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Effects of Harvest on Grizzly Bear Population Dynamics in the Northcentral Alaska Range

by

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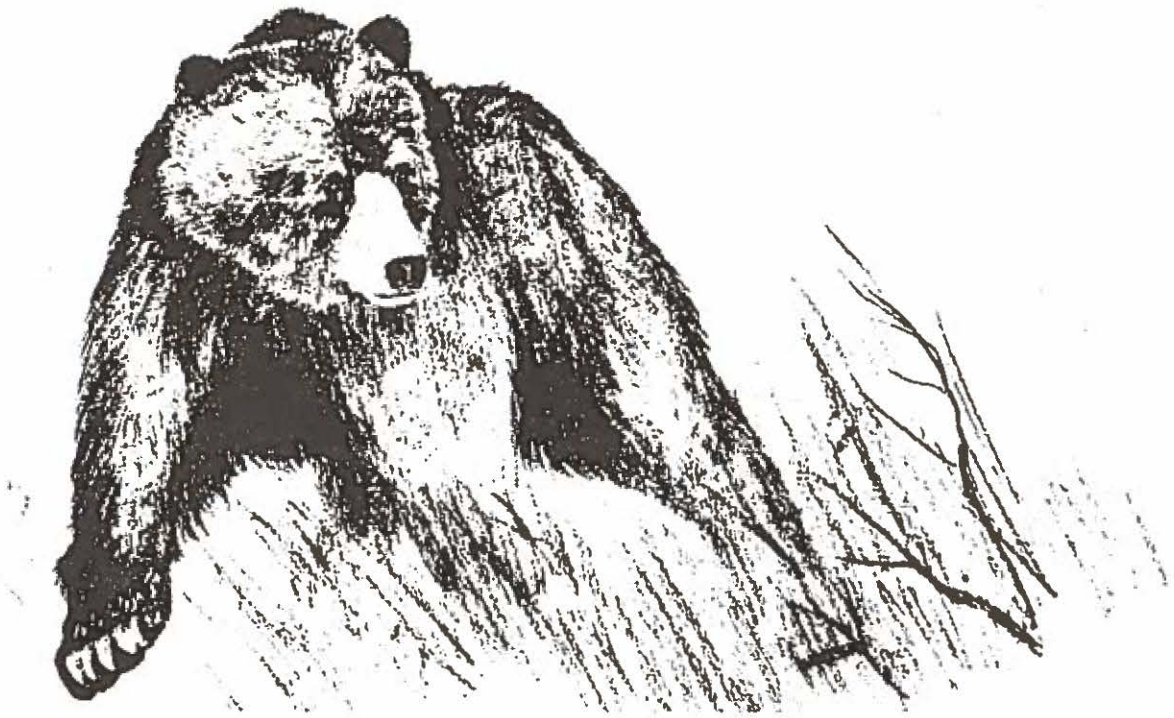

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SUMMARY

During 1993, the third phase began in a long-term investigation of the effects of harvest on grizzly bear (*Ursus arctos horribilis*) population dynamics in a 3,160-km^2 area of the northcentral Alaska Range. During the first two phases, as the total population size declined, the adult female segment of the population was stable at 21-23 during 1981-89, but declined to 15 by 1992. During the third phase, the recovery rate will be determined for both the total population and the productive female segment of the population. During 1993, 16 bears were captured and radiocollars placed on 15 of these, primarily to maintain the sample of radio-collared adult females. Only 14 adult females were present in the area in 1993. The number of young-age (2-5 years of age) females that are potential recruits to the adult female cohort was 15-16 during 1992-93. Fifteen bears have been killed in the Wood River drainage that were taken illegally, suspected taken illegally, taken in defense of life or property, or taken at cabins or residences but legally reported as hunter-killed animals. In comparison, in other portions of the study area, three were killed in defense of life or property, two were recorded as hunter kills at cabins or residences, and four were suspected wounding losses or unrecovered defense of life or property kills.

Key Words: grizzly bear, harvest rates, Interior Alaska, mortality, population dynamics, recovery rates, reproductive biology, *Ursus arctos*.

CONTENTS

BACKGROUND

An understanding of the impacts of different levels of hunter harvest on grizzly bear (*Ursus arctos horribilis*) population density, structure, and dynamics is necessary for effective management. In addition, rates of recovery and mechanisms of response to high levels of harvest must be included in analyses for management models to reflect real-life situations. Although recent studies have increased the knowledge on some of these aspects of population dynamics, additional information is necessary to clarify the extent and direction of population response to, and recovery from, high harvest levels. Further, as demands on grizzly bear habitat and populations increase, more intensive management will be required using models based on observed harvest and recovery rates of specific segments of the population.

