Alaska Department of Fish and Game, Species Management Report and Plan ADF&G/DWC/SMR&P-2020-2, Juneau.

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Cover Photo: Mulchatna caribou in the Tikchik Lakes country. ©2020 ADF&G. Photo by Lauri Jemison.

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Purpose of this Report

This report provides a record of Survey and Inventory (S&I) management activities for the Mulchatna caribou herd (MCH) whose range includes Units 9B, 17B, 18, 19A, 19B, and a major portion of Units 17A, 17C, and 9C. This report is for the previous 5 regulatory years (RY12–RY16) and plans for S&I management activities in the 5 years following the end of this period (RY17–RY21). A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). This report is produced primarily to provide agency staff with data and analysis to help guide and record its own efforts, but it is provided to the public to inform them of wildlife management activities. In 2016 ADF&G/DWC launched this 5-year report to more efficiently document trends and describe potential changes in data collection activities over the next 5-year reporting period. It replaces the caribou management reports of S&I activities that were previously produced every 2 years.

I. RY12-RY16 Management Report

Management Area

The range of the MCH includes Units 9B, 17B, 18, 19A, 19B, and a major portion of Units 17A, 17C, 9C, and 18 (approximately 50,000 mi²; Fig. 1). This area includes major river systems such as the Yukon, Kuskokwim, Goodnews, Togiak, Nushagak, Mulchatna, Kvichak, and Naknek rivers draining into Bristol Bay and Kuskokwim Bay, and portions of the Alaska Range, the Aleutian Range, Kilbuck Mountains, Kuskokwim Mountains, Ahklun Mountains, Wood River Mountains, and the Nushagak Hills which make up the northern portion of Unit 17B. Vegetation ranges from willow (*Salix* spp.), alder (*Alnus* spp.), and cottonwood or aspen (*Populus* spp.) along the stream corridors to spruce-birch forests, to open tundra habitats and mountain peaks >7,000 ft on the eastern end of the range near Lake Clark. The land status contains large tracts of federal land administered as the Yukon Delta National Wildlife Refuge (YDNWR), Togiak National Wildlife Refuge (TNWR), Katmai National Park and Preserve (KNPP), Lake Clark National Park and Preserve (LCNPP), and Bureau of Land Management (BLM) lands. Land belonging to the state, native corporations, and private inholdings along the river systems are present in the central portion of the MCH range. Major human population centers include Bethel and Dillingham, but this area also includes dozens of small villages.

Additional maps for game management units (GMUs) within the range of the MCH can be found at: http://www.adfg.alaska.gov/index.cfm?adfg=maps.main.

This large, rugged, and remote area is not connected to the state road system, and thus access is difficult. Villagers along the major river systems access caribou on the landscape via boats, snow machines, all-terrain vehicles (ATVs), and aircraft. Boats and snow machines are the 2 most popular methods used by villagers to harvest caribou. Winter can provide the best access for harvest if snowfall is sufficient for snowmachine travel. However, above average winter temperatures in the last 5 years have limited snowmachine use for winter caribou harvest. The limited number of ATV trails and Unit 17B restrictions (i.e., the Upper Mulchatna Controlled Use Area, which is closed to the use of motorized vehicles except snow machines and boats



Figure 1. Range of the Mulchatna caribou herd (MCH) and extent of the RC503 registration permit hunt area specific to this herd, Southwest Alaska.

August 1–November 1) reduces local reliance on ATVs as a method for travel. Nonlocal hunters almost exclusively use aircraft (e.g., charter or personal) to access caribou.

The MCH population reached a peak in its population (~200,000) in the 1990s and was distributed widely throughout its range. Today the herd is <30,000 animals and its distribution is limited mostly to that portion of Unit 18 east of the Kuskokwim River, all of Unit 17B, all of Units 17A and 17C except the Nushagak Peninsula, Unit 9B, and the southern portion of Unit 19A. Most calving occurs within 2 general areas: the upper Mulchatna River and the upper Tikchik Lakes country (Fig. 2).

Predators of caribou occur throughout the Bristol Bay area at varying densities. Predators include brown bears (*Ursus arctos*), black bears (*U. americanus*, coyotes (*Canis latrans*), golden eagles (*Aquila chrysaetos*), wolverines (*Gulo gulo*), and wolves (*C. lupus*).



Figure 2. General locations of the core southern calving ground near the Tikchik Lakes, and the core northern calving ground in the upper Mulchatna to Tundra Lake, Southwest Alaska.

Summary of History, Status, Trend, and Management Activities of the MCH

Journals belonging to agents of the Russian-American Fur Company contain the first accounts of caribou in the Bristol Bay Area (Van Stone 1988). In 1818, while traveling through areas now included in GMUs 17A and 17C, Petr Korsakovskiy noted that caribou were "plentiful" along Nushagak Bay, and there were "considerable" numbers of caribou in the Togiak Valley. Another agent, Ivan Vasilev, wrote that his hunters brought "plenty of caribou" throughout his journey up the Nushagak River and into the Tikchik Basin in 1829. Skoog (1968) hypothesized that the caribou population at that time extended from Bristol Bay to Norton Sound, including the lower Yukon and Kuskokwim drainages as far inland as the Innoko River and the Taylor Mountains. This herd reached peak numbers in the 1860s and began declining in the 1870s, remaining at reduced population numbers for the next 60 years. Reindeer were brought into the northern Bristol Bay area early in the twentieth century to supplement the local economy and food resources in lieu of the low caribou numbers. Documentation of the numbers and fate of these animals is scarce, but residents remember a thriving, widespread reindeer industry before the

1940s. Herds ranged from the Togiak to the Mulchatna river drainages, with individual herders following small groups throughout the year. Suspected reasons for the demise of the reindeer herds include wolf predation and the expansion of the commercial fishing industry which increased dependence upon a cash-based local economy and decreased interest in herding reindeer. Local residents also relayed stories of reindeer joining groups of caribou and running off with the wild herds.

