Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 – PO Box 115526
Juneau, AK 99811-5526

CHAPTER 18: CARIBOU MANAGEMENT REPORT

From: 1 July 2012
To: 30 June 2014[1]

LOCATION

GAME MANAGEMENT UNITS: 26B and 26C (25,787 mi^2)

HERD: Central Arctic

GEOGRAPHIC DESCRIPTION: Central Arctic Slope and Brooks Range

BACKGROUND

In the mid-1970s the Central Arctic caribou herd (CAH) was recognized as a discrete herd, and in 1975, it was estimated at 5,000 caribou (Cameron and Whitten 1979). By 1983 CAH increased to approximately 13,000, and by 1992, to more than 23,000 caribou (Valkenburg 1993). In 1995 the herd declined to 18,100 and then stabilized for a few years. By 2000, herd size increased substantially to more than 27,000 animals, and in 2010, the herd was estimated at 70,034 caribou (Table 1). The increase was due to low adult mortality, high parturition rates (≥85%), and good fall calf recruitment to October (≥50 calves:100 cows) during 1998–2010 (Lenart 2013).

Reported harvest on CAH changed over time as a result of regulatory modifications and changes in hunting pressure. Beginning in regulatory year (RY) 1991, which begins 1 July and ends 30 June (e.g., RY91 = 1 July 1991–30 June 1992), harvest and hunting pressure increased on CAH, likely because hunting was severely restricted on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile). These restrictions displaced hunters to hunt CAH, and CAH had become accessible by road because the Dalton Highway was officially opened to public traffic in 1991. During RY00–RY12, the total number of hunters and reported harvest increased, although harvest rates remained less than 3% of the herd.

The Central Arctic caribou range encompasses the eastern north slope coastal plain from just west of the Colville River to the Canadian border, the north side of the Brooks Range from the Itkillik River to the Canadian border, the south side of the Brooks Range from approximately the North Fork Koyukuk River to the East Fork Chandalar River, and as far south as the Chandalar River valley (Fig. 1). CAH traditionally calves between the Colville and Kuparuk rivers on the west side of the Sagavanirktok River and between the Sagavanirktok and the Canning rivers on the east side. During the early 1990s, the greatest concentration of caribou that calved in western Unit 26B shifted southwest as development of infrastructure related to oil production occurred in

[1] At the discretion of the reporting biologist, this report may contain data collected outside the report period.

what was originally a major calving area (Lawhead and Johnson 2000, Wolfe 2000). No directional shift in distribution of caribou that calved east of the Sagavanirktok River was noted (Wolfe 2000). CAH summer range extends from Fish Creek, just west of the Colville River, eastward along the coast (and inland approximately 30 miles) to the Canadian border. CAH winters in the northern and southern foothills and mountains of the Brooks Range. The herd's range often overlaps with the Porcupine caribou herd (PCH) on summer and winter range to the east, and with the Western Arctic (WAH) and Teshekpuk (TCH) herds on summer and winter range to the west.

Within the range of CAH, oil exploration and development began in the late 1960s and continues at present. Beginning in the late 1970s, the Alaska Department of Fish and Game (ADF&G) implemented long-term studies on population dynamics, distribution, movements, and effects of development on CAH. During the 1980s, calving activity was rare in the Prudhoe Bay oil field, where it was known to occur before development (Whitten and Cameron 1983). In addition, cows and newborn calves were underrepresented along the trans-Alaska pipeline corridor and around oil production facilities in the early 1990s (Cameron and Smith 1992, Cameron et al. 1992). By the mid-1980s, major movements of CAH caribou through the Prudhoe Bay oil field in summer had ceased, and caribou distribution and movements within the Kuparuk oil field were altered substantially (Smith and Cameron 1983, 1985a,b; Whitten and Cameron 1983, 1985; Curatolo and Murphy 1986). In the mid-1990s, research on CAH was reduced substantially, and efforts were focused on monitoring population parameters and their relationship to management objectives. During the mid-1990s, some of CAH management goals and objectives were developed in response to concerns arising from research conducted during 1978–1993. Based on the hypothesis that displacement of sufficient magnitude would be harmful to CAH (Cameron 1983), we worked with the oil industry to minimize disturbance to caribou movement due to physical barriers created by oil development. In addition, given that stress is cumulative, ADF&G reduced hunting activity in areas adjacent to the oil field and the Dalton Highway and also restricted cow harvest through the late 2000s. Although measures to mitigate disturbance to caribou were put into effect, we have not determined the success of these measures. Yet, the overall population grew substantially during the mid-1990s through 2010.

MANAGEMENT DIRECTION

During 2000–2010, CAH grew substantially. Current management goals and objectives reflect this increase in population size, as well as intensive management population and harvest objectives that the Alaska Board of Game (board) established for CAH. An intensive management designation means the board must consider intensive management if a reduction in harvest becomes necessary because of dwindling caribou numbers or productivity. In March 2000 the board established the intensive management population objective for CAH as 18,000–20,000 caribou and the harvest objective as 600–800 caribou (Title 5 Alaska Administrative Code [5 AAC] 92.108). In 2004 the board increased intensive management objectives to a population of 28,000–32,000 caribou and harvest of 1,400–1,600 (5 AAC 92.108) in order to reflect the 2002 population estimate.

MANAGEMENT GOALS

Goal 1: Minimize the adverse effects of development on CAH caribou.

Goal 2: Provide the opportunity for a subsistence harvest of CAH caribou.

Goal 3: Maintain opportunities to view and photograph CAH caribou.

MANAGEMENT OBJECTIVES

Objective 1: Maintain a population of at least 28,000–32,000 caribou. (Goals 1, 2, 3)

Objective 2: Maintain accessibility of seasonal ranges for CAH caribou. (Goal 1)

Objective 3: Maintain a harvest of at least 1,400 caribou if the population is ≥28,000 caribou. (Goal 2)

Objective 4: Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 5: Reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. (Goals 2 and 3)

MANAGEMENT ACTIVITIES

- Conduct a photocensus every 2–3 years. (Objective 1)
- Conduct annual fall composition surveys. (Objectives 3 and 4)
- Radiocollar 10–20 yearling females annually. (Objectives 1 and 2)
- Radiocollar 10–20 adult females and males annually to maintain 25–30 radio collars on adult females and 10–20 radio collars on adult males. (Objectives 1 and 2)
- Radiotrack during early summer, fall, and winter to determine seasonal distribution. (Objectives 1 and 2)
- Estimate parturition rate and late June calf:cow ratios for radiocollared females. (Objective 1)
- Estimate peak of calving. (Objective 2)
- Monitor harvest through harvest ticket reports and Division of Subsistence harvest surveys. (Objectives 3)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objectives 1 and 2)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 5)

METHODS

POPULATION STATUS AND TREND

Population Size

Population size was estimated in July 1997, 2000, 2002, 2008, 2010, and 2013 using the modified aerial photo-direct count technique (Davis et al. 1979), commonly referred to as "photocensus." A photocensus represents the caribou that were located and present during the photocensus; we do not locate all caribou in the herd, and caribou from other herds may be present. However, we conduct photocensuses during optimal conditions when caribou are aggregated, and we attempt to locate all radio collars. We note when radio collars from other herds are present and estimate how many caribou those radio collars may represent.

Postcalving aggregations of caribou were located by radiotracking radiocollared animals. These aggregations usually occurred when temperatures were >55°F and wind was <15 mph. Groups of caribou were photographed with a Zeiss RMK-A aerial camera mounted in a deHavilland Beaver aircraft, or caribou were counted directly from the Beaver or radiotracking airplane. As we were photographing, we used a custom-made computer program, "PHOTOMAN (version 3.0.12)," which was developed within ADF&G to assist in overlap lines for transects and photo layouts when caribou were counted from photographs. Caribou were radiotracked via Cessna 182 and Super Cub aircraft to locate groups of caribou.

Caribou were counted directly from photographs, and caribou observed from airplanes were added to this count and referred to as "minimum count" of caribou in the photocensus. During 1997–2013 we also used a method described by Rivest et al. (1998) to estimate herd size and provide a measure of uncertainty. This method used the distribution of radiocollared caribou among groups of known size to estimate the number of caribou in groups without radiocollared caribou. The estimator assumes a random distribution of radio collars among caribou in the herd, and a statistical test is provided to evaluate the appropriateness of this assumption for a given survey.

In 2013 we also took steps to account for (i.e., remove) the 10 PCH caribou captured in the photocensus. We made 2 adjustments to the Rivest estimate to account for PCH caribou: 1) we removed PCH caribou estimated to be represented by the 10 PCH radio collars, and 2) we removed PCH caribou from the caribou that the Rivest's method added to the count by multiplying these additional caribou by the proportion of PCH caribou in the total caribou counted. Each radiocollared PCH caribou represents 2,191 caribou based on the 2013 PCH photocensus estimate of 197,228 and 90 radio collars (J. R. Caikoski, Wildlife Biologist, ADF&G memorandum [2013 Surveys of the Porcupine caribou herd–parturition, postcalving, and photocensus], 5 February 2014, Fairbanks). We accounted for the uncertainty associated with these adjustments. We also took steps to account for 2 PCH caribou in the 2008 photocensus and 2 PCH and 2 TCH in the 2010 photocensus (A. L. Crawford, Biometrician, ADF&G memorandum [Estimating Central Arctic caribou herd abundance under herd mixing conditions: Analysis summary], 6 October 2015, Fairbanks). Analyses of these methods are still being investigated, and adjustments to the method may be made in the future.

We used the adjusted Rivest estimates and their associated variances to estimate trend with a multiplicative mixed effects model using Bayesian methods and the software OpenBUGS (Lunn et al. 2009). The multiplicative model was preferred because a proportional change in slope is assessed as opposed to a linear model which evaluates an additive change in slope (J. Merickel ADF&G Biometrician, Fairbanks, personal communication). In addition, lambda is estimated

directly in the multiplicative model. Trend was estimated separately for 2 time periods (1997–2008 and 2008–2013), because the data indicated the population peaked between 2008 and 2012. Modeling the entire data set was not feasible due to variation in the data. Posterior means were used as point estimates for lambda, and 90% and 95% credible intervals were calculated. Note that a 95% credible interval is interpreted slightly different than a confidence interval: there is a 95% probability that the interval contains the true value of lambda.

No population estimates were conducted during 2003–2007 due to lack of suitable weather, poor aggregation quality, or both.

Radiocollaring

Caribou were captured using a handheld netgun from an R-44 helicopter and manually restrained with hobbles and blindfold-hood while we collected measurements and fitted the radio collars. Eleven-month-old calves captured in April were weighed. We assessed general body condition on all caribou as very poor, poor, average, good, or very good. We recorded sex (male or female) and age as 11-month-old calf (short yearling) or adult. We recorded latitude, longitude, and general location of capture.

We maintained 60–100 radio collars (including VHF [very high frequency transmitters], GPS [Global Positioning System] transmitters, and PTT [Platform Terminal Transmitters]) in CAH. We attempted to maintain approximately 20 radio collars on female yearlings, 12 on adult bulls, and the remaining collars on females ≥2-years old. All 3 transmitters operate using emission of an electromagnetic signal at a specified frequency which is detected by receivers tuned to the frequency. PTT and GPS also use orbiting satellites to receive and relay transmitter signals, resulting in automated tracking. We received satellite-location data from the Service Argos Data Collection and Location System (ARGOS) in Landover, Maryland for the Telonics satellite collars and from Iridium Communications, Inc. in McLean, Virginia for the Lotek radio collars.