To determine sustainable harvest levels for grizzly bears, it is crucial to be able to document responses in population numbers or density to various harvest rates (Miller et al. 1987, Reynolds et al. 1987, Miller 1990*a*, 1990*b*, 1990c, 1993). It is equally important to understand the mechanisms of population responses to harvest (such as compensatory production or survival) through long-term observation of individuals (Reynolds et al. 1987, Schwartz and Franzmann 1991, Reynolds and Boudreau 1992). Use of harvest data alone is inadequate for timely determination of population trend or calculation of sustainable harvest rates (Harris and Metzgar 1987).

Documentation of population response to exploitation is necessary to fully realize the benefits from this long-term study. Additional data on population production, survival, compensatory behavior, and emigration rates will make assessment of future direction of these investigations more effective. Because of characteristics of production and survival, grizzly bear populations respond slowly to forces that may change population status. For instance, because Alaska Range grizzly bears do not usually produce surviving young until they reach 7 years of age, and the mean interval between litters is 4.1 years (Reynolds 1990, Reynolds and Boudreau 1990), the effects of compensatory production or survival cannot be documented until additional litters are weaned and provide potential recruitment to the population, which is approximately 7 years.

During 1981, this study was initiated to address grizzly bear population response to harvest (Reynolds 1982). The background and rationale for this long-term study have been described in previous reports (Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987; Reynolds 1989, 1990, 1993; Reynolds and Boudreau 1990, 1992).

Initially, the study was composed of two phases, the first in which baseline population status and reproductive biology were established and the second in which the population was subjected to higher hunting pressure and the responses identified and measured. At the conclusion of Phase 2 in 1991, the estimated grizzly bear population $\geq$ 2 years of age, and adjusted for closure, had declined by 39% since 1981 following a mean human-caused mortality rate of 16%. Annual estimates of population size were based on the direct count method (Reynolds et al. 1987, Reynolds and Boudreau 1992). However, because variance or confidence intervals could not be measured for the direct count method, a statistically based mark-recapture estimation procedure was conducted during 1992, and results were compared with both a mark-recapture estimate made in 1986 and the annual direct counts (Reynolds 1993). This effort concluded that population size estimates using the direct count method were closely comparable with those calculated using mark-recapture methods.

Several other intensive studies have documented declining grizzly bear populations (Craighead et al. 1974, Knight and Eberhardt 1984, 1985, McLellan 1989*a*,*b*,*c*).

Harvest models that have been developed are complex and illustrate the difficulty of utilizing harvest data to predict population changes (Tait 1983, Harris and Metzgar 1987, Miller and Miller 1990, Miller 1993). Miller (1990*a*) estimated a sustainable harvest rate of 8% in Unit 13, but concluded that a number of potential biases remained to be investigated. Other studies have addressed aspects of population biology or density of grizzly bears in Interior Alaska (Dean 1976; Murie 1981; Ballard et al. 1982; Miller and Ballard 1982; Miller 1984, 1987, 1990*a,b*, 1993).

Before the effects of various harvest rates can be assessed, the following information should be available: (1) population density or size, (2) population structure, (3) movement patterns, (4) home range size, (5) mortality and survival rates, and (6) reproductive potential including age at first breeding, litter size, and interval between litters (Craighead et al. 1974, Reynolds 1974, 1976, 1978, 1980, Bunnell and Tait 1980, 1981, McLellan 1989*a*, Miller 1990c, Miller and Miller 1990). The approach taken in this study is to monitor these characteristics annually so that harvest can be related to potential population responses.

OBJECTIVES

The objective of this study is to determine the length of time necessary for recovery or stabilization of a reduced grizzly bear population following reductions in human-caused mortality rates; and to measure the recovery responses in the dynamics of the population, especially female population size, total population size, and production and survival of offspring.

STUDY AREA

The 3,160-km^2 (1,220-mi^2) study area is located in the mountains and foothills of the northcentral Alaska Range within Unit 20A. The study area boundaries do not include mountainous areas above 1,800 m (6,000 ft), glaciers, or heavily forested portions of the Tanana Flats where searches are not attempted and where few observations have been made. The boundaries are the Gold King Creek and Wood River drainages downstream from Virginia Creek to the west, the crest of the Alaska Range to the south, the Delta Creek drainage to the east, and the southern edge of the Tanana Flats (approx. 64° 07′ N) to the north. It includes portions of two U.S. Army reservations; Fort Wainwright and Fort Greely.