Aerial surveys of the MCH range were first conducted in 1949, when the population was estimated at 1,000 caribou. The population increased to approximately 5,000 by 1965 (Skoog 1968). In June 1973, approximately 6,030 caribou were observed during a survey. In 1966 and 1972 relatively small migrations across the Kvichak River were recorded; however, no major movements of this herd were observed until the mid-1990s.

The first intensive effort to accurately count this herd was conducted in 1974 and yielded a minimum count of 13,079 caribou. In both past and current attempts to obtain a population estimate of the MCH, the biggest challenge biologists face is finding a representative sample of caribou on this large and diverse landscape. Because it appeared that underestimating the population might be the norm, in 1981 biologists deployed 20 VHF transmitters on MCH caribou to aid in locating post-calving aggregations. During a photo survey in June 1981, ADF&G biologists counted 18,599 caribou, providing an extrapolated estimate of 20,618 caribou. The use of radio collars and photography greatly enhanced confidence in the accuracy of population estimates. Throughout the 1980s caribou population estimates continued to increase and by 1996 the MCH reached approximately 200,000 animals. Following this peak, the population experienced a precipitous decline of approximately 85,000 caribou by 2004 and 30,000 by 2008.

Modeling the population during the period of decline suggested that an older age structure with reduced productivity and increased calf mortality were the driving forces in this decline (ADF&G unpublished data). Overgrazing of available forage precipitated the MCH population decline, which resulted in malnutrition, decreased productivity, susceptibility to disease and increase in disease prevalence in the population. Taken together, these factors also likely increased adult and calf caribou susceptibility to predation by wolves, bears, eagles, and other predators. Taylor (1989) reported the carrying capacity of traditional wintering areas had been surpassed as early as 1986–87, prompting the MCH to expand its winter range providing some evidence that density dependent effects were beginning to affect this herd even before the population irruption. Although the hunting pressure was intense during periods of high abundance, it is not thought to be responsible for the precipitous decline the MCH population.

DWC biologists conduct a photo survey of the MCH during the post calving aggregation period in late June or early July in most years from 1980 to 1992. ADF&G scheduled these surveys every other year from 1993–2003. In 2004, ADF&G decided to conduct yearly surveys to estimate the MCH population, acknowledging that conditions might affect survey success, and thus our ability to obtain yearly population estimates. ADF&G management and research biologists used photographs to estimate MCH population size. In 2012 we began using the Rivest method (Rivest et al.1998) to estimate the population, which involves using radio collars in conjunction with a photo survey. The most recent successful survey during July 2016 yielded an estimate for the Mulchatna herd of 27,242 animals. We cancelled the survey in 2017 due to a lack of caribou aggregation, and in 2018 the results of the photo survey suggested the caribou did not aggregate in a manner conducive for obtaining an estimate using the Rivest method. We observed an unusually large number of single animals during the survey and did not see much of a correlation between the number of collars found in a group and the group size. This was a problem as the random distribution of the radiocollared animals among groups is a key assumption underlying the Rivest method. In other words, larger groups are assumed to have more collared animal than smaller groups. Because the assumption that collared caribou are distributed randomly among groups was rejected at α =0.05 (p-value=0.0001). Therefore, the Rivest method was not applicable for the photo survey in summer of 2018 (Meg Inokuma, personal communication, Palmer ADF&G biometrician), and no population estimate was obtained.

ADF&G/DWC staff conducted a photo survey of the MCH during the post-calving aggregation period in late June or early July in most years from 1980 to 1992. From 1993 through 2003 we scheduled surveys on alternate years. In 2004 area management biologists decided to conduct yearly surveys to estimate the MCH population, acknowledging that weather conditions might affect survey success, and thus our ability to obtain yearly population estimates. ADF&G coordinates surveys out of the Dillingham area office in cooperation with staff from the Bethel, McGrath, Palmer, and Fairbanks ADF&G offices; and personnel from Togiak National Wildlife Refuge (TNWR), Yukon Delta National Wildlife Refuge (YDNWR), and Lake Clark National Park and Preserve (LCNPP); and the Bureau of Land Management (BLM) provides additional funding for biologists to radio track caribou, survey the herd's range, estimate the number of caribou observed in groups, and photograph discrete groups via fixed-wing aircraft. Since 1994 we have generally photographed large aggregations with an aerial mapping camera mounted in a De Havilland Beaver (DH-2) or Cessna C-206 aircraft flown by ADF&G staff. As the population declined to pre-irruptive size, we determined that hand-held digital cameras sufficiently captured the same information as the large photo planes at reduced cost and have consistently used this method since 2012.

Management Direction

We manage caribou in the Mulchatna herd for the benefit of all people in Alaska, whether that is for consumptive or non-consumptive purposes. The MCH is managed at a level that provides for a sustained yield while keeping the herd in balance with the available habitat.

EXISTING WILDLIFE MANAGEMENT PLANS

- Mulchatna Caribou Herd Monitoring Plan (2013). Interested stakeholders include: Alaska Department of Fish and Game, Division of Wildlife Conservation (ADF&G/DWC; Bethel, Dillingham, King Salmon, McGrath, Palmer), Department of Natural Resources (DNR; Wood Tikchik State Park, Dillingham), Bureau of Land Management (BLM; Anchorage Field Office), U.S. Fish and Wildlife Service (USFWS; Togiak National Wildlife Refuge, Dillingham, and Yukon Delta National Wildlife Refuge, Bethel), and National Park Service (NPS; Lake Clark National Park and Preserve, Port Alsworth).
- Alaska Wildlife Management Plans: Southwestern Alaska (ADF&G 1976).
- Division of Wildlife Conservation Strategic Plan (ADF&G 2002).