During 21–23 April 2013 we deployed a total of 35 radio collars on CAH, including 12 Telonics-Argos GPS satellite radio collars deployed on adult females ≥2-years old (4 recaptures and 8 random), 3 Telonics VHF radio collars were deployed on males ≥2-years old, and 20 Telonics VHF radio collars were deployed on 11-month-old females. Radio collars were deployed on the south side of the Brooks Range between the Dalton Highway and the East Fork Chandalar River, north of the North Fork Chandalar valley. On 29 June 2013, 3 Telonics VHF radio collars were deployed on adult females ≥2-years old near Badami.

During 17–19 April 2014 we deployed a total of 51 radio collars on CAH including 13 Telonics-Argos GPS satellite radio collars deployed on adult females ≥2-years old (7 recaptures and 6 random), and Telonics VHF radio collars were deployed on 2 males ≥2-years old, 2 female yearlings (almost 2-years old), 21 11-month-old females (short yearlings), 1 recaptured adult female, and 12 random adult females. Radio collars were deployed on the south side of the Brooks Range between the Dalton Highway and the East Fork Chandalar River, north of the North Fork Chandalar valley. On 28 June 2014 we deployed 1 GPS Telonics-Argos with VHF radio collar and 9 GPS Lotek with VHF radio collars on random adult females ≥2-years old with 9 radio collars south of Badami-Bullen Point and 1 on the Kadleroshilik pingo.

Parturition and Early Calf Survival

Parturition and early calf survival (survival to 2 weeks) data were stratified between Unit 26B West (west of the west bank of the Sagavanirktok River) and Unit 26B East (east of the west bank of the Sagavanirktok River) because Arthur and Del Vecchio (2009) determined CAH caribou maintained fidelity to these calving areas from year to year (92%, n = 46 for radiocollared CAH cows with calving locations obtained in ≥5 calving seasons during 1997–2006). Because some overlap occurred, we arbitrarily chose the Sagavanirktok River as the line separating Unit 26B West, where there was substantial oil exploration and development, from Unit 26B East, where little exploration and development occurred.

Parturition rate was determined by observing radiocollared females ≥2-years old from a fixed-wing aircraft during the first half of June. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1991). During 1997–2002, caribou were located once, with a target date of 3–9 June. During this period when caribou were only located once, parturient caribou may have been misclassified because some cows did not have hard antlers or distended udders, particularly if a calf was born early and died or was born late and not observed (Whitten 1995). During 2003–2006, caribou were located 2–3 times during 30 May–14 June concomitant with a research project (Arthur and Del Vecchio 2009). In 2007 and 2008 caribou were located twice during the first week of June. During 2009–2014, caribou were located once during 1–7 June. Data were stratified based on the location of caribou east and west of the Sagavanirktok River, as described above.

The proportion of calves:100 cows (early calf survival) was determined by observing radiocollared females ≥2-years old from a fixed-wing aircraft after the peak of calving likely occurred. If a cow was observed with a calf, she was classified as "with calf." If distended udders were detected but no calf was seen, we assumed the cow had recently lost a calf, and she was classified as "without calf." Thus, these proportions are a conservative estimate of early calf survival. The proportion of calves:100 cows was determined during 20–25 June. This technique provides an indication of early calf survival or net calf production and is referred to as late June calf:cow ratios. Similar to parturition estimates, data were stratified based on the location of caribou east and west of the Sagavanirktok River using locations from the current summer.

Parturition rates and the proportion of calves:100 cows were calculated for females ≥4-years old. Beginning in 2004 we randomly captured some adults and classified them as "young," "medium," and "old" based on tooth wear. Caribou classified as "medium" or "old" were included in the "females ≥4-years old" category. Data for females ≥4-years old were stratified based on the location of caribou east and west of the Sagavanirktok River. A 90% binomial confidence interval was calculated for parturition rates and the late June calf:cow ratio using a normal approximation method: sqrt (parturition rate * (1−parturition rate)/(n−1).

Peak of calving was defined as the date at which 50% or more of the radiocollared parturient females ≥3-years old gave birth. For years 2002–2006, radiocollared females were relocated daily or every 2–3 days until a calf was present. If observations of parturient females with no calf were followed by observations of females with a calf present, the range of days between observations was determined as the estimated date females had calved. For years 1997–2000 and 2007–2014 the estimated date of peak of calving was determined using the following criteria

based on the proportion of ≥3-year-old females with calves to parturient ≥3-year-old females at the last date of radiotracking: 1) ≤25%, a span of 3 days was added following the last radiotracking date; 2) 26–39%, 2 days were added; 3) 40–49%, 1 day was added, 4) 51–59%, 1 day was subtracted and included the last day of radiotracking; 5) 60–74%, 2 days were subtracted; and 6) ≥75%, a span of 3 days were subtracted. The date of the point estimate was determined by deriving the midpoint between the estimated dates for peak of calving. The mean of the date of the point estimate (and standard error of the mean) was calculated to determine the mean estimated date of peak of calving.

Population Composition

During 2009–2012 and 2014, sex and age composition during fall was estimated by classifying caribou from an R-44 helicopter near peak of rut to take advantage of the presumed mixing of bulls, cows, and calf caribou. No fall composition survey was conducted in 2013 because CAH was mixed with PCH.

Peak rut was estimated as the date 228 days (gestation period) prior to the estimated peak calving date of CAH (19 October). Caribou groups were located by radiotracking radiocollared caribou ≥1-year old from a fixed-wing aircraft. Approximately 200 caribou were classified per radio collar per group utilizing a cluster sampling scheme (Cochran 1977). If less than 200 caribou were present in a group, all or most of the caribou in that group were classified. In addition, some groups without radio collars were sampled. Caribou were classified as cows; calves; and small, medium, or large bulls. Composition surveys were conducted on the north side of the Brooks Range, mostly east of the Dalton Highway to the Lupine River and on the south side of the Brooks Range east of the Dalton Highway to the East Fork Chandalar River, and north of the North Fork Chandalar River.

Mortality

Annual adult female mortality rate for females ≥1-year old was estimated per regulatory year by determining the number of known mortalities in a regulatory year and dividing that number by the number of active radio collars beginning 1 July of that regulatory year.

Distribution and Movements

Distribution of CAH was monitored during calving, postcalving, summer, rut, and winter by relocating radiocollared females during June, July, mid-October, and late March or early April. Distribution was also monitored using PTT or GPS satellite radio collars using the Argos and Iridium satellite service systems.

HARVEST

Harvest and hunting pressure by Alaska residents who lived south of the Yukon River and by nonresidents were monitored using harvest reports submitted by hunters. Total harvest, residency and success, chronology, and transportation were summarized by regulatory year.

Alaska residents who lived north of the Yukon River were not required to obtain caribou harvest tickets and report cards. However, they were required to register with ADF&G or an authorized vendor. ADF&G Division of Subsistence estimated caribou harvested by residents of Kaktovik and Nuiqsut (S. Pedersen, ADF&G files, Fairbanks). Caribou harvested by hunters from Nuiqsut

included animals from the TCH and WAH herds, as well as some CAH caribou (Braem et. al. 2011).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

2013 Photocensus. We conducted a photocensus on the Central Arctic caribou herd 4–5 July 2013. A complete description of survey and analyses methods were described in E. A. Lenart, ADF&G memorandum (2013 Central Arctic caribou photocensus results), 8 August 2014, Fairbanks.

We considered conditions for the photocensus to be good. On 4 July temperature was 58°F, mostly cloudy with broken clouds, ceilings at 5,000 feet, and an estimated 12–18 mph wind from the northeast when caribou west of Prudhoe Bay were photographed during late afternoon. Caribou were loosely aggregated. We photographed caribou east of Prudhoe Bay on 5 July during late morning. Temperature was 58°F, sunny and clear, with an estimated 12–18 mph wind from the northeast switching to southwest. Caribou were tightly aggregated.

We located and photographed all 54 of 54 active radio collars deployed on Central Arctic caribou (≥1-year old, 9 males and 45 females), including 2 caribou originally collared as TCH but are now identified as CAH caribou. We also located 10 Porcupine Caribou radio collars in 4 groups mixed in with the 7 groups that were photographed east of Prudhoe Bay. Caribou were distributed in 12 groups from the Colville River delta to east of the Canning River on the Sadlerochit River. Caribou were distributed in 4 groups west of Prudhoe Bay between the Colville River delta and Beechey Point, 7 groups east of Prudhoe Bay between the Canning and Sadlerochit rivers either along the coast or up to 15 miles inland, and 1 group of 2 bull caribou with a radio collar on the mouth of Sagavanirktok River. All other radiocollared bulls were located with radiocollared females. A total of 10 groups were photographed, and 2 groups were either estimated or counted from the Beaver. Ten of the 12 groups of caribou had 1 or more radio collars.

Minimum Count: In 2013 we counted 70,364 caribou from photographs and caribou not included in photographs in 12 groups of caribou and considered this a "minimum count" of caribou in the photocensus which also included some PCH caribou (Table 1).

Rivest's Population Estimate. We estimated CAH population at 50,753 (SE = 4,345, 95% CI = 40,924–60,582 caribou), using the Rivest et al. (1998) estimator and made adjustments for PCH caribou in the count (Table 1; E. A. Lenart, Wildlife Biologist, ADF&G memorandum [2013 Central Arctic Caribou Photocensus Results], 8 August 2014, Fairbanks).

Historical Population Size and Summary. Population size was not estimated during 2003–2007; however, CAH increased substantially during 1995–2008 (Table 1). Using the adjusted Rivest estimates for years 1997–2008, there is significant evidence at the 95% credible interval that the population was increasing at an annual rate between 1.10 and 1.13 with a point estimate (posterior mean) of 1.12 (Table 2, Fig. 2). High parturition rates, good calf survival, and low adult mortality since 1997 contributed to the increase in population size. We determined that

immigration from PCH and TCH likely played a minor role in contributing to the increase during those years. High annual rates of increase similar to those reported here have been reported for other Arctic caribou herds (1.12), although minimum count estimates were used as well as a different method to calculate the annual rate of increase (Carroll 2007, Dau 2007).

Using the adjusted Rivest estimate for years 2008–2013, lambda was estimated to be between 0.86 and 1.01 at the 95% credible interval with a point estimate (posterior mean) of 0.95 (Table 2, Fig. 2). The 95% credible interval encompasses 1, indicating the growth rate is not significantly less than 1, however a 90% credible interval for lambda is (0.90, 0.99) which does indicate a lambda less than 1 (growth rate <1 indicates the herd is declining). These results show that during 2008–2013, the CAH population stopped increasing and may be slightly decreasing. Note that results from 2008 to 2013 should be viewed with caution because there were only 3 data points with high variability as represented by the large credible interval (Fig. 2). Although results of the model are somewhat inconclusive because there are only 3 data points, a very late spring occurred in 2013 resulting in high mortality of adult and yearling females during the month of May. We suspect that these high mortality rates were reflected in the 2013 photocensus estimate resulting in a lower population number. In conclusion, it is likely CAH population peaked between 2008 and 2012 (note that the 2 estimates between 2008 and 2010 are not significantly different from each other) and was either stable, or slightly decreased during 2008–2013. Two additional population estimates should help us determine the trend more conclusively since 2008 (Fig. 2).

Parturition and Early Calf Survival

Parturition Rates. Parturition rates of radiocollared females ≥4-years old throughout Unit 26B were 80% (n = 25) in 2013 and 76% (n = 34) in 2014 (Table 3; Fig. 3). In 2013, parturition rates were higher in Unit 26B West (100%, n = 9) compared to Unit 26B East (69%; n = 16); but note low sample sizes in Unit 26B West. Spring in 2013 persisted approximately 1 month longer, and caribou calved further south compared to previous years (Fig. 3). Parturition rates were similar between Units 26B West and Unit 26B East in 2014 (Table 3). Parturition rates for 3-year-olds were 75% (n = 4) in 2013, and no 3-year-olds were located in 2014 (Table 4).

