Alaska Department of Fish and Game
Division of Wildlife Conservation
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Reducing Mortality on the Fortymile Caribou Herd

Rodney D. Boertje
Craig L. Gardner

Research Final Performance Report
1 July 1997–30 June 2003
Federal Aid in Wildlife Restoration
Grant**s** W-27-1 to W-33-1, **Project** 3.43

FEDERAL AID
FINAL RESEARCH PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Reducing mortality on the Fortymile caribou herd

PRINCIPAL INVESTIGATORS: Rodney D Boertje and Craig L Gardner

COOPERATORS: John Burch (NPS), Layne Adams (USGS), Rick Farnell and Dorothy Cooley (Yukon Department of Environment); and Jim Herriges (BLM)

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR.: W-27-1, W-27-2, W-27-3, W-27-4, W-27-5, and W-33-1

PROJECT NR.: 3.43

WORK LOCATION: The Fortymile Herd's range encompasses most of the area between the Yukon River and the Tanana River east of the Steese Highway. Occasionally the herd crosses into Yukon, Canada to Dawson and slightly west of the Steese Highway. The range has increased in recent years as the herd has grown.

STATE: Alaska

PERIOD: 1 JULY 1997–30 JUNE 2003

I PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

The Fortymile Herd was stable at about 22,000 animals in the early 1990s when conflicts arose between the objectives of the 4 agencies responsible for managing the Fortymile Caribou Herd; specifically the Alaska Department of Fish and Game, the Bureau of Land Management, the National Park Service, and the Yukon Department of the Environment. As a result, representatives of the various agencies and individual stakeholders from several diverse groups gathered together and formed the Fortymile Planning Team. They reached consensus on a 1995 management plan to increase the Fortymile Caribou Herd. This plan formally acknowledged the need for continued intensive studies of the Fortymile ecosystem. The first study plan (1992–1997, Study 3.38) began prior to the formation of the Fortymile Planning Team and was entitled "Factors Limiting the Fortymile Caribou Herd." The second study plan, reported on here (Study 3.43), terminates at this writing and the third formal, consecutive study plan was initiated 1 July 2003. Boertje and Gardner have been responsible for all 3 plans.

Dissatisfaction with the herd arose, in part, because the herd formally ranged over a major portion of Interior Alaska and Yukon. In contrast, from the early 1970s through the mid-1990s, the herd was largely restricted to a relatively inaccessible and small portion of

Interior Alaska between the Steese and Taylor Highways. The decline occurred before detailed studies of caribou mortality and reproduction were possible. Excessive harvest was probably not a major cause of the decline but harvest exceeded estimated recruitment from 1970 through 1973. Therefore harvest contributed to the latter part of the decline to a stable low point of 5700 to 8600 caribou from summer 1973 through summer 1975.

The Team justified their plan to begin a recovery of the herd, in part, because excessive harvest contributed to the herd's low point. If harvest had been curtailed in 1970 instead of 1973, the herd could probably have stabilized at a low of 10,000–12,000 caribou and subsequently recovered to at least 33,000 by 1990. Instead, the herd recovered to an estimated 22,800 animals by 1990 and remained stable through 1995, when the plan was written.

The Team described reasons for developing the 1995 recovery plan for the Fortymile Herd as follows (Appendix A):

- For the long-term benefit of the Fortymile ecosystem and, specifically, the biodiversity of this ecosystem;
- To help recover the Fortymile caribou herd to its traditional range and to benefit the people who value the herd and its ecosystem;
- To promote viewing opportunities of the Fortymile Herd during its spring and fall migrations, particularly along the Steese, Taylor, Top of the World, and Klondike Highways where people once witnessed thousands of migrating caribou;
- To promote similar goals among the agencies involved in management of the Fortymile caribou herd;
- To resolve conflicts among interest groups;
- To encourage sound wildlife management decisions recognizing diverse values.

II REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

Boertje and Gardner (2000) published the proposed management and relevant biology of the Fortymile caribou herd from 1992 through 1997. This included the results of Study 3.38, entitled "Factors Limiting the Fortymile Caribou Herd." Stability of the herd during 1990–1995 directly resulted from high mortality, not reduced natality, except in 1993 when a low natality rate was documented throughout Interior Alaska caribou herds as a consequence of the short growing season in 1992. Except in 1993, we found consistent evidence for moderate to high nutritional status of the Fortymile Herd when indices were compared among herds. Also, no significant diseases were found among Fortymile caribou. We deemed the winter range adequate to support elevated caribou numbers both in regards to the lichen availability on currently used winter ranges and on the availability of vast expanses of winter range formerly used by the herd.

By collaring large numbers of adult and calf caribou and investigating causes and rate of mortality, we documented that wolf predation was consistently the major cause of mortality among Fortymile caribou during 1992–1997. We estimated that wolves killed between 2000 and 3000 caribou calves annually during this period and between 1000 and 2300 older

caribou. To reduce wolf predation, the Team envisioned state-sponsored wolf translocations and fertility control in 15 key wolf packs during November 1997–May 2001.

Harvest was consistently ≤2% of the herd from 1990–1995; only 200–500 bulls were harvested. Therefore harvest was a minor influence on the herd compared with wolf predation. In part to increase social acceptance of the Team's plan to reduce wolf predation, the harvest during 1996–2000 was reduced to 150 bulls (<1% of the herd). This action probably had only a slight positive effect (<2% annually) on herd numbers. We saw no significant increase in the bull:cow ratio during this period, therefore we assume the change was too low to measure or wolves may have compensated for the reduced harvest by consuming a higher proportion of bulls. If wolf predation on bulls increased, wolves may have slightly reduced predation of female caribou, which would have had a beneficial effect on herd numbers. However, we were unable to detect any measurable change in wolf predation on female caribou. We concluded that changes in survival that allowed the herd to increase were subtle changes that could not be attributed to specific causes using samples of 50–80 newborn caribou and 50–90 older caribou.

III APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: Review literature on wolf and bear translocations, canid fertility control, responses of caribou and moose to reduced predation, ecology and interactions of these predators and prey, nonlethal techniques for reducing predation, and effects of harvest on wolves, bears, and caribou.

We continue to review available scientific literature, primarily through Internet searches.

OBJECTIVE 2A: Monitor distribution and numbers of wolves in treated and several adjacent untreated packs during the course of this study using radiotelemetry.

In and near the treatment area we continue to monitor changes in wolf pack size and distribution. Treatment included sterilizing the dominant pair and translocating the remaining wolves. Treatment occurred during 4 consecutive winters (1997–1998, 1998–1999, 1999–2000, and 2000–2001). We found that sterilized pairs and bordering unsterilized packs maintained use of their respective territories, as previously observed in smaller study samples in Minnesota and Yukon. We conclude that sterilization does not affect the probability of dispersal.

Although sterilized wolves largely remained in their territories as predicted, territory size declined on average after pack size was reduced. We effectively reduced pack size by translocating all wolves other than the dominant pair. The surgical sterilization techniques we used successfully halted reproduction. Some sterilized pairs accepted a strange wolf into their pack and we translocated these wolves as prescribed in the plan.

We completed the treatment of 15 packs on schedule in winter 1999–2000 and maintained 15 packs as pairs through winter 2000–2001. Treatment ceased as of June 2001. Most of the 15 treated packs remained as treated pairs through winter 2001–2002. In September 2002, 11 sterilized packs remained, but by April 2003 only 8 sterilized packs remained. Untreated adjacent packs regularly reproduced during this study and generally retained original

territories. Two new packs were formed in the Yukon–Charley Rivers National Preserve during this study because packs denning in the preserve were not treated as prescribed in the plan. These packs wintered on state lands outside the preserve and regularly killed caribou in the treated area. At least 3 of 4 packs that regularly or occasionally denned in the preserve killed several hundred calf caribou each year of this study.