• Operational Plan for Intensive Management of Caribou in Game Management Units 9B, 17, 18, and 19B (ADF&G Nov 2018).

GOALS

- Maintain healthy sex and age structures with MCH for the benefit of all users.
- Provide for maximum opportunity to participate in the hunting of caribou.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The MCH has a positive customary and traditional use determination finding. The amount reasonably necessary for subsistence value is 2,100–2,400 caribou (5 AAC 99.025 (4)).

Intensive Management

In 2001 the Alaska Board of Game adopted a positive finding for intensive management (IM) of caribou for the MCH, with the following objectives:

- Population objective: 30,000–80,000.
- Harvest objective: 2,400–8,000.

In 2011, the board designated the Mulchatna Caribou Herd Predation Management Area (MCHPMA; 5 AAC 92.111(c)) corresponding with the range of the MCH in Units 9B, 17B, 17C, 19A and 19B (39,683 mi²) because the MCH is important for providing high levels of human consumptive use. The objective of the plan is to enhance recovery of the MCH and achieve a population, sex and age structure that will sustain human harvests within the objectives established for this herd by the board. This plan works towards achieving this goal by reducing wolf numbers both within and adjacent to the MCHPMA. The MCHPMA is defined by the calving grounds that the MCH uses and is re-defined annually by the department based on demographic data and changes to areas used by the herd as calving grounds. The wolf population reduction plan initially authorized in March 2011 for Units 9B, 17B and 17C was modified in March 2012 to include Units 19A and 19B. It was limited to 10,000 mi², which is approximately 25% of the MCHPMA.

The plan was initially approved for 6 years and scheduled to end in 2017; however, because most of the IM objectives were not met in 2017 when the IM program was reviewed, the department requested that the board reauthorize this program for an additional 6 years. This extended the program through 2024 which coincides with the region's 3-year board cycle. This plan authorizes the department to issue permits to public pilot/gunner teams to take wolves on the same-day-airborne (SDA) flights. These permits allow for both land-and-shoot taking of wolves, and aerial shooting by a backseat gunner.

MANAGEMENT OBJECTIVES

- To maintain a population of 30,000–80,000 with a minimum bull-to-cow ratio of 35:100 observed during October surveys.
- To maintain an annual harvest of 2,400–8,000.
- Manage the MCH for maximum opportunity to hunt caribou.

MANAGEMENT ACTIVITIES

Assessing population status and trends, monitoring harvest and mortality, and assessing habitat conditions through indirect indices such as caribou body condition and productivity are important components of management programs for the MCH. Survey and Inventory (S&I) management activities used to monitor the MCH are described below.

1. Population Status and Trend

ACTIVITY 1.1. Maintain a sample of radiocollared caribou.

Data Needs

Locating caribou within the large range occupied by the MCH during S&I activities such as parturition surveys, photo surveys, and fall composition surveys is dependent on having an ample number of radiocollared caribou on the landscape. Not only does having collared animals facilitate our ability to find the majority of the herd for S&I activities, but collaring both young (i.e., 10-month-old animals) and adult (i.e., \geq 3 years) animals provides us with a sample of marked and known-age individuals to study various population parameters over both spatial and temporal scales. Age-specific data collected over time allows us to determine survival rate and first age of reproduction. At the time of collar deployment, reproductive success can be assessed through aging and intermittent checks in health and body condition. These data are essential for the management of this herd. Body mass data from 10-month-old females collected during collar deployment also provides an indirect measure of habitat quality which is helpful in assessing abundance and harvest objectives.

Methods

In April of each year we capture and obtain various samples (e.g., blood, body condition, etc.) of short-yearling female caribou to which we affix VHF collars. We treat a smaller sample of adult female caribou in a similar manner, but place satellite (GPS) collars with VHF abilities on these individuals. The short-yearlings provide age-specific survival and productivity data for each annual cohort, while adult cows with satellite collars provide easily accessible location data to guide our S&I activities and inform us on long-term adult survival trends. During this reporting period we also collared a sample of bull caribou to help us understand their movements, survival, and to incorporate bull caribou into our sample of animals used in the photo survey. During the reporting period we deployed radio collars on 149 caribou (103 females and 46 males; Table 1). We divided captures evenly between the western (Unit 18) and eastern (Unit 9B and 17B) ranges of the MCH. We used a dart rifle fired from an R-44 helicopter to immobilize all caribou, using

standard techniques approved by the department's Institutional Animal Care and Use Committee (IACUC 2015-33).

Regulatory Year	10-Month-Old Females	Adult Females	Adult Males	Total Collars
2012	13	4	0	17
2013	10	5	9	24
2014	18	3	9	30
2015	17	10	26	53
2016	23	0	2	25

Table 1. Radio collars deployed on Mulchatna Caribou Herd (MCH), Southwest Alaska, during regulatory years 2012–2016.

Results and Discussion

We recorded body weights for all short-yearling, female caribou that we captured and radiocollared. Average weights of short-yearling females increased steadily during RY12–RY15, going from 119 pounds in RY12, to 133 pounds in RY15. In RY16 the average weight was lower at 119 pounds (Table 2). These data are indicative of caribou in good condition, which is an indirect measure of quality habitat. During this reporting period, we annually maintained about 100 active radio collars on MCH caribou to assist in our S&I activities.

Table 2. Mulchatna caribou female short-yearling weights (10 months of age), SouthwestAlaska, in April of each regulatory year from 2000–2016.

Regulatory	Average	
Year	Weight (lbs.)	<i>(n)</i>
2000	103.5	11
2001	109.4	13
2002	109.2	22
2003	106.7	19
2005	115.9	19
2006	118.9	21
2007	121.8	15
2008	119.7	15
2009	95.5	6
2010	128.3	15
2011	124.1	18
2012	119.1	13
2013	127.0	10
2014	128.0	14
2015	133.0	13
2016	119.0	23

Recommendations for Activity 1.1

Continue.