Elevation in the area ranges from 500 to 3,700 m (1,500 to 12,000 ft). Most rivers flow northerly through U-shaped, glacially formed valleys and are fed by active glaciers. Treeline occurs at approximately 900 m (3,000 ft). Dense patches of willow (*Salix* spp.) or alder (*Alnus crispa*), which bears use for cover, may be present up to an elevation of approximately 1,200 m (4,000 ft).

METHODS

The methods used to capture bears and measure population variables have been described in previous reports (Reynolds 1982, 1993; Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987, Taylor et al. 1989, Reynolds and Boudreau 1992). Standardized weight and measurement data were collected (Kingsley et al. 1988).

RESULTS AND DISCUSSION

The primary emphasis of the work accomplished during 1993 was to monitor the survival and reproductive parameters of all adult females living within the study area. As funding allowed, I also replaced radiocollars on adult females and those 2- to 5-year-old females that will enter the adult cohorts if they survive.

Bears Captured and Radio-collared

During 1993, 16 bears were captured; 15 of these were radio-collared. Captures included 14 females and 2 males: 10 (9 females, 1 male) were recaptured to replace radiocollars and 6 had not been captured previously. Of those not previously captured, two were female 2-year-old offspring of radio-collared female no. 1626, one was a female 3-year-old of radio-collared female no. 1308, two were young females (3 and 5 years of age, respectively) of unknown lineage, and 1 was an adult male. Because of limited funding during 1993, six other offspring of radio-collared females were not captured, including two 2-year-olds of female no. 1398, two 2-year-olds of female no. 1608, one 2-year-old of female no. 1303, and one 3-year-old of female no. 1308. No capture mortalities occurred for the sixth consecutive year and 109 captures; this is in part due to the use of Telazol (Tiletamine HCL and Zolazepam HCL, Aveco Co., Ft. Dodge, IA) as an immobilizing drug (Taylor et al. 1989) and to experience gained in avoiding other hazards related to immobilization (Reynolds 1992).

One hundred and thirty-two individual bears were captured in the study area during 1981-93 (Table 1). In addition, 112 bears were recaptured to replace radiocollars. During 1981-83, initial captures were made of bears of all sex and age classes. Since 1983, most initial captures were of offspring of previously captured bears. Radiocollars have been placed on 119 bears; 41 on young-age males ($\leq$ 5 years), 19 on adult males ($\geq$ 6 years), 35 on young-age females, and 24 on adult females. Radiocollars were not placed on 13 bears, because they were cubs or yearlings (7), capture-related mortalities (4), or were captured outside the boundaries of the study area (2). By June 1993, 32 bears carried functioning radiocollars; 16 bears had shed

collars; 59 bears were dead; 1 was presumed dead; and 10 bears could not be located, presumably because of long-range movements or collar failure.

Status of Individual Bears

Several observations were made during 1993 that affect the status reported for bears in 1992 (Reynolds 1993). Bear no. 1348, a 21-year-old female, was observed accompanied by her three 2-year-olds, nos. 1619, 1620, and 1621, during early September within her home range near the Gold King benches. No. 1619 was killed by a hunter near Gold King airstrip on 18 September. A trapper in the area killed bear no. 1621 at his cabin on Gold King Creek on 3 October. During a subsequent interview, a reliable source reported a radio-collared female had been killed in the Gold King area after bear no. 1621 was killed, but the name of the person who killed the bear was not revealed. This kill was not reported nor presented to the Alaska Department of Fish and Game (ADF&G) as required by regulation. I mistakenly assumed that no. 1348 was this unknown mortality and reported that in 1992 (Reynolds 1993); however, she was located with her remaining 3-year-old in May 1993. Two other adult females, nos. 1362 and 1607, have home ranges in the vicinity but their radiocollars are not functioning and neither has been located for at least 2 years. Of the two, it is most likely that no. 1607 was the bear reported killed because of the proximity of her home range.

During 1992, a hunter was surprised and mauled by a female accompanied by two large offspring in the Dry Creek drainage. Information available during 1992 (Reynolds 1993) indicated that the female was no. 1626 and that one of her offspring was also killed. Data gathered during 1993 provides stronger evidence that no. 1626 was killed in the encounter, but that neither of her yearling offspring were killed.