OBJECTIVE 2B: Monitor survival rates and homing abilities of translocated wolves.

Our specific objective was to determine if young, translocated wolves regularly succumb near release sites, return to or attempt to return to capture sites, or disperse widely from release sites. No wolves <9 months old were moved, and all wolves were moved at least 100 miles (160 km) because of homing tendencies.

We found no evidence that wolves starved at or near release sites. Wolves <12 months old did not return to the treatment area and appeared to have little or no homing abilities, but several adult wolves did return to the treatment area when moved <150 miles. More commonly, translocated wolves initially moved in the general direction of their original territories. Prior to reaching these original territories, the wolves moved in a random direction apparently to locate an acceptable territory. These wolves traveled alone or with 1 or more translocated or new wolves. In a few, relatively uncommon instances, several pack members that were translocated together remained together as a pack and dominated a territory at or near the release site. Most translocated wolves were simply eartagged rather than radiocollared and we continue to receive ear tags from harvested, translocated wolves throughout much of the state.

OBJECTIVE 2C: Estimate wolf harvest rates in the respective annual ranges of the Fortymile caribou herd.

Wolf harvest rates have varied in recent years, but wolf harvest alone has not controlled the wolf population at a reduced level. Indeed, autumn wolf densities have not declined outside of the treatment area within the annual ranges of the herd. The remoteness of the area and the declining fur market are factors contributing to the generally low wolf harvests. Harvesting wolves in the treatment area is especially problematic because of the extreme remoteness of the area.

OBJECTIVE 3: As wolf numbers in the treatment area are reduced, continue modeling Fortymile caribou herd production and causes and rate of mortality to evaluate annually the effects of wolf-caused mortality on herd trend.

Photocensus data indicated that the Fortymile Herd increased throughout this reporting period and has doubled in size since the recovery plan was written in October 1995. In June 1995 we counted only 22,558 caribou in photos of the herd and in June 2003 we counted 43,375 caribou. Clearly, recovery of the herd occurred during implementation of the plan. Therefore the plan is deemed a management success.

Improved calf:cow ratios during October 1998, 1999, 2001, and 2002 support the contention that calf survival and/or productivity improved during implementation of the recovery plan. These ratios are derived from counting several thousand female caribou, and

are the most reliable indicator of herd trend. Sample sizes of 50–80 radiocollared calf caribou and 50–90 adult caribou were not adequate to determine why survival increased. We concluded that increased herd size resulted from both improved productivity and survival. We detected 3 years of elevated pregnancy rates (1996, 1998, and 2002) during the herd's increase. Also, survival of collared calves was ≥50% for 3 years during recovery and adult survival rates were consistently ≥88%. In contrast, when the herd was stable (1990–1995), adult survival was only 75% in 1990 and 80% in 1991. Calf survival during this stable period was only measured in 1994 (33%) and 1995 (41%).

Treatment of 15 wolf packs was originally proposed to reduce summer wolf predation on young caribou calves. Annual population modeling indicated no clear reduction in the annual wolf predation rate on the caribou herd after treating 15 wolf packs, presumably because the herd ranged well outside the treated area during most of each year. Also, wolf packs from the Yukon–Charley Rivers National Preserve continued to regularly kill caribou in the treated area, and the number of these packs increased during the treatment period.

OBJECTIVE 4A: Given the conditions described in the project statement, estimate the annual effect of translocating grizzly bears on grizzly-caused caribou calf mortality. Data for the 1-year of treatment will be compared with 6 years of data without bear reductions.

OBJECTIVE 4B: Assuming grizzly bears are translocated, document the proportion of the bear population that is moved and the return rate of 20 translocated, radiocollared bears.

We had 2 objectives in this section relating to potential grizzly bear translocations. However, grizzlies were not translocated because the conditions for translocations were not met. Grizzlies did not kill >15% of the radiocollared calves in May 1998 and May 2000.

OBJECTIVE 5: Document whether a significant increase in moose density occurs in the treatment area between October 1996 and October 2002.