ACTIVITY 1.2. Conduct parturition surveys each spring using radiocollared female caribou of known age to determine age-specific pregnancy rates.

Data Needs

Determining age-specific productivity is an important component to managing this caribou herd. Data from spring parturition surveys provides insight into the condition of these animals based on their pregnancy rates as well as the reproductive potential of the herd. These metrics also help us to determine if the landscape can support more caribou, which is critical for making management decisions that include abundance and harvest objectives. The present IM program uses this information to determine the efficacy of the current management regime, and how we might change our protocol to meet the IM objectives.

Methods

In May 2000, ADF&G initiated parturition surveys to determine the proportion of adult females calving and age-specific productivity of known-aged radiocollared animals. We used a fixed-wing aircraft to get visuals on as many of the radiocollared females as possible, and record if they were pregnant (e.g., presence of a calf at heel). Additional evidence that a cow was pregnant included the presence of hard antlers prior to calving (Whitten 1995). In most years we could assess pregnancy on 50–60 adult cows (i.e., \sim 50% of our collared sample). Most importantly, we were able to assess pregnancy on the 2- and 3-year-old cohorts which provided the most valuable data on the reproductive potential of the herd (Table 3).

Results and Discussion

To obtain a parturition rate, we classified an average of 52 radiocollared cows per year (range: 36-68). We classified collared cows into 4 age categories: 2-year-old, 3-year-old, 4-year-old, and \geq 5-year-old (Table 3). Although our sample sizes for any given age class are small, the ability to compare data year to year still provides useful insight into the productivity of this population. Most notable is that we had an average of 26% of the 2-year-olds classified as pregnant (range 0%–60%), and 88% of the 3-year-olds (range 67%–100%) during the 5-year reporting period. This indicates that the MCH is at a very high plane of nutrition and has a high reproductive potential. This is in contrast with many other caribou herds in the state, where few if any 2-year-old caribou are pregnant and only a small percentage of 3-year-olds are pregnant.

Recommendations for Activity 1.2

Continue.

Age Class		Age 2			Age 3			Age 4			Age <u>></u> 5		Total	Age ≥3
Regulatory Year	Sample Size	Number Pregnant	Percent Pregnant	Annual (<i>n</i>)	Percent Pregnant									
2012	12	0	0	15	10	67	2	1	50	32	27	84	61	76
2013	11	3	27	14	12	86	15	10	67	28	23	82	68	79
2014	5	3	60	8	8	100	11	11	100	31	26	84	55	90
2015	10	3	30	3	3	100	5	3	60	23	13	57	41	61
2016	7	1	14	9	8	89	3	1	33	17	14	82	36	83

Table 3. Mulchatna Caribou Herd (MCH) spring parturition rates, regulatory years 2012–2016.

ACTIVITY 1.3. Conduct an annual photo survey of the MCH to obtain a population estimate.

Data Needs

Conduct surveys to estimate abundance each year as conditions allow. This is needed because both management objectives and IM objectives include abundance thresholds that are managed for and used to set seasons, bag limits, and guide IM actions.

Methods

The survey conducted during this reporting period was in June 2016. ADF&G coordinates surveys out of the Dillingham area office in cooperation with staff from the Bethel, McGrath, Palmer, and Fairbanks ADF&G offices. Personnel from Togiak National Wildlife Refuge (TNWR), Yukon Delta National Wildlife Refuge (YDNWR), and Lake Clark National Park and Preserve (LCNPP) provide additional support, with further funding provided by the BLM. Biologists using fixed-wing aircraft to radiotrack caribou and survey the herd's range, estimate the number of caribou observed, and photograph discrete groups. Starting in 1994, we photographed large aggregations with an aerial mapping camera mounted in a De Havilland Beaver (DH-2) or Cessna C-206 aircraft flown by ADF&G staff. However, as the population declined, we began using hand-held cameras in each aircraft. In 2012 we began estimating the herd size using the methods of Rivest et. al. (1998), whereby we use radio collars to locate, photograph, and count caribou groups and individuals. Although we count all caribou observed during the survey to provide ADF&G with a minimum population count, the Rivest method used to obtain the MCH population estimate only includes groups with ≥ 1 collared caribou.

Results and Discussion

We were able to conduct photo surveys during each year of this reporting period. The trend in abundance continued downward from the previous period, with 22,809 in RY12, and 18,308 in RY13. In the following 3 years, the estimated abundance began increasing (RY14, RY15, and RY16; Table 4, Figs. 3 and 4).

	Bull:	Calves:				Small	Medium	Large		Estimate
Regulatory	100	100	Calves	Cows	Bulls	Bulls	Bulls	Bulls	Composition	of Herd
Year	Cows	Cows	(%)	(%)	(%)	(%	of total bu	ılls)	Sample Size	Size
2012	23	30	20	65	15	38	38	24	4,853	22,809 ^a
2013	27	19	13	68	19	39	36	25	3,222	18,308 ^a
2014	35	30	18	61	21	44	31	25	4,793	26,275 ^a
2015	35	29	18	61	21	35	43	22	5,414	30,736 ^a
2016	39	22	14	63	24	43	29	28	5,195	27,242ª

Table 4. Mulchatna Caribou Her	d fall composition survey data and population estimates,
regulatory years 2012-2016, Alas	ka.

^a Estimate based on Rivest et al. (1998) caribou abundance estimator.



Figure 3. Mulchatna Caribou Herd (MCH) fall composition percent of the sample comprised of calves, cows, and bulls plotted against the population estimate (Rivest et al. 1998), regulatory years 2012–2016, Alaska.

Recommendations for Activity 1.3

Continue.

ACTIVITY 1.4. Conduct fall composition surveys to estimate sex ratio, age ratios, and recruitment of calves to fall.