We determined the 5-year moving weighted average for 3-year-olds for years 2009–2013 to be 63.8%±18.8% (annual sample size ranged 4–7, CI = 95%) using methods described in Boertje et al. 2012 and estimating a binomial standard error for the 95% CI (Table 4). The point estimate was lower the previous 4 years (2010–2013) compared to 2003–2009; however the error bars overlap considerably which likely reflects the annual low sample sizes. Boertje et al. 2012 considered 5-year moving weighted averages of 55–80% to be moderate parturition rates, although the utility of this measure for Arctic caribou remains unknown (Valkenburg et al. 2000, Boertje et al. 2012). A high parturition rate, particularly in 3-year-olds, is indicative of good nutritional condition, although variability in parturition rates can be relatively high among 3-year-old cows.

During the previous 15 years (since 2000), parturition rates were very high for females ≥4-years old (≥91%) for 11 of the 15 years (Table 3). Parturition rates were still considered good (≥75%) in years they were lower than 91% (2005, 2009, 2013, 2014; Table 3). We observed no significant differences in parturition rates between Unit 26B West and Unit 26B East during 1994–2014, except in 2013, although sample sizes were small (Table 3).

Peak of Calving. In 2013, 32% (7 of 22) of the radiocollared females ≥3-years old that were considered pregnant had a calf by 6 June. Therefore, the estimated date range for peak of calving in 2013 was 7–8 June, and the point estimate was 7.5 (Table 5). In 2014, 12% (3 of 26) of the radiocollared females ≥3-years old that were considered pregnant had a calf by 3 June. The estimated date for peak of calving in 2014 was 4–6 June and the point estimate was 5.0 (Table 4). During 1997–2014 the mean estimated date was 5 June (mean point estimate ± SE = 5.5 ± 0.52; Table 5; Arthur and Del Vecchio 2009; Lenart 2013; ADF&G unpublished data, Fairbanks; R. D. Cameron, Wildlife Biologist, ADF&G [retired], personal communication, 2012).

Early Summer Calf Survival. The late June calf:cow ratio of radiocollared females ≥4-years old throughout Unit 26B was 56:100 (n = 25) in 2013 and 65:100 (n = 34) in 2014 (Table 6). During 1997–2012, the late June calf:cow ratio was relatively high (≥71:100; Table 6) in all years except 2009 and 2012, when they were slightly lower (52:100 and 69:100). These high calf:cow ratios indicated consistently high productivity and early calf survival, which contributed to the increase in population size observed during 2000–2010. Late June calf:cow ratios were similar between Unit 26B West and Unit 26B East (Table 6).

The late June calf:cow ratio for radiocollared 3-year-olds was 50:100 (n = 4) in 2013, and only 1 3-year-old was located in 2014, and it did not have a calf. Calves born to 3-year-olds tended to have lower survival rates compared to cows ≥4-years old, although sample sizes were small (n = 4–14; Table 4).

Population Composition

No sex and age composition survey was conducted in 2013 because CAH was mixed with PCH. In 2014 a fall composition survey was conducted on the south side of the Brooks Range between the Dalton Highway and the East Fork Chandalar River. A total of 3,903 caribou were classified in 31 groups with 32 radio collars. However, we determined, post-survey, that some CAH caribou may have been mixed with some PCH caribou based on PCH satellite radio collar locations (E. A. Lenart, ADF&G memorandum [Fall 2014 CAH composition], 1 September 2015, Fairbanks). Therefore, only groups sampled west of the Middle Fork Chandalar River were included in the 2014 composition analyses (15 groups with 18 radio collars). This resulted in 2,004 caribou with an observed bull:cow ratio of 41:100 and calf:cow ratio of 42:100 (Table 7). The bull:cow ratio was considerably lower compared to previous years, but this number should be viewed with caution because of the smaller sample size and potential mixing. The calf:cow ratio was also lower but still considered good. We expected a lower calf:cow ratio because parturition rates and late-June calf:cow ratios were lower in 2014 compared to 2010−2012. This ratio should also be viewed with caution.

During 2009–2012, we observed high bull:cow ratios ranging from 50:100 to 69:100. Similarly, calf:cow ratios were high ranging from 33:100 to 61:100 (Table 7). Bull:cow ratios were high since 1976 (≥50:100), indicating harvest had little effect on sex ratios (Lenart 2013). Calf:cow ratios also were high, implying summer calf survival rates were relatively high and contributed to the growth of the herd (Lenart 2013).

Distribution and Movements

Calving Distribution. Distribution of calving in 2013 was different compared to previous years because spring persisted approximately 1 month longer in the eastern Brooks Range and on the eastern coastal plain. It appeared that some CAH calved along the way to the calving grounds, from the north side of the Brooks Range to the calving grounds (Fig. 3). Peak of calving was estimated 2.5 days later compared to the overall mean for the previous 16 years (Table 5). Calving distribution in 2014 was similar to where CAH calved during 2009–2012, such that the greatest concentration in Unit 26B West was in the headwaters of the Kachemach River and the Itkillik Hills, and in Unit 26B East, along the Kadlersohilik River, just east of Franklin Bluffs with calving occurring as far east as the Katakturuk River (Fig. 3; Lenart 2013).

Summer and Early Fall Distribution. In 2012 CAH moved east toward the Canadian border along the coast during early July. By 20 July a large proportion of the satellite collars were in the foothills and mountains between Juniper Creek and the Canning River. By the end of August many of the caribou redistributed west of the Dalton Highway to the Itkillik River and north of the mountains. Generally, the caribou moved into the foothills during early September. However, by the end of September most of the caribou moved north onto the coastal plain before eventually moving south toward the mountains for rut.

In 2013 approximately 80% of CAH was east of the Sagavanirktok during postcalving, going as far east as the Canadian border in July and returning to west of the Canning River in early August. During late August and early September, CAH was mostly east of the road on the coastal plain between the Sagavanirktok and Canning Rivers. By the end of September, caribou were in the foothills of the Brooks Range near Accomplishment Creek and Ribdon River.

In 2014 caribou were distributed on the coastal plain between the Colville and Sadlerochit rivers with some caribou going into the foothills-mountains between the Sadlerochit and Kongakut rivers. By the middle of August, caribou were on the coastal plain, and by the end of August, caribou had moved back west and were distributed between the Colville and Canning rivers. Most of the herd east of the Dalton Highway had moved into the foothills by early September. Approximately 30% of the herd was on the west side of the Dalton Highway in early September and remained on the coastal plain until early October and migrated with Teshekpuk caribou south to the mountains, remaining west of the Dalton Highway. In most years CAH summer range extends from the Colville River to just east of the Katakturuk River and from the coast inland to the foothills. Postcalving movements during summer are influenced by insect abundance. Generally, when the temperature is >55°F and wind speed is <15 mph, caribou are found along the coast or on large gravel bars. Caribou tend to concentrate along the coast during warm weather but move inland on cool and windy days.

In general CAH begins migrating toward the foothills of the Brooks Range during August, and by September most caribou are found along the foothills of the Brooks Range, particularly around Toolik Lake, Galbraith Lake, Accomplishment Creek, the Ivishak River, and the upper Sagavanirktok River. When unusually warm temperatures persist in September, CAH sometimes remains on the coastal plain as far north as the White Hills and Franklin Bluffs, moving back and forth from the coastal plain to the foothills until early to mid-October.

Fall Distribution. During the rut in 2012, most of the caribou were on the north side of the Brooks Range in the upper Sagavanirktok and Lupine drainages. During the rut in 2013, most CAH were distributed between Bob Johnson and Ackerman Lakes and in the upper North Fork and upper Middle Fork Chandalar rivers. In 2014 most caribou were distributed between the upper North Fork Chandalar River, Your Creek, Middle Fork Chandalar, and Wind rivers. The proportion of CAH that migrated with the Teshekpuk caribou remained with TCH during rut and winter.

In general, during the rut in mid-October, large concentrations of caribou can be found on the south side of the Brooks Range on Chandalar Shelf near Your and Thru creeks, the North Fork and Middle Fork Chandalar River, and as far east as the East Fork Chandalar River. On the north side of the Brooks Range, caribou can be located around Galbraith Lake, Accomplishment Creek, and in the upper Sagavanirktok river drainage. During RY08–RY10 most of CAH were on the south side of the Brooks Range by mid-October, and in 2011 and 2012, most of CAH were on the north side of the Brooks Range during rut.

Winter Distribution. In RY12 most CAH were distributed between Twin Lakes and the upper North Fork and Middle Fork Chandalar rivers with some caribou as far east as the East Fork Chandalar River between the Wind and Junjik rivers. In RY13 most CAH caribou were distributed between Bob Johnson and Ackerman Lakes and further south into the northern part of the Hodzana Hills.

Since RY01 most of CAH (54–100%) wintered on the south side of the Brooks Range between the Dalton Highway and the East Fork Chandalar River, north of Hodzana Hills. However in RY07 only 2% of the herd wintered on the south side (Table 8; Lenart 2013). Caribou that wintered on the north side of the Brooks Range were usually found east of the Dalton Highway along the foothills in the upper Sagavanirktok River, Accomplishment Creek, and Lupine river drainages, with some caribou as far east as the Canning River. In some years CAH caribou can also be found west of the Dalton Highway in the foothills of the Brooks Range along the Itkillik, Kuparuk, and Toolik rivers.

Mixing with Other Herds.

Teshekpuk Caribou Herd — In 2012 a small proportion of mixing occurred during summer, early fall, and rut. During winter RY12, 1–2 satellite radiocollared caribou wintered with CAH. During summer and fall 2013, no mixing with TCH occurred. However, a small proportion of TCH mixed with CAH during winter in RY13. During postcalving and summer 2014, 1–3 satellite radiocollared TCH remained within CAH summer range. In late summer-early fall 2014 a proportion of CAH remained on the coastal plain and migrated with TCH during rut and remained with TCH during winter for RY14.

Mixing with Teshekpuk caribou frequently occurs in both summer and winter because herd ranges overlap along the Colville River in summer and early fall in particular. Annually since 2004, 1–5 radiocollared TCH cows have calved with CAH. These animals frequently switch back and forth between the Teshekpuk and Central Arctic herds from year to year. In addition, near the Colville river drainage, some cow caribou calve between the Teshekpuk and Central Arctic core calving grounds or on the boundary of the summer ranges and may spend the summer with either herd.

Porcupine Caribou Herd — In summer 2012 a small amount of mixing occurred near the Canadian border. Mixing did not occur during rut because most of CAH was still north of the Brooks Range during rut in 2012. Mixing did not occur during winter 2012–2013 because most of PCH was in Canada.

In 2013 approximately 11% of PCH mixed with CAH during postcalving-early summer on the coastal plain between the Canning River and the Hulahula River. Substantial mixing occurred again during rut and early winter west of the East Fork Chandalar River. In 2014, substantial mixing occurred late winter-early spring west of the East Fork Chandalar River and again during postcalving-early summer on the eastern coastal plain near the Canning River. Some mixing occurred during rut. During winter RY14, substantial mixing occurred near the East Fork Chandalar River.

Mixing with PCH during fall and winter occurred frequently during RY01–RY11, except in RY09 (Lenart 2013). Mixing with PCH during summer (postcalving aggregations) in 2010 and 2011 occurred along the coastal plain between the Canning River and Kaktovik (Lenart 2013). Mixing during summer occurred less frequently during 2002–2009 (Lenart 2013).

Western Arctic Caribou Herd — No mixing occurred with WAH in 2013 or 2014. Mixing with WAH occurs occasionally during winter, most recently during RY11 when portions of the WAH, TCH, and PCH wintered with CAH on the south side of the Brooks Range, east of the Dalton Highway (Lenart 2013). No mixing of CAH and WAH during summer has been documented.