Through early winter 2002 no significant changes in moose numbers or calf survival were observed in the treatment area. We previously documented that grizzlies, not wolves, were the predominant predator on moose calves in this area. Wolves killed only 13% of radiocollared moose calves in this area, whereas grizzlies killed 52%.

OBJECTIVE 6: Document whether significant increases in sheep numbers occurs in the treatment area between 1997 and 2002.

No short-term increases in sheep were observed in the treatment area through July 2002. Wolf predation is probably not the dominant factor influencing sheep numbers in this area.

OBJECTIVE 7: Follow guidelines presented in Part V of the Management Plan to continue to increase public awareness of Fortymile wildlife issues.

We continue to write progress reports annually and to incorporate results in related plans, including the recently published "Habitat Management Needs Assessment Plan for the Fortymile Caribou Herd, 2000" and the "Harvest Plan for the Fortymile Caribou Herd, 2001–2006." The "Habitat Management Needs Assessment Plan" involved all the major landowners of the herd's range and provided detailed maps of seasonal ranges used by the herd in recent years. The "Harvest Plan" was written by the 5 advisory committees within

the herd's range and was adopted by the Board of Game in 2000. Twelve issues of *The Comeback Trail* newsletter were published, the most recent one in July 2003. *The Comeback Trail* both solicits input and presents information and is distributed to about 4500 interested readers at least annually. Results of studies were presented at Fortymile Team meetings; local advisory committee meetings in Fairbanks, Central, Delta, Eagle, and Tok; Board of Game meetings; classrooms; and elsewhere as requested. Numerous presentations were made to advisory committees and village councils in preparation for translocating wolves to remote areas. Local art contests and guessing contests (involving annual census counts) were also sponsored in Tok in recent years, to enhance local awareness of the herd.

In addition we participated in several briefings with the military and miners and developed a website of current caribou locations to expedite mitigation of overflights during May and June 1999 through 2003. We also participated in a study of the short-term impacts of military jet overflights on the Fortymile caribou herd during the 2002 calving season. Results of this study were published in January 2003 by the Alaska Department of Fish and Game. This was a cooperative study with the National Park Service and 11th US Air Force. One conclusion of the study was that maintaining a floor of 2000 ft above ground level for all military jets would eliminate most of the stronger-level caribou reactions to jets. Also, A-10 jets could operate as low as 1500 feet above ground level, because of the reduced noise levels of these jets.

IV MANAGEMENT IMPLICATIONS

The primary management implication of this study is that small changes in survival and productivity can allow a herd to double in size in 8 years. Photocensuses were essential to document the change in herd size. Well-distributed late September calf:cow counts of >10% of the herd were cost-efficient indicators of herd trend. Studies of the causes and rate of mortality among 50–90 collared adult caribou were insufficient to determine why caribou survival increased. Mortality studies were important in determining that wolves were the dominant cause of calf and adult caribou mortality before, during, and after treatment.

Although we could not detect a change in wolf predation rates on Fortymile caribou during the treatment period, and the herd began its increase before treatment, circumstantial evidence from adjacent herds indicates that the Fortymile Herd probably would not have increased substantially without treating wolves. For example, all Interior Alaska caribou herds were stable or declining during the treatment period.

Recommendations for future caribou recovery plans need to consider, foremost, the social and political ramifications of treating wolves. To the extent that the recovery plan succeeded in its objectives of increasing the herd 5–10% annually without major political interference, we condone the Team's plan of action. Evaluating why survival increased is, however, problematic when the major predator is reduced slightly in number and remains the dominant predator.

V SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN FOR LAST SEGMENT PERIOD ONLY

JOB 1: Continue a literature review of wolf and bear translocations, canid fertility control, responses of caribou and moose to reduced predation, ecology and interactions of these predators and prey, nonlethal techniques for reducing predation, and effects of harvest on wolves, bears, and caribou.

Internet searches were conducted and peer contact was maintained to keep informed of new references.

JOB 2A: Monitor distribution and numbers of wolves in treated and several adjacent untreated packs during the course of this study using radiotelemetry.