Data Needs

Demographic data provides insights into herd productivity. When the proportion of bulls to cows reaches 35:100, it is a good indication that conditions may be right for the herd to experience population growth and eventually provide more harvest opportunity in the future. Composition surveys should be conducted each October to assess sex and age structures of a portion of the population.

Methods

These surveys were conducted over a 2-day period: 1 day was designated for the portion of the MCH wintering in Unit 18, the second day's effort focused on caribou wintering in Units 19B and 19C. We tried to obtain a representative sample of the MCH by splitting the sample evenly between these 2 groups, with the goal of surveying 5,000 caribou total. We made an effort to include satellite groups, and not just the main groups of animals. We used fixed-wing aircraft to locate radiocollared animals. Once found, we used a helicopter to separate out a workable group size of 50–100 animals. Animals were classified by sex, and as calves or adults. Bulls were further classified based on antler-size (i.e., small, medium, or large) through visual observation

while flying directly behind the group of animals. Although classifying bulls by antler size is subjective, the metric provides information on bull recruitment and age distribution.

Results and Discussion

Department staff conducted composition surveys of the MCH in October during each year of the reporting period (Table 4, Figs. 3 and 4). The bull-to-cow ratio showed an increasing trend throughout the reporting period, meeting or exceeding our management objective of 35:100 in each of the last 3 years of the period. The calf-to-cow ratio did not show the same positive trend, but rather undulated between the objective of 30:100, and much lower levels of 19:100 and 22:100 during RY13 and RY16, respectively. The composition of this herd has varied substantially from periods of increasing abundance to periods of decline. During 1981–1996 when the population grew from 20,000 to 200,000 animals, the annual average bull-to-cow ratio was 55:100 (range 31–68), and the calf-to-cow ratio averaged 46:100 (range 34–60). During 1999–2013 when the herd declined from 175,000 to 18,000, both the bull-to-cow and calf-to-cow ratios averaged 22 (range of 14–38 and 14–28, respectively). During this reporting period, the herd increased to approximately 27,000–30,000 animals, the bull-to-cow ratio averaged 32:100 (range 32–39), and the calf-to-cow ratio averaged 26:100 (range 22–30).

Recommendations for Activity 1.4

Continue.

ACTIVITY 1.5. Investigate and monitor calf survival to determine factors responsible for calf mortalities.

Data Needs

Understanding factors that are limiting survival of caribou neonates is an important component to consider when designing an IM program for this herd. Increasing yearling weights and high pregnancy rate of 2- and 3-year-olds suggests that MCH caribou are healthy and highly productive, but the population abundance and harvest are still below objectives. The low calf-to-cow ratios seen in our October composition surveys indicate that too few calves are recruited into the population to cause positive growth in the herd. Obtaining cause-specific mortality data on MCH calves is a priority for this herd.

Methods

From 2012 through 2014 we conducted calf mortality studies on the 2 main calving grounds (northern and southern) of the MCH. The northern calving ground is located in the upper Mulchatna River to Tundra Lake, and ranges between these 2 areas at times. The southern calving ground ranges from southwest of Koliganek to the upper Tikchik Lakes system near Upnuk and Nishlik Lakes (Fig. 2). As part of a newly adopted IM program in 2011, a calf mortality study was initiated both in the northern and in the southern calving grounds. In mid-May each year, caribou neonates were captured and radiocollared. An R-44 helicopter is used to approach adult females with calves less than 3 days of age. A biologist captures the calf, deploys an expandable VHF collar on the calf, and records its sex and weight. During the 2 weeks following these captures, calves are monitored daily from a fixed-wing aircraft to determine survival. When we identify that an animal has died, we use the helicopter to land at the mortality

site and attempt to determine cause of death. If predation is the suspected cause of death, we use clues such as carcass disposition, the presence and pattern of bites, scat, hair, feathers, or the presence of predators themselves to determine the predator species responsible.

Results and Discussion

Although predation appeared to be the most important cause of calf mortality, other sources of mortality included drowning, starvation, abandonment, and trauma due to stomping by adult caribou. Frequently we could not make a determination of cause of mortality as the collar was found lying by itself without any evidence of predation. Predators identified as having killed and consumed calves include brown and black bears, wolves, wolverine, and eagles. (Tables 5 and 6).

Cause of Mortality	2012 (%)	2013 (%)	2014 (%)
	n=65	n=69	n=43
Brown Bear	53	38	14
Black Bear	8	15	0
Unknown Bear	5	3	0
Wolf	8	25	7
Wolverine	0	0	7
Unknown Predator	8	3	0
Eagle	0	3	57
Drowned	13	15	7
Trauma	3	0	7
Unknown Cause	3	0	0

Table 5. Causes of mortality of Mulchatna caribou neonates by percent in the northerncalving ground during calendar years 2012–2014.

NOTE: The northern calving ground ranges from the upper Mulchatna River to Tundra Lake.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor the caribou harvest through registration permit harvest reports and contact with hunters.

Data Needs

Harvest data allow managers to assess harvest levels in relation to overall abundance and thus ensure that the population remains viable at the current harvest limit. Harvest and survey data can be used together to determine the population's trajectory (e.g., increasing, decreasing, or stable) and guide management decisions (e.g., adjust seasons and bag limits). In some cases, it is necessary to adjust bag limits by sex to ensure we meet demographic objectives. Additionally, an important component of the IM decision framework is documenting if we are meeting harvest objectives.

Cause of Mortality	2012 (%)	2013 (%)	2014 (%)
	n=51	n=50	n=19
Brown Bear	20	13	0
Black Bear	0	0	0
Unknown Bear	0	0	0
Wolf	0	38	57
Wolverine	0	0	0
Unknown Predator	20	0	0
Eagle	0	0	14
Drowned	20	38	14
Trauma	40	13	14
Unknown Cause	0	0	0

Table 6. Causes of mortality of Mulchatna Caribou Herd neonates by percent in the southern calving ground during calendar years 2012–2014.