MORTALITY

Harvest

Most harvest occurred in Unit 26B, but some also occurred in Units 24, 25A, 26A, and 26C. However, harvest in units other than Units 26B and 26C (in summer and early fall) may be recorded as harvest from a different herd (e.g., PCH). In addition, parts of TCH and WAH occasionally mixed with CAH in fall and winter, and some of these animals may have been harvested and recorded as harvest from CAH.

Season and Bag Limit (5AAC 85.025).

RY11–RY13 seasons and bag limits:

Unit and location	Resident open season and bag limit	Nonresident open season and bag limit
Unit 25A, those portions east of the east bank of the East Fork Chandalar River extending from its confluence with the Chandalar River upstream to Guilbeau Pass, Unit 25B, and the remainder of Unit 25D.	1 Jul–30 Apr; 10 caribou	1 Aug–30 Sep; 1 bull

Unit and location	Resident open season and bag limit	Nonresident open season and bag limit
Remainder of Unit 25A	1 Jul–30 Jun; 10 caribou; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May
Unit 26B northwest, that portion north of 69°30′ and west of the east bank of the Kuparuk River to a point at 70°10′N latitude 149°04′W longitude, then west approximately 22 miles to 70°10′ latitude 149°56′W longitude, then following the east bank of the Kalubik River to the Arctic Ocean.	1 Jul–30 Jun; 5 caribou per day; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Apr; 5 caribou
Unit 26B, south of 69°30′N latitude	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May
Remainder of Unit 26B	1 Jul–30 Apr; 5 caribou	1 Jul–30 Apr; 5 caribou
Unit 26C	1 Jul–30 Apr and 23–30 Jun; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Aug–30 Sep; 1 bull

Additional state regulations that affect caribou hunting include special restrictions along the Dalton Highway. These restrictions conform to Alaska Statutes (AS) 16.05.789 and 19.40.210. The Dalton Highway Corridor Management Area (DHCMA) extends 5 miles from each side of the Dalton Highway from the Yukon River to the Prudhoe Bay Closed Area, which encompasses most of the Prudhoe Bay oil field. The DHCMA is closed to hunting with firearms. Big game, small game, and fur animals can be taken by bow and arrow only by hunters who possess a valid Alaska Bowhunter Education Program card or a recognized equivalent certification. In addition, no motorized vehicles except licensed highway vehicles on specified publicly maintained roadways, aircraft, and boats may be used to transport game or hunters within the DHCMA.

Federal subsistence hunting regulations also apply on federal lands within the DHCMA. Beginning in RY92 federal regulations allowed the use of firearms for hunting on federal land within the DHCMA by qualified rural subsistence hunters. During the first year of the regulation, qualified hunters included any rural resident. Subsequently, qualified hunters included residents of the corridor and the nearby villages of Anaktuvuk Pass, Wiseman, Nuiqsut, and Kaktovik.

Alaska Board of Game Actions and Emergency Orders. No regulatory changes were made to caribou seasons and bag limits within CAH range during RY11−RY13.

During the March 2010 board meeting, the season and bag limit for caribou was changed in Units 26B and 25A (winter range of CAH). In northwestern Unit 26B, the bag limit for resident hunters was changed from 10 caribou to 5 caribou per day, and the season was changed from 1 July–30 April to no closed season; except cows could be taken only during 1 July–15 May. This change in seasons and bag limits was comparable to Unit 26A caribou regulations reflecting similar hunting patterns and regulations for residents of Nuiqsut in particular. The nonresident season and bag limit did not change in this portion of Unit 26B. In Unit 26B south of latitude 69°30′ North, both the resident and nonresident seasons were changed from 1 July–30 April to no closed season. Bag limits were liberalized for both resident and nonresident hunters to a bag limit of 5 caribou, and cow caribou could be taken only during 1 July–15 May. This was a change for resident hunters from a bag limit of 2 caribou, and cow caribou could only be taken during 1 October–30 April and for nonresident hunters from a bag limit of 2 bulls. The bag limit was changed similarly in the remainder of Unit 26B, but the season continued to end 30 April because this portion of Unit 26B includes the calving grounds of CAH.

Regulations in Unit 25A were also changed to increase harvest opportunity on the winter range of CAH. In Unit 25A east of the east bank of the East Fork Chandalar River extending from its confluence with the Chandalar River upstream to Guilbeau Pass, regulations were changed to reflect appropriate harvest regimes for PCH range, similar to changes made in Unit 26C. A summary of these changes are described by Caikoski (2011). In the remainder of Unit 25A, where CAH winters, the resident and nonresident seasons were changed from 1 July–30 April to no closed seasons; however, only bull caribou could be taken 16 May–30 June. The bag limits remained 10 caribou for resident hunters and 5 caribou for nonresident hunters.

Hunter Harvest, Success, and Residency. Most of the harvest of CAH caribou occurs in Unit 26B, and all summaries related to harvest hereafter (unless otherwise noted) refers to harvest in Unit 26B.

In RY12, 1,430 hunters reported hunting and 722 hunters reported harvesting 1,007 caribou (50% success rate; Tables 9 and 10). In RY12, 522 hunters harvested 1 caribou, 143 hunters harvested 2 caribou each, 37 hunters harvested 3 caribou each, 12 hunters harvested 4 caribou each, and 8 hunters harvested 5 caribou each (Table 11).

In RY13, 1,423 hunters reported hunting, 616 hunters reported harvesting 854 caribou (43% success rate; Tables 9 and 10). In RY13, 433 hunters harvested 1 caribou, 143 hunters harvested 2 caribou each, 29 hunters harvested 3 caribou each, 7 hunters harvested 4 caribou each, and 4 hunters harvested 5 caribou each (Table 11). Reported harvest steadily increased beginning in RY04 (Table 9), but was <2% of the estimated CAH population level. Success rates in RY12 and RY13 were similar to previous years, and success by hunters who hunt CAH has always been good (at least 40% and frequently ≥50%; Table 10). Fluctuation in success rates and harvest numbers are related to caribou distribution and accessibility.

In RY12, 1,126 Alaska residents reported hunting, and 533 resident hunters reported harvesting 771 caribou (47% success rate; Table 10). A total of 295 nonresidents reported hunting, and 188

of these reported harvesting 235 caribou (64% success rate). In RY13, 983 residents reported hunting, and 354 resident hunters reported harvesting 516 caribou (36% success rate; Table 10). A total of 424 nonresidents reported hunting, and 255 nonresident hunters reported harvesting 328 caribou (60% success rate). A small proportion of hunters were nonresidents (21% in RY12 and 30% in RY13; Table 10). Nonresidents took 23% and 38% of the harvest in RY12 and RY13 respectively.

Bowhunters accounted for 28% and 22% of the harvest in RY12 and RY13, respectively (Table 9). They accounted for an average of 26% of the harvest during the previous 5 years (RY09–RY13; Table 9). The success of bowhunters using the DHCMA is related to caribou distribution.

Reported harvest of cows during RY12 and RY13 was 275 and 131, respectively. Harvest of cows was higher beginning RY10 compared to previous years because the cow season was lengthened in RY10 (Table 9). Cow harvest is <1% of the herd and currently has no impact on herd growth.

During RY09–RY13, a range of 8–27 caribou were reported harvested in Unit 25A west of the East Fork Chandalar River during October through early May. CAH winters in this region and frequently mixes with PCH. All harvest in Unit 25A is reported in the PCH management report as harvest from PCH; however, some or all of the 8–27 caribou may have been CAH.

Braem et al. (2011) estimated a 5-year average of 61 caribou harvested annually (RY02–RY06) by Nuiqsut residents, who likely represent most of the local harvesters. Because Nuiqsut residents tend to hunt west of their village, only 13% of the total harvest was estimated to be from CAH, based on the timing and location of harvest and distribution of caribou (Braem et al. 2011). Additional local harvest of CAH likely occurs in other units when the caribou are distributed near Kaktovik in summer (Unit 26C) and Wiseman and Coldfoot (Unit 24A) and Arctic Village in fall and winter (Unit 25A).

Harvest Chronology. Most reported harvest occurred in August during RY12 (58%) and RY13 (54%), similar to previous years (Table 12). The remaining harvest occurred primarily in September (25% and 28%). In RY11 the number of caribou harvested in April was substantially higher (159) compared to 7–67 during RY00–RY10, RY12, and RY13. Some of this increase was likely due to a change in bag limit from 3 to 5 beginning in RY10 and was likely related to availability of caribou in Unit 26B in April. Harvest by Nuiqsut residents typically occurs in July, August, September, March, and April (Braem et al. 2011). A little more than 50% of the harvest taken by Nuiqsut hunters occurs in summer and fall and is made up of both Teshekpuk and Central Arctic caribou.

Transport Methods. Because of restrictions on the use of off-road vehicles within the DHCMA and the remoteness of Unit 26B, most hunters used highway vehicles and aircraft for access. During RY12 and RY13 the proportion of successful hunters who used highway vehicles to access caribou was 43% and 33%, respectively (Table 13). The proportion of successful hunters who used airplanes in RY12 was 32% and in RY13 was 40%. The proportion of successful hunters using airplanes increased beginning in RY07 (Table 13). The use of boats (including airboats), particularly in the Ivishak and Echooka drainages, to access caribou is also common,

and the proportion of successful hunters who used boats and airboats combined averaged approximately 22% during RY09–RY13. Few hunters used horses, dogs, snowmachines, or all-terrain vehicles as a transport method (Table 13), except in RY11, when a higher proportion of caribou were harvested using dogs (6%) as a transport method in April, compared to previous years. Residents of Unit 26 used boats during summer and fall and snowmachines during the spring. Nuiqsut residents primarily hunted from the Colville River and Fish Creek in Unit 26A during summer, and Kaktovik residents hunted along the coast to Camden Bay (ADF&G files, Fairbanks).

Natural Mortality

Radiocollared caribou were relocated infrequently in fall and winter, making it difficult to accurately estimate adult mortality or determine causes of mortality. Natural mortality of CAH caribou during calving and postcalving is relatively low because calving occurs in areas near the coast where there are few wolves, and predation by golden eagles appears to be rare compared to the Porcupine caribou herd (Murphy and Lawhead 2000). Winter mortality was probably higher during the 1990s than in previous years because more CAH caribou wintered on the south side of the Brooks Range, where wolves were more abundant, and snowfall is deeper than on the north side. However, there have been no studies of predation rates on CAH. During RY97–RY13, we determined minimum mortality rates of 4–33% among radiocollared cow caribou ≥1-year old (Table 14).

In RY12 we determined that 49 CAH females ≥1-year old were alive beginning 1 July 2012. During the regulatory year, we determined that 16 CAH female caribou ≥1-year old died. This resulted in a mortality rate of 33% for CAH females ≥1-year old for RY12. Additional mortalities included 3 adult females; 11 of 20 short yearlings (11-month-old calves) that were radiocollared in April 2013 died by 30 June 2013; and 5 adult males. Two yearling caribou that were collared in April 2012 were found dead with the Teshekpuk caribou and were assigned as Teshekpuk caribou. The spring of 2013 persisted approximately 1 month later than usual, and CAH experienced high mortality in adult females and 11-month-old calves immediately following the spring.

In RY13 we determined that 44 radiocollared CAH females ≥1-year old were alive beginning 1 July 2013. During the regulatory year, we determined that 10 radiocollared CAH female caribou ≥1-year old died. This resulted in a mortality rate of 23% for CAH females ≥1-year old for RY13. Additional mortalities included 1 adult female during recaptures; 2 of 22 short yearlings (11-month-old calves) that were radiocollared in April 2014; and 4 adult males (2 with TCH). Two 2-year-old caribou that were collared in April 2012 were found dead with the Teshekpuk caribou in October 2013 and were assigned as Teshekpuk caribou. One yearling caribou that had not been heard since captures in April 2013 was found dead with the Porcupine caribou and was assigned as Porcupine caribou. Similarly, a caribou radiocollared in 2008 and subsequently found with the Porcupine caribou was found dead this year with PCH and was assigned to PCH.