We radiotracked about 20 packs monthly and conducted extensive wolf surveys for 1–3 days each in March and April. Snow cover was insufficient to track wolves in October and November. Several sterilized wolves were recollared and several new wolves were collared to help estimate numbers and to monitor distribution.

JOB 2B: Monitor survival rates and homing abilities of translocated wolves.

Our specific objective was to determine if young, translocated wolves regularly succumb near release sites, return to or attempt to return to capture sites, or disperse widely from release sites. No wolves <9 months old were moved, and all wolves were moved at least 100 miles (160 km) because of homing tendencies.

We continued to receive ear tags from wolves that had been translocated but we no longer were radiotracking translocated wolves. Most translocated wolves were simply eartagged because of insufficient funds for radio collars and telemetry flights. Most wolves dispersed from release sites and none were known to die at release sites. Wolves 9–12 months old appeared to have little or no homing tendencies.

JOB 2C: Estimate wolf harvest rates in the respective annual ranges of the Fortymile caribou herd.

We continued to monitor wolf harvest using pertinent data from mandatory wolf sealing certificates. Wolf harvest was low in the Fortymile Herd range in winter 2002–2003. Wolf numbers have not been reduced within the annual ranges of the herd, despite a 70–75% reduction in the numbers of wolves in 15 treated packs within the herd's summer range.

JOB 3: As wolf numbers in the treatment area are reduced, continue modeling Fortymile caribou herd production and causes and rate of mortality to evaluate annually the effects of wolf-caused mortality on herd trend.

We tracked collared calves weekly in July, August, and September 2002 and at least monthly during the winter months. We radiocollared 15 additional calves in late September 2002 and 1 died about 7 days later. The death may have been related, in part, to capture. Predators were not involved. No calves were collared in May 2003 because only 8 sterilized

wolf packs remained. A calf mortality study is proposed after wolves recover in the treated area. Nine studies of radiocollared newborn caribou were conducted from May 1994 through May 2002.

We radiotracked collared adults at least monthly. In addition, during the 2003 calving season, we radiotracked 54 adult cows 4 times to estimate a pregnancy rate. The May 2003 pregnancy rate was the second lowest value observed in 19 years of studies of the Fortymile Herd. Low pregnancy rates were observed in all studies of Interior Alaska herds in 2003. From observations of high warble fly infestations in the Delta Herd in April 2003, we surmise that elevated insect harassment levels may have caused the low pregnancy rates in Interior herds in 2003.

Collars emitting a "mortality signal" were investigated as soon as possible to determine cause of death. We used a helicopter for transportation to these sites, and derived mortality rates using Kaplan–Meier techniques. Calf survival was the third highest value observed during 9 years of Fortymile studies.

On 28 September 2002 we counted the proportion of calves, cows and bulls among 6080 caribou. These caribou were distributed in proportion spatially to the 111 independent radio collars. Calves were relatively abundant indicating herd numbers would increase significantly in 2002.

We photographed aggregations of caribou on 30 June 2002 and counted 43,375 caribou in these photos. The herd was primarily concentrated in 1 large group of 30,275 caribou. In addition, we radiotracked 11 smaller groups ranging in size from 243 to 3168 caribou and totaling 12,286 caribou. Also, 814 caribou were found in groups without radios during a visual search of the elevated portions of the summer range. Seven small fixed-wing aircraft were used in the visual search. One additional plane was dedicated to locating all 97 collared caribou, and the DeHavilland Beaver was used to photograph aggregations. We deemed this census the most comprehensive census since 1997 with ideal weather conditions.

We modeled mortality and composition data to compile the ninth annual summary of the effects of births and deaths among years; data were detailed to contrast the effects of wolves, grizzly bears, and other causes of death. Wolf predation was the single most important cause of mortality as in all previous years, but most of this predation occurred from untreated wolves.

JOB 5: Document whether a significant increase in moose density occurs in the treatment area between October 1996 and October 2002.