NOTE: The southern calving ground ranges from southwest of Koliganek to the upper Tikchik Lakes system near Upnuk and Nishlik Lakes.

Methods

Beginning in RY13, management of hunter harvest and effort across the MCH range changed from the RC000 harvest ticket hunt to a registration permit RC503. The Board of Game adopted this change to acquire a higher level of hunt reporting needed to manage this herd. Hunters who successfully harvest caribou must report their harvest within 5 days of the kill. Those who are not successful must report on their hunting effort within 15 days of the close of the season. If hunters fail to comply with these permit conditions, they are cited, and lose their hunting privileges for permit hunts for the following regulatory year.

Season and Bag Limit

Current MCH season dates and bag limits are available on the ADF&G website:

https://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting

In RY13 when the management of the MCH hunt went from a GC000 general season harvest ticket to a registration permit RC503, the hunt was managed similarly across the entire range of the herd. The bag limit was 2 caribou, however no more than 1 could be a bull, and no more than 1 could be taken during Aug. 1–Jan. 31. This was a carryover to protect bull caribou during the fall period when they were at their peak of trophy value. Since then the seasons across the MCH range have changed through Board of Game action, with portions of the range allowing a harvest of 2 caribou of any sex taken at any time during the season.

Results and Discussion

Harvest by Hunters

A decline in reported harvest began in the late 1990s, a trend that has continued through this reporting period. RY13 had the lowest reported harvest in over 25 years (Table 7). The change from the general season harvest ticket to the registration permit in RY13 could play a role in the low reported harvest as many hunters may not yet have been aware or accustomed to the new registration permit. However, more likely it is the winter weather, which has been mild with poor snow conditions, resulting in little winter access to caribou herds during the time of year when most harvest by local hunters regularly occurs. In recent years, the reported harvest has increased and harvest reporting has improved as hunters have become more familiar with the registration permit process. The winter of RY16 was much colder with better snow conditions for travel than the previous 3 years, allowing hunters to harvest more caribou than in previous years.

Table 7. Mulchatna caribou reported harvest from harvest reports, regulatory years 2012–2016, Alaska.

		Reported Hunter Harvest						
Regulatory Year	Permits Issued	GC000 Harvest	Male	Female	Unknown	Total ^a		
2012 ^a	NA	339	174	162	3	339		
2013	2,075	15	81	38	1	120		
2014	2,068	27	142	60	5	207		
2015	2,175	18	173	77	2	252		
2016	2,454	17	221	124	2	347		

^a For RY12, this total is from general season harvest ticket for caribou (GC000) only. For RY13–RY16, this total includes both the registration permit (RC503) harvest reports as well as GC000 due to some hunters not recognizing the change to the RC503 permit.

Permit Hunts

The RC503 registration permit replaced the general season harvest ticket in RY13 and all Mulchatna caribou harvest should be reported under this permit. However, because this is a relatively new process, there has been a transition period during the first few years of the RC503 permit where a number of hunters continued to use the GC000 harvest ticket and reported under the associated harvest report (Table 7). Since its inception in RY13, we have issued an average of 2,193 RC503 permits each year, with an average of 746 permittees who hunted, 235 who did not report, and a remainder who were unsuccessful. Compliance in reporting hunting effort or harvest requires consistent outreach by the department through news releases, radio messages, postcards, and letters reminding hunters to report. This is challenging as the Mulchatna management area spans 9 GMUs and includes dozens of remote communities. Although the transition to a registration permit over the general season harvest ticket has been an improvement towards collecting data on harvest and effort, additional steps need to be taken to ensure a higher rate of reporting. Social media, such as Facebook, could be a useful tool for outreach as it is popular for communicating and acquiring news in western Alaska.

Hunter Residency and Success

There is no nonresident hunting season for Mulchatna caribou and most harvest in recent years is by residents of the units within the Mulchatna range. Few hunters fly into Dillingham with the intent of targeting only caribou as they had in the past when the population was much higher. Today, nonlocal harvest is either in conjunction with a moose hunt or conducted by private pilots from Anchorage or the Kenai Peninsula who have the ability to search broad areas for caribou that provides them with a higher probability of success over your typical hunter.

Harvest Chronology

Harvest of the MCH has changed substantially from the 1990s to today. The abundance of caribou available for harvest in the 1990s led to more animals harvested during the fall. Today, the MCH population is significantly reduced. This decrease in the population has caused most of the harvest to occur during late winter when snow allows for faster and more efficient traveling and harvest conditions. This change is largely related to the origin of the hunters between these 2 periods. During the peak years the non-local and non-resident hunters and thus harvest was in concert with the fall moose seasons when hunters could hunt multiple species, and when bull caribou were at their peak trophy value. Most of these hunters used aircraft-supported transport services to access caribou and were much more successful than local hunters because of the advantages this access provided. Local subsistence hunters were much more limited in their ability to access caribou as they relied on boats for access and thus hunted along river corridors alone. Although they harvested some caribou in this manner, most hunter effort was focused on the late winter period when they could use snowmachines to locate and access caribou away from the river corridors.

However, in recent years with the elimination of the nonresident hunt due to low abundance of caribou, and the decline in nonlocal Alaskan hunters, the harvest has largely shifted to the late winter period as local subsistence hunters using snowmachines now dominate the harvest.

Transport Methods

Boats, snowmachines, all-terrain vehicles (ATVs), and aircraft provide access to caribou during all seasons if the conditions are good, with boats and snowmachines being the most popular methods. ATV use is limited due to the lack of many usable trails away from the villages, and nonlocal hunters almost exclusively use aircraft (e.g., aircraft charter service or personal aircraft) for access. Winter can provide the best access for harvest if snowfall is sufficient for snowmachine travel. This is especially pronounced in the western portion of the MCH range in Unit 18, where hunters from many of the lower Kuskokwim villages can access caribou via snowmachines relatively quickly under good travel conditions.