Ralph Borders, of Sitka, and his hunting partner, William Gonce, described the mauling during an interview with John Hechtel and me at the Fairbanks Memorial Hospital. On 11 September, the two men hiked along Dry Creek to a point about 1 mi upstream from the sheep lick and began climbing the ridge to the west. About 300 m above Dry Creek, at approximately 4:00 p.m. they prepared to cross a divide to look into a basin to the north. Suddenly, they saw the grizzly bear family group nearby immediately up the hill. The hunters were downwind from the bears, which may have been lying down in a small depression. When first sighted, the adult female's body was oriented away from the hunters and she was looking at them over her shoulder. Almost immediately after the hunters saw the bears, all three bears charged. The bears made no sound during the attack. The two offspring charged Gonce, who had a cartridge loaded in the chamber of his 30-06 rifle, and the adult charged Borders, who had cartridges in the magazine of his rifle, but none in the chamber. When Gonce shot at one of the offspring from his hip at a distance of about 4 ft., it stumbled and both offspring retreated up the hill and over the divide.

By this time, the female was mauling Borders and Gonce shot it. The bear was knocked down, but got up and attacked Borders again before Gonce shot twice more and killed it. The hunters did not spend much time at the mauling site but hiked down to Dry Creek and left Borders' rifle and personal gear there before hiking further downstream to get help. Gonce was certain that he had hit the offspring when he shot at it and reported seeing blood above the mauling site that could have come from the bear. Both hunters were certain that the adult female did not have an obvious radiocollar or ear-tags.

Borders had a number of puncture wounds, but the most serious cutting wounds were on his right upper and left lower lips. Borders said, "that the bear did not seem serious in the mauling, but rather almost seemed to be nibbling." He was initially treated at Fairbanks Memorial Hospital, but had to travel to Los Angeles for treatment by specialists for his upper lip wound.

Heavy snowstorms blanketed the area for 2 days following the attack. Because of intermittent snowstorms and aircraft availability, I was unable to fly over the site until 29 September. I located the site from Gonce and Borders' descriptions, and observed what appeared to be the dead female's carcass in the snow. Numerous tracks of 1-2 bears were also present but I was unable to find any bears. The radiocollar of no. 1626, a female with two yearlings, was also transmitting from the site on mortality mode (which means that it had not moved for at least 4 hours previous to signal reception). I attempted to examine the site by helicopter on 1 October, but because of a mechanical malfunction, I was unable reach it. Another biologist located the site during late April from the longitude/latitude position that I gave him, and recovered the radiocollar and a grizzly bear scapula. I visited the site on 29 June and located grizzly bear hair and some bones. My examination of the site confirmed Gonce's and Borders' account of the physical area. I also located a small swale that could have easily hidden the family group until the hunters were within 50 m of the bears.

These circumstances indicate that the bears involved in the attack were female no. 1626 and her two unmarked yearling offspring. Although the bear was collared and marked 23 May and should have had noticeable earflags, it is possible that her offspring tore them off. Also, by mid-September, her fur could have been thick enough to hide a radiocollar. Alternately, she could have shed her collar in this same vicinity, but that possibility seems unlikely. In addition, two 2-year-olds were observed in the vicinity of the mauling site during late April 1993 (P. Valkenburg, pers. commun.). When I captured two sibling 2-year-olds 4.8 km from the site on 7 May 1993, I assumed that these were the two offspring of no. 1626. In a cursory physical examination of the two bears, I did not see evidence of a healed bullet wound, but one could have been present. Both of the siblings were females, and one charged the helicopter repeatedly during the capture process, a behavior that I have seldom observed in adult males, very rarely observed in females with offspring, and

never before observed in young males or females, in the course of over 1000 captures. Whether these two siblings, nos. 1628 and 1629, are offspring of no. 1626 should be confirmed by future analysis of genetic relationships.

Female no. 1336 was not visually relocated during radio-tracking flights after she was captured on 7 May 1992. A weak signal that could only be received from 2 km distance was received on mortality mode on 28 April 1993 near the junction of Cody Creek and the Wood River in the middle of a large stand of black spruce. There was complete snow cover on the ground and no tracks were apparent in the trees. The transmitter was picked up on 29 June 1993. It had apparently been hidden by humans about 50 cm under a root mass of a fallen spruce tree; it was too heavy to have been cached there by small mammals and the site was not disturbed enough to indicate burial by a fox, wolf, or bear. Both ends of the collar material, including the antenna, had been cut with a knife from the transmitter. Based on this information, I assumed that she had been killed illegally during May-October, 1992. The bear had not been presented for sealing as a marked bear or as a defense of life or property kill.