In RY14 we determined that 60 radiocollared CAH females ≥1-year old were alive beginning 1 July 2014. During the regulatory year, we determined that 12 radiocollared CAH female caribou ≥1-year old died. This resulted in a mortality rate of 20% for CAH females ≥1-year old for RY14. Additional mortalities included 4 males (2 were with the TCH), 4 females assigned to

PCH, 2 adult females captured in April 2015 that were dead in May 2015, and 1 11-month-old calf that was captured in April 2014 and dead by the end of June.

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates, high early summer calf survival, and low adult mortality during 1998–2008 contributed to a population increase of approximately 12% annually in 10 years (Tables 1–4, 6, and 14). During 2008–2013 the population ceased increasing and may be slightly decreasing. The lower population size observed in 2013 was likely related to the late spring in 2013 when high mortality rates for adult and yearling females were observed. Distribution during calving and postcalving during 2002–2012 and 2014 was similar among years. In 2013 caribou calved further south likely because spring lasted approximately 1 month longer. During summers CAH was distributed mostly east of Prudhoe Bay, particularly near the Canning River, and further east in some years. CAH appears to have expanded its winter range on the south side of the Brooks Range south into more timbered areas and east toward Arctic Village. In some years, substantial overlap with PCH occurs on the wintering grounds.

Reported harvest increased beginning in RY00 but remained <2% of the herd (Table 9). Most hunters who lived outside of Unit 26 primarily used highway vehicles as a means of access, and most harvest occurred in August. However, the use of boats (including airboats) and airplanes has increased in recent years. The DHCMA is valued by bowhunters because caribou are accessible from the road, and there is no competition with rifle hunters within 5 miles of the road. Harvest by bowhunters averaged 29.5% of the overall harvest during RY00–RY13. Hunters who resided in Unit 26 used boats to take approximately half of their caribou harvest in July, August, and September and used snowmachines in March and April to take the other half of their harvest. CAH has provided substantial hunting opportunity. Regulatory change in 2010 to increase the bag limit and liberalize the season added to this opportunity. In addition, liberalizing the season and bag limit for RY10 did not negatively affect the bull:cow ratio in the population. We observed 56 and 41 bulls:100 cows during the most recent fall composition surveys in 2012 and 2014.

We met our first goal, to minimize adverse effects of development on caribou by working with various industry companies in developing mitigation measures to decrease disturbance of caribou, particularly during calving. We met our second goal, to maintain a population level that will support a harvest of at least 1,400 caribou without precluding population growth, because the herd grew, and sustainable harvest exceeded 1,400. We met our third goal, maintaining an opportunity for a subsistence harvest, by providing liberal hunting seasons. We met our fourth goal, to maintain viewing and photographing opportunities, because these opportunities were adequate when taking into account the unpredictability of caribou movements.

We met our first and third objectives, to maintain a population of at least 28,000–32,000 caribou and a harvest of at least 1,400 caribou if the population is ≥28,000. In 2013 the population was 50,753±9,829 caribou. This population size could provide for a harvest >1,400 caribou. We also met our second objective, to maintain accessibility of seasonal ranges for CAH caribou. Based on radiotelemetry and anecdotal observations, CAH animals were able to access calving, postcalving, summer, fall, and winter ranges. We met our fourth objective, to maintain a ratio of at least 40 bulls:100 cows. In October 2012 the bull:cow ratio was 56 bulls:100 cows, and in

October 2014, the bull:cow ratio was 41 bulls:100 cows; noting that the 2014 data should be viewed with caution because of small sample size (n = 2,004) and potential mixing with PCH. We met our sixth objective, to reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. Few conflicts between consumptive and nonconsumptive use appeared to arise during RY12–RY13.

REFERENCES CITED

Arthur, S. M., and P. A. Del Vecchio. 2009. Effects of oil field development on calf production and survival in the Central Arctic herd. Alaska Department of Fish and Game, Division of Wildlife Conservation, Final Research Technical Report 1 July 2001–30 June 2006, Federal Aid in Wildlife Restoration Project 3.46, Juneau.

Boertje, R. D., C. L. Gardner, K. A. Kellie and B. D. Taras. 2012. Fortymile caribou herd: Increasing numbers, declining nutrition, and expanding range. Alaska Department of Fish and Game, Wildlife Technical Bulletin 14, ADF&G/DWC/WTB-2012-14, Juneau.

Braem, N. M., S. Pedersen, J. Simon, D. Koster, T. Kaleak, P. Leavitt, J. Patkotak, and P. Neakok. 2011. Monitoring of annual caribou harvests in the National Petroleum Reserve in Alaska: Atqasuk, Barrow, and Nuiqsut, 2003–2007. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 361, Fairbanks.

Caikoski, J. R. 2011. Units 25A, 25B, 25D, and 26C caribou. Pages 251–270 [*In*] P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Project 3.0, Juneau.

Cameron, R. D. 1983. Issue: caribou and petroleum development in arctic Alaska. Arctic 36(3):277–231.

Cameron, R. D., D. J. Reed, J. R. Dau, and W. T. Smith. 1992. Redistribution of calving caribou in response to oil field development on the Arctic slope of Alaska. Arctic 45(4):338–342.

Cameron, R. D., and W. T. Smith. 1992. Distribution and productivity of the Central Arctic caribou herd in relation to petroleum development: Case history studies with a nutritional perspective. Alaska Department of Fish and Game, Division of Wildlife Conservation, Research Progress Report 1 July 1991–30 June 1992, Federal Aid in Wildlife Restoration Study 3.35, Juneau.

Cameron, R. D., and K. R. Whitten. 1979. Seasonal movements and sexual segregation of caribou determined by aerial survey. Journal of Wildlife Management 43:626–633.

Carroll, G. M. 2007. Unit 26A Teshekpuk caribou herd. Pages 262–283 [*In*] P. Harper, editor. Caribou management report of survey–inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Project 3.0, Juneau.

Cochran, W. G. 1977. Sampling techniques. 3rd Edition. John Wiley & Sons, New York.

Curatolo, J. A., and S. M. Murphy. 1986. The effects of pipelines, roads, and traffic on the movement of caribou, *Rangifer tarandus*. Canadian Field-Naturalist 100:218–224.

Dau, J. 2007. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A Western Arctic caribou herd. Pages 174–231 [*In*] P. Harper, editor. Caribou management report of survey–inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Project 3.0, Juneau.

Davis, J. L., P. Valkenburg, and S. J. Harbo Jr. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Alaska Department of Fish and Game, Division of Game, Research Final Report 1 July 1978–30 June 1979, Federal Aid in Wildlife Restoration Job 3.25R, Juneau.

Gasaway, W. C., S. D. DuBois, D. J. Reed, and S. J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Institute of Arctic Biology, Biological Papers of the University of Alaska, No. 22, Fairbanks.

Lawhead, B. E., and C. B. Johnson. 2000. Surveys of caribou and muskoxen in the Kuparuk–Colville region, Alaska, 1999, with a summary of caribou calving distribution since 1993. Unpublished Final Report prepared for Phillips Alaska, Inc. ABR, Inc., Fairbanks.

Lenart, E. A. 2013. Units 26B and 26C caribou. Pages 356–389 [*In*] P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2010–30 June 2012. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2013-3, Juneau.

Lunn, D., D. Spiegelhalter, A. Thomas, and N. Best. 2009. The BUGS project: Evolution, critique and future directions. Statistics in Medicine 28:3049–3067. doi:10.1002/sim.3680

Murphy, S. M., and B. E. Lawhead. 2000. Caribou. Pages 59–84 [*In*] J. C. Truett and S. R. Johnson, editors. The natural history of an arctic oil field – Development and the Biota. Academic Press, San Diego, California.

Rivest, L-P, S. Couturier, and H. Crepeau. 1998. Statistical methods for estimating caribou abundance using postcalving aggregations detected by radio telemetry. Biometrics 54:865–876.

Smith, W. T., and R. D. Cameron. 1983. Responses of caribou to industrial development on Alaska's Arctic Slope. Acta Zoologica Fennica 175:43–45.

Smith, W. T., and R. D. Cameron. 1985a. Factors affecting pipeline crossing success of caribou. Pages 40–46 [*In*] A. M. Martell and D. E. Russell, editors. Caribou and Human Activity. Proceedings of 1st North American Caribou Workshop, 28–29 September 1983, Whitehorse, Yukon. Canadian Wildlife Service, Special Publication, Ottawa, Canada.

Smith, W. T., and R. D. Cameron. 1985b. Reactions of large groups of caribou to a pipeline corridor on the Arctic coastal plain of Alaska. Arctic 38:53–57.

Valkenburg, P. 1993. Central Arctic caribou. Pages 225–233 [*In*] S. M. Abbott, editor. Caribou management report of survey and inventory activities 1 July 1990–30 June 1992. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Study 3.0, Juneau.

Valkenburg, P., T. H. Spraker, M. T. Hinkes, L. H. Van Daele, R. W. Tobey, and R. A. Sellers. 2000. Increases in body weight and nutritional status of transplanted Alaskan caribou. Pages 133–138 [*In*] R. E. Haugerud, editor. Proceedings of 8th North American Caribou Workshop, 20–24 April 1998, Whitehorse, Yukon, Canada. Rangifer, Special Issue 12.

Whitten, K. R. 1991. Antler retention and udder distension as indicators of parturition in free-ranging caribou. Pages 170–173 [*In*] C. E. Butler and S. P. Mahoney, editors. Proceedings of 4th North American Caribou Workshop, 31 October–3 November 1989, St John's, Newfoundland. Newfoundland and Labrador Wildlife Division, St. John's, Canada.

Whitten, K. R. 1995. Antler loss and udder distention in relation to parturition in caribou. Journal of Wildlife Management 59(2):273–277.

Whitten, K. R., and R. D. Cameron. 1983. Movements of collared caribou, *Rangifer tarandus*, in relation to petroleum development on the Arctic Slope of Alaska. Canadian Field-Naturalist 97(2):143–146.

Whitten, K. R., and R. D. Cameron. 1985. Distribution of caribou calving in relation to the Prudhoe Bay oil field. Pages 35–39 [*In*] A. M. Martell and D. E. Russell, editors. Caribou and Human Activity. Proceedings of 1st North American Caribou Workshop, Whitehorse, Yukon, 28–29 September 1983. Canadian Wildlife Service, Special Publication, Ottawa, Canada.

Wolfe, S. A. 2000. Habitat selection by calving caribou of the Central Arctic herd, 1980–1995. Thesis, University of Alaska Fairbanks.

PREPARED BY:

Elizabeth A. Lenart
Wildlife Biologist III

APPROVED BY:

Jackie J. Kephart
Assistant Management Coordinator

REVIEWED BY:

Torsten W. Bentzen
Wildlife Biologist III

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

Lenart, E. A. 2015. Units 26B and 26C caribou. Chapter 18, pages 18–1 through 18–38 [*In*] P. Harper and L. A. McCarthy, editors. Caribou management report of survey and inventory activities 1 July 2012–30 June 2014. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2015-4, Juneau.