Snowmachines are by far the most commonly used form of transport to access and harvest caribou in the Mulchatna herd.

Other Mortality

Both bears and wolves are responsible for some level of adult mortality but acquiring causespecific mortality We have data on annual adult survival from radiocollared animals; however, determining cause of death when we often find only a few bones or just the collar at the mortality site leaves little reliable data on specific causes of mortality.

Alaska Board of Game Actions and Emergency Orders

During its Spring 2013 meeting, the Alaska Board of Game passed a proposal to replace the general season harvest ticket for caribou (GC000) with a registration permit (RC503) for hunting Mulchatna caribou, this included Units 17, 18, 19A, 19B, 9A, 9B, and a portion of 9C. This regulation went into effect in July 2014. During its Spring 2015 meeting, the Board lengthened the season for caribou hunting in Units 17 and 9B from 1 Aug–15 Mar to 1 Aug–31 Mar. In addition, the board also changed the bag limit in these 2 units from 2 caribou of which only one can be a bull, to 2 caribou of any sex.

Recommendations for Activity 2.1

Continue.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Evaluate the condition of the Mulchatna caribou range by monitoring the condition and productivity of captured female caribou.

Data Needs

Acquiring body condition and pregnancy data on female caribou provides important insight into the condition of the caribou range. This data helps guide our management strategy and is very important in determining whether the landscape can sustain an increased caribou population.

Methods

During early April of each year, we focused our capture efforts on 10-month-old female caribou for ongoing nutritional assessment. Once captured, caribou were weighed and fitted with VHF radio collars. Animals were then located by VHF signal during aerial surveys. We compared the weights of these short yearlings over time to determine if they were in good or poor condition and located these same animals when they were 2 and 3 years of age to determine pregnancy status. Both metrics provide valuable insight into habitat quality.

Results and Discussion

Body condition of the 10.5-month-old female caribou has remained relatively good throughout this reporting period. Pregnancy rates also reflected this good condition with up to 60% of our 2-year-old females being pregnant and up to 100% of our 3-year-old females being pregnant (Table 4).

Recommendations for Activity 3.1

Continue.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Paper records of aerial surveys are stored in the Dillingham area office . Back-up copies of data and activity summaries are stored on an in-house server (H:\WC-DIV).

Agreements

There is an agreement for use of MCH telemetry data between ADF&G/DWC and ABR, Inc.-Environmental Research and Services for analysis of the caribou distribution and movements near the proposed Pebble Mine.

Permitting

IACUC approval for caribou capture activities (No. 2015-33).

Conclusions and Management Recommendations

Interest in the MCH remains high despite the low numbers in recent years. Hunters from nearby villages, other parts of Alaska, and even from outside Alaska continuously ask about this herd, and all wonder the same thing, that is, when will this herd again reach the heights of 200,000 as it did in the mid-1990s. This population peak is still recent enough that many of our hunting constituents experienced this phenomenon and yearn for "the good old days". Due to the cyclic nature of caribou populations, and the history of the MCH, it seems likely that this herd will remain at a relatively low density for a period.

We were able to conduct a photo survey of the MCH in each year of this reporting period, with estimates ranging from 18,308 (2013) to 30,736 (2015). The population trend suggests that the population is increasing, although the last estimate in 2016 was at 27,242, lower than that from 2015. Caribou body condition and pregnancy rates suggest that the MCH is in good condition with a high reproductive potential. The factor limiting a steady growth of this herd is low calf survival, and therefore low recruitment of calves into the adult portion of the population. The fall composition counts have been showing an increase in bull-to-cow ratios, but the calf-to-cow ratios have undulated between just meeting objectives of 30:100 to falling short of objectives.

ADF&G has an intensive management (IM) program for the MCH. Part of this plan includes a wolf control program, with the goal of enhancing caribou calf survival and thus recruitment into the population. This program has not shown to have had an appreciable effect on calf survival and recruitment. There have been several years where winter conditions were not adequate to facilitate wolf removal (i.e., low snowfall makes it difficult to track and harvest wolves via airplane). Additionally, the SDA program does not appear to contribute much to the overall number of wolves harvested, as regular harvest methods continue to contribute to most of the wolf harvest. However, this program will remain active through the next board cycle in the hopes that a series of winters with adequate snowfall will allow us to assess the true effectiveness of wolf removal on caribou calf survival. So far, in years of increased wolf harvest, predation remained the top source of calf mortality. However, the main source of predation switched to

other predators (e.g., brown bears) as the primary cause of calf death. Thus, even with wolf control, it appears that caribou calf survival is consistent.

We believe it is important to continue the various S&I activities outlined in this document that start with keeping a sample of radio collared animals on the air, to use these marked animals for monitoring this herd.

II. Project Review and RY17-RY21 Plan

Review of Management Direction

MANAGEMENT DIRECTION

Management of the MCH has been and should continue to be guided by the Mulchatna Caribou Monitoring Plan, the partners of which include ADF&G, DNR, USFWS, BLM, and NPS. It is important to continue to conduct the annual S&I activities to provide us with the best available data on herd size, health, and composition. This data is also essential for guiding decisions on seasons and bag limits as well as IM decisions that are based on caribou abundance and demographics. If during the next reporting period we meet our IM objectives for the herd, we will consider suspending the program.

GOALS

- Improve caribou harvest reporting rates and compliance with hunting regulations.
- Continue S&I activities outlined in the reports section to monitor population status and trend.
- Maintain healthy age and sex structures within the range of the MCH.
- Use IM activities to enhance caribou calf survival and meet abundance and demographic objectives.
- Provide for sustained yield of caribou for the benefit of consumptive as well as nonconsumptive users.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses (5 AAC 99.025)

• Across the entire MCH range: 2,100–2,400 caribou per year.