Moose surveys were conducted in the southern portion of the treatment area and nearby untreated areas to test the effect of reducing wolf numbers on moose. No clear increase in moose numbers or calf survival was noted in the wolf treatment area.

JOB 6: Document whether significant increases in sheep numbers occur in the treatment area between 1997 and 2002.

Sheep surveys were conducted throughout the treatment area. No clear increase in sheep numbers or lamb survival was noted in the wolf treatment area.

JOB 7: Follow guidelines presented in Part V of the Management Plan to continue to increase public awareness of Fortymile wildlife issues.

The twelfth issue of *The Comeback Trail* newsletter was published in July 2003. Results of these studies were presented at local advisory committee meetings in Fairbanks, Central, Delta, Eagle, and Tok; Board of Game meetings; classrooms; and elsewhere as requested. In addition we participated in several briefings with the military and continued to post current caribou locations on a website to expedite mitigation of overflights during May and June 2003. Conclusions of the study of the effects of jet overflights on Fortymile caribou were submitted for publication in the *Journal of Wildlife Management*.

VI ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THE LAST SEGMENT PERIOD, IF NOT REPORTED PREVIOUSLY

We flew about 20 additional telemetry flights to monitor caribou distribution and movements during June, August, and September using funds from Tok caribou survey and inventory sources. Specifically, these flights provided precensus and harvest monitoring data, as well as mortality data. The caribou census, caribou composition count, moose surveys, and sheep surveys were also funded using Tok survey and inventory funds.

VII PUBLICATIONS

- The Fortymile Caribou Herd Management Plan, 1995 The Fortymile Caribou Herd Planning Team, http://aurora.ak.blm.gov/fmcaribou/ Pages 56–76 *in* RD Boertje and CL Gardner. 1996. Factors Limiting the Fortymile Caribou Herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Study 3.38. Grants W-24-4. Juneau, Alaska.

- The Fortymile Caribou Herd: Novel proposed management and relevant biology, 1992–1997. RD Boertje and CL Gardner. 2000. *Rangifer* Special Issue 12:17–38.

- *The Comeback Trail* newsletter, 1994–2003. CL Gardner and L Zaczkowski. Issues 1–12. Alaska Department of Fish and Game, Tok, Alaska.

- Wolf Predation Control Implementation Plan, 1997. The Fortymile Caribou Herd Planning Team, Alaska State Miscellaneous Game Regulations 18:32–35. Juneau, Alaska.

- Factors Limiting the Fortymile Caribou Herd. RD Boertje and CL Gardner. 1998. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-24-1 through W-24-5. Study 3.38. Juneau, Alaska.

- Reducing Mortality of the Fortymile Caribou Herd. RD Boertje and CL Gardner. March 1999, December 1999, and December 2000. Alaska Department of Fish and Game.

Federal Aid in Wildlife Restoration. Research Progress Reports. Grants W-27-1 through W-27-4. Study 3.43. Juneau, Alaska.

- Habitat Management Needs Assessment for the Fortymile Caribou Herd, 2000. The Fortymile Caribou Herd Planning Team, Tok.

- Harvest Plan for the Fortymile Caribou Herd, 2001–2006. Authored by advisory committees in Tok, Fairbanks, Delta Junction, Eagle, and Central. Available from Alaska Department of Fish and Game, Tok, Alaska.

- Short-term impacts of military jet overflights on the Fortymile caribou herd during calving season. 2003. AJ Magoun, JP Lawler, CL Gardner, RD Boertje, and JM Ver Hoef. Alaska Department of Fish and Game. Juneau, Alaska. Submitted to the *Journal of Wildlife Management* in August 2003.

VIII RESEARCH EVALUATION AND RECOMMENDATIONS

When manipulating predators to increase prey, it is desirable, scientifically, to clearly manipulate a majority of the individuals of the particular predator species chosen for the experiment. In the case of the Fortymile manipulation, wolves remained the major predator throughout this study. The plan allowed only 15 packs to be manipulated, whereas 29 to 46 packs preyed on Fortymile caribou during the winters 1995–1996 to 1999–2000. Equivocal results as to the cause of any response can be expected when a minimal manipulation is conducted.