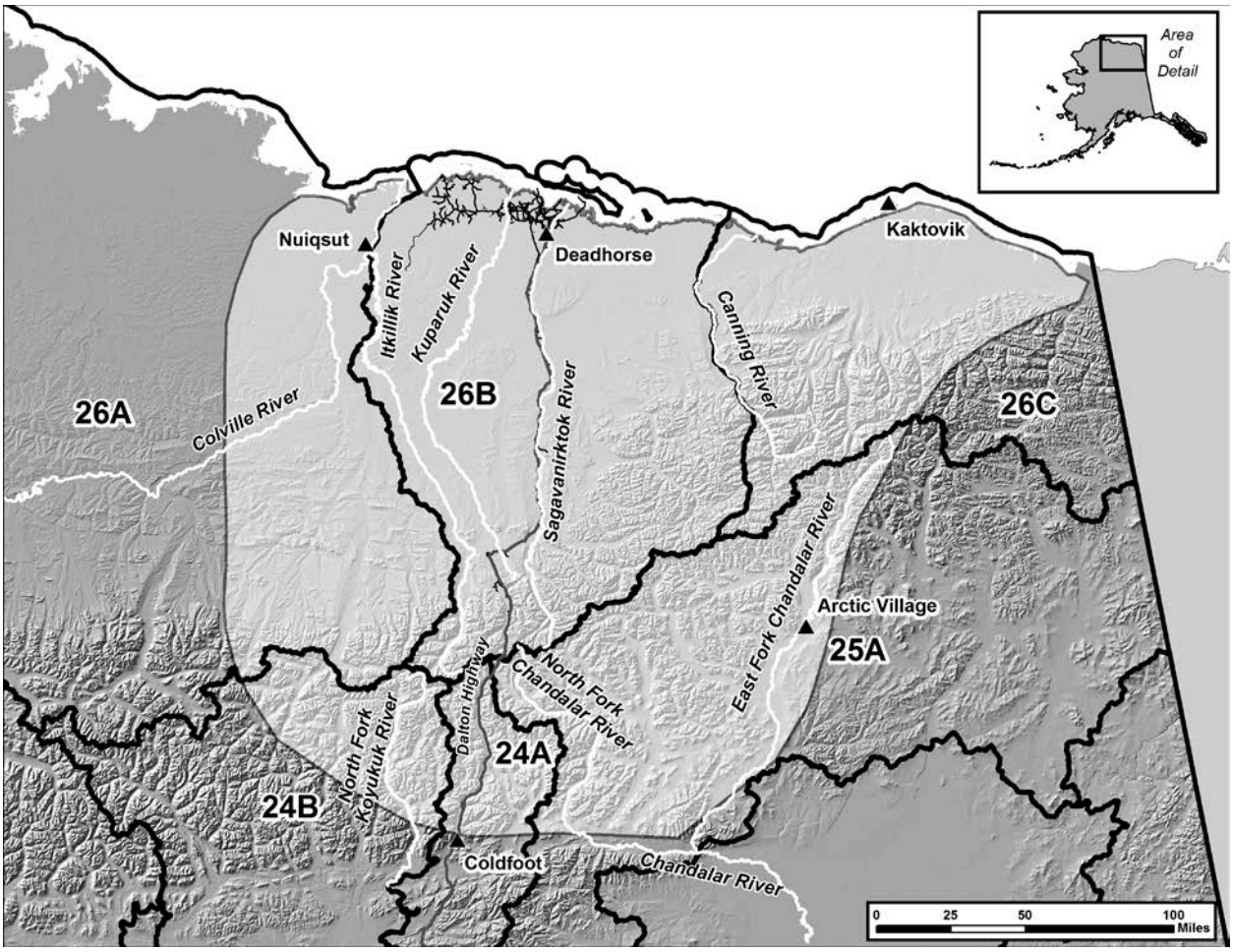

Figure 1. Range of the Central Arctic caribou herd, Alaska, 2006–2014.

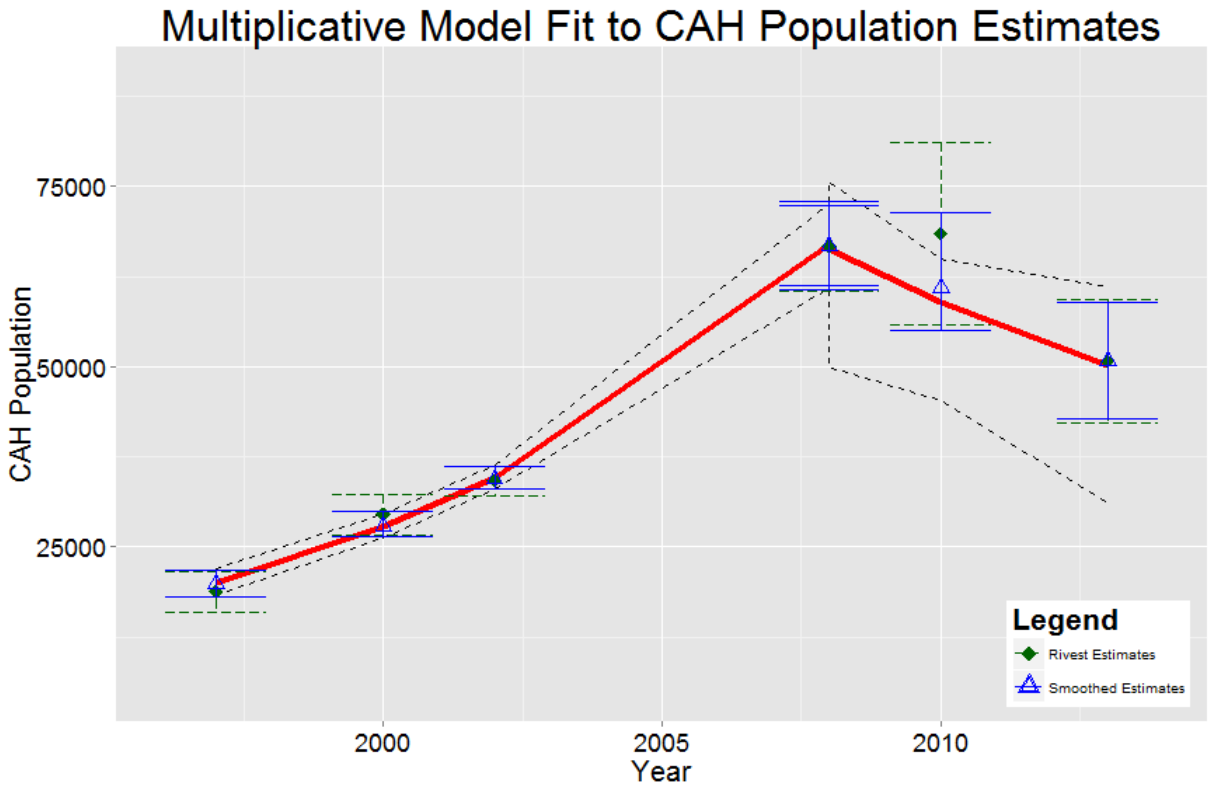

Figure 2. Central Arctic caribou (Alaska) population trend estimation derived from adjusted Rivest estimates and associated variances. A multiplicative mixed effects model fit using Bayesian methods was applied to estimate lambda during 1997–2008 and 2008–2013. Lambda is depicted by the trend line (solid thick line). The dashed error bar along the trend line represents a 95% credible interval. During 1997–2008 the 95% credible interval for lambda was 1.10–1.13 (point estimate = 1.12). During 2010–2013 the 95% credible interval was 0.85–1.01 (point estimate = 0.95). The solid error bars around the smoothed (triangle) estimates represents a 95% credible interval. The dashed error bars around the Rivest estimates (diamond) represents a 95% credible interval.

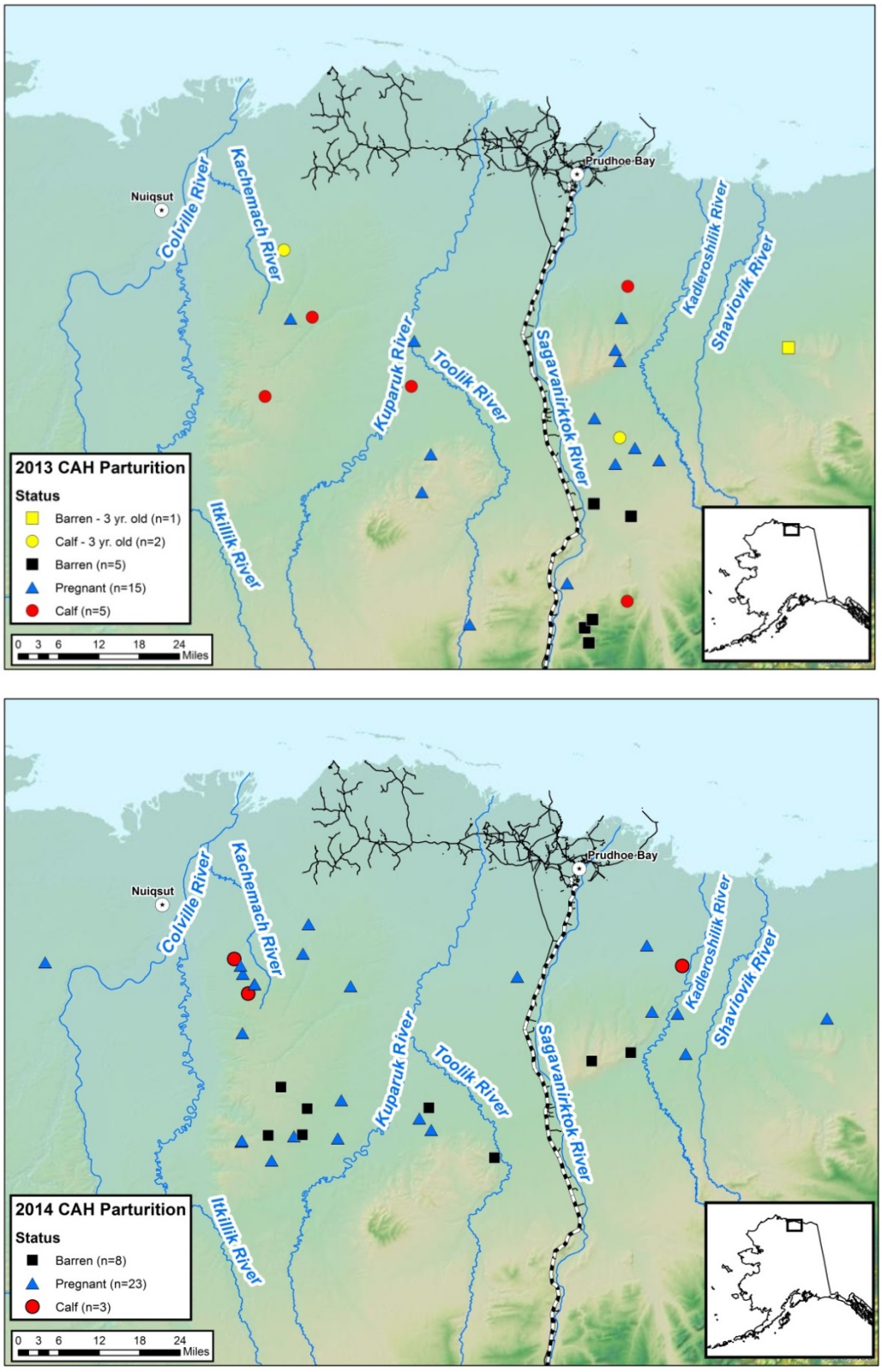

Figure 3. Locations of radiocollared Central Arctic caribou females ≥3-years old during calving 2–6 June 2013 (top) and 2–3 June 2014 (bottom), Alaska.

Table 1. Central Arctic herd estimated population size, Alaska, 1978–2013.