Intensive Management

- Population objective: 30,000–80,000.
- Harvest objective: 2,400–8,000.

The IM program for the MCH has been in place since 2011, however, it has been generally unsuccessful due to inadequate conditions for aircraft hunters to track, pursue and harvest

wolves. There are several wolf packs found throughout the MCH range, within and adjacent to the herd's important calving grounds. ADF&G initiated a wolf control program under IM in order to enhance caribou calf survival and recruitment, which has remained below objectives.

MANAGEMENT OBJECTIVES

- Bull-to-cow ratio of 35:100.
- Calf-to-cow ratio of 30:100.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Maintain a sample of radio-collared caribou in the MCH.

Data Needs

Locating caribou within the large range occupied by the MCH during S&I activities such as parturition, photo survey, and fall composition surveys is dependent on having an ample number of radio collared caribou on the landscape. These collared animals serve several purposes, the most obvious being they provide focal animals for us to use in finding the bulk of the herd for S&I activities, determining survival rates, and, by collaring short-yearlings, we are able to keep a sample of known age individuals marked and available for study across years. These age cohorts allow us to gather age-specific data over time that is essential for our management program. Body mass from 10-month-old females collected during collar deployment also provide us with an indirect measure of habitat quality which is a necessary and important factor towards assessing abundance and harvest objectives for this herd.

Methods

There are no changes to the methods described in the report section.

ACTIVITY 1.2. Conduct parturition surveys each spring, using radio collared female caribou of known age to determine age-specific pregnancy rates.

Data Needs

Determining age-specific productivity is an important component to managing this caribou herd. Data from spring parturition surveys provides insight into the condition of the animals on the landscape based on their pregnancy rates and provides insight into the reproductive potential of the herd. These metrics provide insight into an area's ability to support more caribou, which is critical for making management decisions that include abundance and harvest objectives. Presently there is an active IM program for the MCH and having these data that provide insight into the carrying capacity of the habitat is critical.

Methods

There are no changes to the methods described in the report section.

ACTIVITY 1.3. Conduct an annual photo survey of the Mulchatna herd to estimate abundance.

Data Needs

Acquire abundance estimates of the MCH at least every other year using fixed-wing aircraft and photographic equipment. Both management objectives and IM objectives include abundance thresholds that we manage for and use to set seasons and bag limits as well as guide IM actions.

Methods

There are no changes to the methods described in the report section.

ACTIVITY 1.4. Conduct fall composition surveys to estimate sex ratios, age ratios, and recruitment of calves to fall.

Data Needs

Demographic data are essential to provide insights into the productivity of the herd and the bull component of the population to ensure timely breeding of cows as well as to provide harvest opportunity. We will conduct composition surveys each October to assess sex and age structures of a sample of the population.

Methods

There are no changes to the methods described in the report section.

ACTIVITY 1.5. Investigate and monitor calf survival to determine factors responsible for calf mortalities.

Data Needs

Understanding factors that are limiting survival of caribou neonates is essential in designing a successful IM program for this herd. Increasing short-yearling weights and high pregnancy rate of 2- and 3-year-olds suggests that MCH caribou are healthy and highly productive, but the population abundance and harvest are still below objectives. Low calf-to-cow ratios seen in our October composition surveys indicate the survival of calves at a young age is limiting growth of this population, so data on causes of mortality has become a priority for this herd.

Methods

There are no changes to the methods described in the report section.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor the caribou harvest through registration permit harvest reports and contact with hunters.

Data Needs

Harvest data are important to help managers assess harvest levels in relation to overall abundance to ensure the harvest is sustainable. These data can also provide insight into the

trajectory of the population. In lieu of, or in concert with, good survey data, we can use harvest data to guide management decisions (e.g., adjust seasons and bag limits). In some cases, it is necessary to adjust bag limits by sex to ensure we meet demographic objectives. Additionally, harvest objectives and if these objectives are met represent an important component of the IM decision framework.

The transition from the general season harvest ticket to the RC503 registration permit has produced some positive results thus far and should continue. However, efforts need to be taken through educational outreach and enforcement to ensure hunters acquire the proper permit before going hunting, and that they report on their hunting effort and harvest. As mentioned in the report section of this document, employing social media such as Facebook may be the best way to begin these efforts as this medium is widely used in western Alaska by rural residents, and may provide our best access to constituents for encouraging hunt reporting.

Methods

There are no changes to the methods described in the report section.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Evaluate the condition of the Mulchatna caribou range by monitoring the condition and productivity of captured female caribou.

Data Needs

Acquiring body condition and pregnancy data on female caribou provides important insight into the condition of the caribou range. This data helps guide our management strategy and is very important in determining whether the landscape can support an IM program aimed at increasing caribou.

Methods

There are no changes to the methods described in the report section

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

These activities will remain consistent with those described in the report section.

Agreements

Agreement for use of MCH telemetry data between the ADF&G/DWC and ABR, Inc.-Environmental Research and Services for analysis of the caribou distribution and movements near the proposed Pebble Mine.

Permitting

IACUC approval for caribou capture activities (No. 2015-33).

Acknowledgments

We would like to thank the following stakeholders in the Mulchatna Caribou Monitoring Plan for their involvement and efforts in assisting with the management of Mulchatna caribou: ADF&G/DWC (Bethel, Dillingham, King Salmon, McGrath, Palmer), Department of Natural Resources (Wood Tikchik State Park, Dillingham), Bureau of Land Management (Anchorage Field Office), US Fish and Wildlife Service (Togiak National Wildlife Refuge, Dillingham and Yukon Delta National Wildlife Refuge, Bethel), and National Park Service (Lake Clark National Park and Preserve, Port Alsworth).

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