IX PROJECT COSTS FROM LAST SEGMENT PERIOD ONLY

FY03 FEDERAL AID SHARE $71,199 + STATE SHARE $23,733 = TOTAL $94,932

X APPENDIX

Table 1 Estimated numbers, harvest, natural mortality, pregnancy rates, and composition in the Fortymile Herd, 1983–2003

Year	Estimate of herd size		Estimated harvest[a] M	F	Survival rate of collared newborn and older calves for year ending 12 May (*n*)	Survival rate of collared caribou older than 12 months old for year ending 12 May (*n*)	Pregnancy rate of collared females ≥36 months old (*n*)		Bulls or Calves:100 females in Sep–Oct (*n* = no. females ≥1 year old in survey) Bulls	Calves	*n*
1983	12,350	(8)[b]	294	10		91 (8–21)			61	36	498
1984	13,402	(19)	430	20		90 (19–21)	87	(23)	--	--	--
1985	--	--	421	20		92 (19–24)	100	(19)	50	36	574
1986	15,307	(19)	360	20		86 (19–22)	95	(21)	36	28	842
1987	--	--	229	20		95 (19–38)	95	(19)	40	37	1274
1988	19,975	(39)	645	150		86 (23–36)	95	(20)	38	30	770
1989	--	--	401	100		81 (17–23)	--	--	27	24	1182
1990	22,766	(16)	321	22		75 (11–17)	88	(16)	44	29	1002
1991	--	--	495	10		80 (21–53)	91	(11)	39	16	931
1992	21,884	(64)	432	35		90 (51–63)	87	(39)	48	30	1416
1993	--	--	335	11		94 (45–65)	68[c]	(47)	46	29	2095
1994	22,104	(91)	313	15	33 (20–50)	89 (48–54)	82	(45)	44	27	1710
1995	22,558	(85)	203	22	41 (26–52	94 (45–51)	85	(41)	43	32	1879
1996	23,458	(97)	138	7	41 ((31–60)	88 (55–62)	97[d]	(39)	41	36	2601
1997	25,910	(113)	143	8	66 (42–55)	94 (60–70)	85	(46)	46	41	3313
1998	31,029	(146)	151	3	53 (43–72)	92 (69–81)	98[d]	(48)	40	38	2433
1999	33,110	(130)	142	5	32 (34–78)	88 (70–89)	87	(68)	48	37	2347
2000	34,640	(111)	142	3	41 (34–67)	90 (65–79)	92	(61)	45	27	3780
2001	--		493	200	45 (38–63)	96 (66–74)	88	(57)	49	38	3658
2002	--		667	197	50 (40–66)	88 (61–76)	95	(55)	43	39	3347
2003	43,375	(97)	--	--			69	(54)			

[a] From 1 Jul–30 Jun of the next year.

[b] Number of caribou with independent radio collars during census.

[c] In 1993, 5 of 12 (42%) females 3 years old were pregnant, and 27 of 36 (75%) females ≥4 years old were pregnant. Pregnancy rate in 1993 was significantly lower than rates for each of the other years on this table (chi-square test of proportions, 2×2 tables, $P \leq 0.12$), except 2003.

[d] Pregnancy rate in 1996 and 1998 was significantly greater than other rates during 1994–1997 (chi-square test of proportions, 2×2 tables, $P \leq 0.02$).

XI PREPARED BY:

Rodney D. Boertje
Wildlife Biologist III

Craig L. Gardner
Wildlife Biologist III

SUBMITTED BY:

Jay M. Ver Hoef
Acting Research Coordinator

Laura A. McCarthy
Publications Technician II

APPROVED BY:

Thomas W. Paul
Federal Aid Coordinator
Division of Wildlife Conservation

Matthew H. Robus, Director
Division of Wildlife Conservation

APPROVAL DATE: _____