Year	Date	Method[a]	No. CAH[b] radio collars located (no. missing)	No. of groups photographed (located)[c]	No. of groups with radio collars	No. PCH[b] or TCH[b] radio collars (Est. no. caribou)	Minimum count[d]	Estimated population size (SE)[e]	Confidence interval (population range)
1978	Jul	STS	–[f]	unk	unk	unk	5,000		
1981	Jul	AC	–[f]	unk	unk	unk	8,537		
1983	21 Jul	APDCE	–[f]	unk	unk	unk	12,905		
1991	18–20 Jun	RSQS	unk	unk	unk	unk	n/a	19,046 (n/a)	90% (14,667–23,414)
1992	8–9 Jul	APDCE	unk	9 (10)	unk	unk	23,444		
1995	13 Jul	APDCE	unk	12 (42)	unk	unk	18,100		
1997	19–20 Jul	APDCE	41 (3)	22 (22)	12	0	19,730	18,824 (1,431)	95% (15,674–21,974)
2000	21 Jul	APDCE	81 (4)	22 (24)	22	0	27,128	29,519 (1,449)	95% (26,504–32,533)
2002	16 Jul	APDCE	76 (4)	9 (9)	9	0	31,857	34,211 (1,050)	95% (31,790–36,361)
2008	2–3 Jul	APDCE	62 (0)	14 (18)	12	2 PCH (3,379)	66,772	66,666 (3,206)	95% (59,609–73,722)
2010	9 Jul	APDCE	57 (2)	16 (18)	14	2 PCH (3,379), 2 TCH (1,916)	70,034	68,442 (6,420)	95% (54,571–82,312)
2013	4–5 Jul	APDCE	54 (0)	10 (12)	10	10 PCH (21,914)	70,364	50,753 (4,345)	95% (40,924–60,582)

[a] STS = systematic transect surveys; AC = aerial count; APDCE = aerial photo direct count extrapolation (Davis et al. 1979); RSQS = random stratified quadrat survey (Valkenburg 1993).

[b] CAH = Central Arctic herd; PCH = Porcupine caribou herd; TCH = Teshekpuk caribou herd.

[c] Groups located include single caribou.

[d] Minimum number of caribou observed during survey; may include caribou from other herds.

[e] In 1991, analysis used was Gasaway et al. 1986. During 1997–2013, analysis used was Rivest et al. 1998. In years that PCH or TCH caribou radio collars were present, we adjusted the "Rivest" estimate to account for PCH or TCH radio collars (E. A. Lenart, Wildlife Biologist, ADF&G memorandum [2013 Central Arctic caribou photocensus results], 8 Aug 2014, Fairbanks).

[f] No radio collars were deployed.

Table 2. Central Arctic caribou, Alaska, estimate of lambda at the 90% and 95% credible intervals derived from a multiplicative mixed effects model using Bayesian methods on adjusted Rivest estimates and their associated variances for years 1997–2008 and 2008–2013.

Time period (yr)	Point estimate of λ	LCI[a] 90%	UCI[b] 90%	LCI 95%	UCI 95%
1997–2008	1.116	1.103	1.128	1.100	1.131
2008–2013	0.9453	0.9004	0.9864	0.8561	1.011

[a] LCI = lower credible interval.
[b] UCI = upper credible interval.

Table 3. Central Arctic herd caribou percent parturition of radiocollared females, Alaska, 1997–2014.

		Percent parturition by unit for females ≥4-years old[a]			
		Unit		Unit 26B combined	Total
Year	Date(s)	26B West (*n*)	26B East (*n*)	±90% CI	(*n*)
1997	6 Jun	77 (13)	46 (13)	61 ±16.0	(26)
1998	3–4 Jun	93 (14)	83 (12)	88 ±10.5	(26)
1999	5, 9 Jun	94 (16)	92 (12)	93 ±8.2	(28)
2000	6–7 Jun	89 (9)	100 (16)	96 ±6.6	(25)
2001	3–9 Jun	90 (20)	93 (15)	91 ±7.9	(35)
2002	4–7 Jun	89 (27)	96 (23)	92 ±6.4	(50)
2003	30 May–8 Jun	93 (29)	100 (25)	96 ±4.3	(54)
2004	31 May–11 Jun	88 (40)	96 (28)	91 ±5.7	(68)
2005	31 May–9 Jun	86 (35)	80 (25)	83 ±8.0	(60)
2006	29 May–8 Jun	94 (32)	100 (22)	96 ±4.3	(54)
2007	2–6 Jun	88 (32)	100 (24)	93 ±5.7	(56)
2008	2–4 Jun	100 (26)	96 (20)	98 ±3.6	(46)
2009	1–3 Jun	74 (19)	76 (25)	75 ±10.9	(44)
2010	2–5 Jun	91 (11)	100 (26)	97 ±4.4	(37)
2011	2–4 Jun	83 (12)	96 (23)	91 ±7.9	(35)
2012	3, 7 Jun	83 (12)	100 (12)	92 ±13.4	(24)
2013	2–6 Jun	100 (9)	69 (16)	80 ±12.6	(25)
2014	2–3 Jun	77 (26)	75 (8)	76 ±8.2	(34)

[a] Data for females ≥4-years old were stratified based on the location of caribou east and west of the Sagavanirktok River. In some years, we captured unknown-age adult females that were included in the ≥4-years old sample.

Table 4. Central Arctic caribou herd annual parturition rates and 5-year moving weighted average of proportion pregnant and late June calf:cow ratios for 3-year-olds, Alaska, 1999–2013.

	3-Year-old percent parturition				3-Year-old late June calf:cow ratios (calves:100 cows)	
Year	%	*n*	5-Year moving weighted average proportion pregnant ±95% CI	Total *n* in 5th year	Calves:100 cows ±90% CI	*n*
1999	100	7			33 ±34.6	6
2000	80	10			60 ±26.9	10
2001	77	13			38 ±23.0	13
2002	77	12			57 ±22.6	14
2003		0	82 ±12	42		0
2004	88	8	80 ±12	43		0
2005	86	7	81 ±12	40	40 ±40.3	5
2006	71	7	80 ±13	34	71 ±30.5	7
2007	100	4	85 ±14	26	75 ±41.1	4
2008		0	85 ±14	26		0
2009	60	5	78 ±17	23	60 ±40.3	5
2010	60	5	71 ±19	21	40 ±40.3	5
2011	50	4	67 ±22	18	50 ±47.5	4
2012	71	7	62 ±21	21	43 ±33.2	7
2013	75	4	64 ±19	25	50 ±47.5	4

Table 5. Estimated date of peak of calving[a] for Central Arctic caribou herd, Alaska, 1997–2014.

Year	Survey dates	Number of radiocollared parturient cows ≥3-years old	Estimated dates for peak of calving[b]	Point estimate for calving date[c]
1997	6 Jun	16	4–5 Jun	4.5
1998	3–4 Jun	25	1–3 Jun	2.0
1999	5, 9 Jun	33	8– Jun	8.5
2000	6–7 Jun	32	8–10 Jun	9.0
2001	3–8 Jun	43	9–10 Jun	9.5
2002	4–7 Jun	55	4–6 Jun	5.0
2003	30 May–8 Jun	52	4–6 Jun	5.0
2004	31 May–11 Jun	69	4–6 Jun	5.0
2005	31 May–9 Jun	56	4–6 Jun	5.0
2006	29 May–8 Jun	57	4–6 Jun	5.0
2007	2–6 Jun	56	7–8 Jun	7.5
2008	2–4 Jun	32	1–2 Jun	1.5
2009	1–3 Jun	36	4 Jun	4.0
2010	2–5 Jun	39	2–5 Jun	3.5
2011	2–3 Jun	34	4–5 Jun	4.5
2012	3, 7 Jun	27	6–7 Jun	6.5
2013	3–6 Jun	22	7–8 Jun	7.5
2014	2–3 Jun	26	4–6 Jun	5.0

[a] Peak of calving was defined as the date when 50% or more of the radiocollared parturient cows ≥3-years old gave birth.

[b] For years 2002–2006, radiocollared females were relocated daily or every 2–3 days until a calf was present (Arthur and Del Vecchio 2009). If observations of females determined parturient with no calf were followed by ones with a calf present, the range of days between observations was determined as the estimated date the females had calved. For years 1997–2000 and 2007–2014, the estimated date of peak of calving was determined using the following criteria based on the proportion of ≥3-year-old females with calves to parturient females ≥3-years old at the last date of radiotracking: 1) ≤25%, a span of 3 days was added following the last radiotracking date; 2) 26–39%, 2 days were added; 3) 40–49%, 1 day was added; 4) 51–59%, 1 day was subtracted and included the last radiotracking date; 5) 60–74%, 2 days were subtracted; and 6) ≥75%, a span of 3 days were subtracted (Lenart 2013).

[c] The date of the point estimate was determined by deriving the midpoint between the estimated dates for peak of calving.

Table 6. Central Arctic herd caribou late June calf:cow ratios (calves:100 cows) of radiocollared females ≥4-years old, Alaska, 1997–2014.

		Late June calf:cow ratios (calves:100 cows) by unit for females ≥4-years old[a]			
		Unit		All Unit 26B	Total
Year	Date(s)	26B West[b] (*n*)	26B East (*n*)	±90% CI	(*n*)
1997	29–30 Jun	85 (13)	64 (11)	75 ±14.8	(24)
1998	29–30 Jun	79 (14)	80 (15)	79 ±12.6	(29)
1999	22–24 Jun	92 (13)	67 (12)	80 ±13.4	(25)
2000	17–19 Jun	79 (14)	72 (18)	75 ±12.8	(32)
2001	23–25 Jun	78 (18)	81 (16)	79 ±11.6	(34)
2002	23–25 Jun	78 (28)	83 (24)	81 ±9.1	(52)
2003	24–26 Jun	77 (26)	78 (27)	77 ±9.5	(53)
2004[c]	24 Jun	78 (27)	87 (17)	82 ±9.7	(44)
2005	24 Jun	77 (35)	61 (23)	71 ±9.7	(58)
2006	23–24 Jun	82 (22)	94 (33)	89 ±7.0	(55)
2007	22–23 Jun	87 (32)	71 (21)	81 ±8.9	(53)
2008	23–24 Jun	100 (3)	90 (42)	91 ±7.0	(45)
2009	23–24 Jun	56 (17)	48 (25)	52 ±12.8	(42)
2010	22–23 Jun	92 (12)	81 (27)	85 ±9.6	(39)
2011	20–21 Jun	80 (10)	75 (20)	77 ±12.9	(30)
2012	26–27 Jun	64 (11)	73 (15)	69 ±15.1	(26)
2013	26–27 Jun	60 (5)	55 (20)	56 ±16.7	(25)
2014	24–25 Jun	75 (24)	40 (10)	65 ±13.7	(34)

[a] Data for females ≥4-years old were stratified based on the location of caribou east and west of the Sagavanirktok River. In some years, we captured unknown-age adult females and these were included in the ≥4-years old sample.
[b] Unit 26B West is west of the west bank of the Sagavanirktok River and Unit 26B East is east of the west bank of the Sagavanirktok River.
[c] Only GPS radiocollared females with radiocollared calves were relocated because the caribou were aggregated tightly, making identifying a calf with the correct cow impossible.

Table 7. Central Arctic caribou herd fall composition surveys, Alaska, 2009–2014.

Date[a]	Bulls:100 cows	Calves:100 cows	Percent calves (no. calves)	Percent cows (no. cows)	Percent bulls (no. bulls)	Sample size	No. groups	No. collars (no. bull collars)
13–14 Oct 2009	50	33	18 (1,193)	55 (3,641)	27 (1,814)	6,648	19	37 (0)
23 Oct 2010	50	46	23 (889)	51 (1,930)	26 (968)	3,787	12	21 (0)
13 Oct 2011	69	56	25 (1,303)	44 (2,306)	31 (1,590)	5,199	22	33 (0)
14 Oct 2012	56	61	28 (1,132)	46 (1,845)	26 (1,039)	4,016	11	31 (5)
13–14 Oct 2014[a]	41	42	23 (462)	55 (1,097)	22 (445)	2,004	15	18 (0)

[a] View data with caution. Originally 3,903 caribou were classified but we determined caribou may have been mixed with Porcupine herd caribou based on Porcupine caribou herd satellite radio collar locations. Therefore, only groups sampled west of the Middle Fork Chandalar River were included; reducing overall sample size substantially.

Table 8. Winter distribution of radiocollared Central Arctic herd (CAH) caribou south of the Brooks Range, Alaska, regulatory years[a] 2001–2013.

Regulatory year	Date(s) of radiotracking	Percent of CAH on south side of Brooks Range	Number of radio collars located
2001	29–31 Mar 2002	69	103
2002	26 Feb 2003	68	89
2003	15 Mar 2004	87	100
2004	11, 17 Mar 2005	60	111
2005	9 Mar 2006	54	76
2006	Mar 2007	60	54
2007	27 Mar 2008	2	43
2008	10–11 Mar, 7 Apr 2009	95	58
2009	29, 30 Mar, 18 Apr 2010	91	53
2010	8–9 Mar, 13 Apr 2011	94	50
2011[b]	Feb 2012	80	10
2012	28 Mar 2013	100	39
2013[b]	25 Mar 2014	94	17

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2001 = 1 July 2001–30 June 2002).
[b] No radiotracking flights of VHF radio collars were conducted in March when distribution of caribou can reflect winter distribution. Locations of GPS and PTT satellite collars were recorded during the end of February in 2012 and end of March in 2014 to capture winter distribution.

Table 9. Reported Central Arctic caribou herd harvest by sex and method of take, Alaska, regulatory years[a] 2000–2013[b].

Regulatory year	Reported harvest				Total hunters	Percent successful hunters[d]
	Male	Female	Unk	Total (harvest by bow)[c]		
2000	465	28	1	494 (214)	804	52
2001	496	16	4	516 (192)	918	47
2002	389	23	3	415 (96)	851	41
2003	389	11	4	404 (136)	717	48
2004	588	42	4	634 (228)	989	52
2005	635	45	7	687 (239)	1,104	52
2006	798	37	6	841 (301)	1,331	53
2007	620	68	2	690 (183)	1,380	42
2008	669	47	1	717 (180)	1,362	43
2009	757	45	13	815 (224)	1,317	49
2010	978	234	26	1,238 (296)	1,622	54
2011	814	346	12	1,172 (330)	1,401	57
2012	726	275	6	1,007 (285)	1,430	50
2013	719	131	4	854 (190)	1,423	43

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2000 = 1 July 2000–30 June 2001).
[b] Source: Harvest ticket reports from Unit 26B in caribou database via ADF&G's Wildlife Information Network (WinfoNet).
[c] Harvest by bow is also included in total harvest.
[d] Percent successful hunters calculated by dividing successful hunters by number of total hunters.

Table 10. Reported Central Arctic caribou herd hunter residency and success, Alaska, regulatory years[a] 2000–2013[b].

Regulatory year	Successful hunters				Unsuccessful hunters				Total hunters[c]
	Alaska resident	Nonresident	Unk	Total (%)	Alaska resident	Nonresident	Unk	Total (%)	
2000	339	74	3	416 (52)	354	32	2	388 (48)	804
2001	331	101	4	436 (47)	403	76	3	482 (53)	918
2002	247	103	2	352 (41)	428	70	1	499 (59)	851
2003	249	90	5	344 (48)	313	58	2	373 (52)	717
2004	381	127	9	517 (52)	385	78	9	472 (48)	989
2005	421	154	1	576 (52)	425	100	3	528 (48)	1,104
2006	476	213	20	709 (53)	498	98	26	622 (47)	1,331
2007	383	189	8	580 (42)	649	141	10	800 (58)	1,380
2008	411	157	12	580 (43)	603	163	16	782 (57)	1,362
2009	461	175	6	642 (49)	574	87	8	669 (51)	1,317
2010	633	234	4	871 (54)	600	142	4	746 (46)	1,622
2011	594	194	6	794 (57)	511	81	9	601 (43)	1,401
2012	533	188	1	722 (50)	593	107	5	705 (49)	1,430
2013	354	255	7	616 (43)	629	169	5	803 (56)	1,423

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2000 = 1 July 2000–30 June 2001).
[b] Source: Harvest ticket reports from Unit 26B in caribou database via ADF&G's Wildlife Information Network (WinfoNet).
[c] Total hunters includes hunters who were not determined successful or unsuccessful.

Table 11. Number of caribou bagged and total caribou harvested by hunter residency, Central Arctic herd, Alaska, regulatory years[a] 2010–2013.

No. caribou harvested/ Hunter residency	Regulatory year 2010	2011[b]	2012	2013
1 caribou				
Resident	426	373	378	242
Nonresident	191	161	143	186
Total[c]	620	537	522	433
Total caribou harvest	620	537	522	433
2 caribou				
Resident	130	146	100	74
Nonresident	42	32	43	68
Total[c]	173	181	143	143
Total caribou harvest	346	362	286	286
3 caribou				
Resident	49	43	35	26
Nonresident	1	1	2	2
Total[c]	50	44	37	29
Total caribou harvest	150	132	111	87
4 caribou				
Resident	18	20	12	7
Nonresident	0	0	0	0
Total[c]	18	20	12	7
Total caribou harvest	72	80	48	28
5 caribou				
Resident	10	11	8	4
Nonresident	0	0	0	0
Total[c]	10	11	8	4
Total caribou harvest	50	55	40	20

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).
[b] One hunter harvested 6 caribou illegally.
[c] Total includes unknown residency.

Table 12. Reported Central Arctic caribou herd harvest chronology, Alaska, regulatory years[a] 2000–2013[b].

Regulatory year	Harvest chronology by month (%)																								Unk[c]	Total
	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May/Jun					
2000	42	(8)	263	(53)	109	(22)	32	(6)	11	(2)	0	(0)	2	(<1)	3	(<1)	4	(1)	24	(5)					4	494
2001	28	(5)	218	(42)	117	(23)	127	(25)	7	(1)	0	(0)	0	(0)	2	(<1)	5	(1)	7	(1)					5	516
2002	24	(6)	181	(44)	127	(31)	43	(10)	8	(2)	1	(<1)	1	(<1)	1	(<1)	4	(1)	21	(5)					4	415
2003	17	(4)	223	(55)	116	(29)	24	(6)	3	(<1)	0	(0)	1	(<1)	2	(<1)	1	(<1)	12	(3)					5	404
2004	22	(3)	371	(58)	118	(19)	77	(12)	6	(1)	1	(<1)	0	(0)	0	(0)	17	(3)	19	(3)					3	634
2005	43	(6)	369	(54)	136	(20)	74	(11)	10	(1)	2	(<1)	3	(<1)	2	(<1)	18	(3)	22	(3)					8	687
2006	63	(7)	432	(51)	219	(26)	38	(4)	31	(4)	2	(<1)	4	(<1)	0	(<1)	8	(1)	32	(4)					12	841
2007	27	(4)	333	(48)	165	(24)	65	(9)	8	(1)	6	(1)	1	(<1)	3	(<1)	12	(2)	67	(10)					3	690
2008	30	(4)	439	(61)	149	(21)	38	(5)	6	(<1)	0	(0)	0	(0)	0	(0)	3	(<1)	48	(7)					4	717
2009	16	(2)	457	(56)	246	(30)	18	(2)	1	(<1)	0	(0)	1	(<1)	0	(0)	7	(<1)	61	(7)	3	(<1)			4	815
2010	24	(2)	793	(64)	275	(22)	47	(4)	11	(<1)	0	(0)	0	(0)	0	(0)	5	(<1)	57	(4)	19	(1)			7	1,238
2011	20	(2)	681	(58)	214	(18)	40	(3)	36	(3)	3	(<1)	2	(<1)	1	(<1)	2	(<1)	159	(13)	8	(<1)			6	1,172
2012	19	(2)	584	(58)	252	(25)	63	(6)	6	(<1)	0	(0)	2	(<1)	0	(0)	0	(0)	33	(3)	43	(4)			5	1,007
2013	10	(1)	461	(54)	241	(28)	79	(9)	6	(<1)	0	(0)	0	(0)	1	(<1)	3	(<1)	35	(4)	16	(2)			2	854

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2000 = 1 July 2000–30 June 2001).

[b] Source: Harvest ticket reports from Unit 26B in caribou database via ADF&G's Wildlife Information Network (WinfoNet).

[c] Includes the occasional animal reported taken illegally in May and June prior to regulatory year 2009.

Table 13. Reported Central Arctic caribou harvest by transport methods, Alaska, regulatory years[a] 2000–2013[b].

Regulatory year	Harvest by transport methods (%)								Total
	Airplane	Horse/Dog	Boat	Airboat	Snowmachine	4-Wheeler/ Other ORV[c]	Highway vehicle	Unk	
2000	91 (18)	17 (3)	57 (11)	17 (3)	4 (<1)	1 (<1)	302 (61)	5 (1)	494
2001	108 (21)	7 (1)	50 (10)	18 (4)	0 (0)	5 (1)	324 (63)	4 (<1)	516
2002	112 (27)	10 (2)	54 (13)	11 (3)	1 (<1)	14 (3)	206 (50)	7 (2)	415
2003	78 (19)	2 (<1)	61 (15)	36 (9)	0 (0)	3 (<1)	219 (54)	5 (1)	404
2004	97 (15)	10 (2)	101 (16)	82 (13)	1 (<1)	3 (<1)	335 (53)	5 (<1)	634
2005	120 (17)	7 (1)	119 (17)	60 (9)	0 (0)	2 (<1)	362 (53)	17 (2)	687
2006	191 (23)	10 (1)	133 (16)	56 (7)	0 (0)	1 (<1)	433 (51)	17 (2)	841
2007	205 (30)	22 (3)	72 (10)	40 (6)	3 (<1)	1 (<1)	333 (48)	14 (2)	690
2008	259 (36)	20 (3)	93 (13)	46 (6)	0 (0)	1 (<1)	287 (40)	11 (2)	717
2009	216 (26)	33 (4)	144 (18)	45 (5)	0 (0)	1 (<1)	364 (45)	12 (1)	815
2010	356 (29)	27 (2)	194 (16)	111 (9)	0 (0)	3 (<1)	517 (42)	30 (2)	1,238
2011	330 (28)	73 (6)	178 (15)	61 (5)	0 (0)	3 (<1)	505 (43)	23 (2)	1,172
2012	324 (32)	26 (3)	136 (14)	56 (6)	0 (0)	6 (<1)	436 (43)	23 (2)	1,007
2013	341 (40)	26 (3)	122 (14)	72 (9)	0 (0)	5 (<1)	278 (33)	10 (1)	854

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2000 = 1 July 2000–30 June 2001).
[b] Source: Harvest ticket reports from Unit 26B in caribou database via ADF&G's Wildlife Information Network (WinfoNet).
[c] ORV = off-road vehicles.

Table 14. Mortality rates of radiocollared cow caribou ≥1-year old, Central Arctic herd, Alaska, regulatory years[a] 1997–2014.

Regulatory year	Number of mortalities	Number of radio collars[b]	% Mortality
1997	2	44	4
1998	2	53	4
1999	7	53	13
2000	12	66	18
2001	4	64	6
2002	11	78	14
2003	7	75	9
2004	19	96	20
2005	8	77	10
2006	5	69	7
2007	7	64	11
2008	9	74	12
2009	9	65	14
2010	5	58	9
2011	10	58	17
2012	16	49	33
2013	10	44	23
2014	12	60	20

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 1997 = 1 July 1997–30 June 1998).
[b] Number of radiocollared cow caribou ≥1-year old known to be alive at the beginning of the regulatory year.