Females Present in the Population

By October 1992, only 11 adult females ($\geq$ 6 years of age) were assumed present in the population, compared to 21-23 during 1982-89 (Reynolds 1993). However, by May 1993, three more females had reached 6 years of age, bringing the adult female segment of the population up to 14. These figures included the mortalities of adult female nos. 1302, 1348, 1379, and 1626 during 1992 and the gain of female nos. 1391, 1394, and 1397 during 1993. No additional adult females were captured during 1993, although it was determined that female no. 1348 was still alive and no. 1336 was not. The estimate of 14 adult females alive in the population in May 1993 is a maximum figure because the status of three of these bears is unknown due to radiocollar failure. No. 1362, whose home range was centered in the Sheep Creek and Rogers Creek drainages, has not been located for 4 years despite searches in these areas. Similarly, no. 1345 was not located during 1992 or 1993 in her home range in the upper drainages of the Wood River and Yanert River. No. 1607's last location was at an apparent den site during May 1992, and it is possible that she was the bear that was reported illegally killed during October 1992. Searches for these females will continue within their established home ranges. Other similar searches have been successful in the past. Of 13 females not located for at least a year: three were recaptured after 1 year, three after 2 years, two after 3 years, three after 4 years, and one each after 5 and 6 years. Only one female, no. 1340, was not found after 6 years.

Radiocollars of no. 1398, a 12-year-old female, and no. 1608, a 17-year-old female, each with two 2-year-olds, failed by early May 1993 before they could be recaptured.

During 1993, no. 1374, a 13-year-old female whose home range has been immediately adjacent to, but not within, the study area began using an area in the upper East Fork of the Little Delta River drainage. If she continues this shift of her home range to this area, it would result in an increase in the adult female population size.

Two females of unknown family lineage were captured in the Wood River drainage south of Virginia Creek during 1993. These bears could be the unmarked offspring of two marked females who lived in that portion of the study area. No. 1630, a 3-year-old, could be an offspring of female no. 1345. Similarly, no. 1631, a 5-year-old, could be the offspring of no. 1322. Initial relocations of these bears support these hypotheses. These relationships may be confirmed when genetic analysis of blood samples is completed.

Recovery of the adult female segment of the population depends upon the number of female offspring produced and their survival. The number of young age (2- to 5-year-old) bears in the population that were females was 15 during 1993 and 16 during 1992. We expect there were probably additional females among bears of unknown sex in four 3-year-olds and five 2-year-olds that were not captured during 1993 and among the four 2-year-olds not captured during 1992. Assuming that half of the 2- or 3-year-olds of unknown sex were females, these 2- to 5-year-old cohorts would include 18 potential recruits to the adult female segment in 1992 and 20 in 1993. The annual mean number of potential 2- to 5-year-old female recruits during 1982-91 was 10.3 (range = 6-15). If no more than two adult and one young-age females die annually from all causes, and no other adult females are captured in the area, then the female segment of the population would reach 18 by spring 1998. Faster or slower recovery would depend on hunter kill and natural mortality levels.

Status of Productive Females

Of four adult females that bred during 1992, three (1308, 1324, and 1374) were observed with three cubs during 1993. Although no. 1311 was not observed with cubs, it is probable that she produced some and then lost them; she remained in her den until after most other females with and without cubs had left den sites, which is usually a good indicator of cub production. Nos. 1394 and 1397, both 5-year-olds, bred but only no. 1394 produced a single cub. Four-year-old female no. 1609 bred but apparently did not produce cubs.

During 1993, five 5-year-olds (nos. 1603, 1604, 1605, 1609, and 1631) and one 6-year-old (no. 1397) probably bred, and may produce their first offspring during 1994. Nos. 1603 and 1609 both consorted with males as 4-year-olds, but did not produce cubs. Female nos. 1605, 1609, and 1631 all showed evidence of estrus when captured during 1993. Since 1984, six 5-year-olds and three 4-year-olds have successfully bred and produced cubs the following year. However, three of those successfully reared the offspring until weaning, the offspring of three died before weaning, and the

success of rearing of three sets of offspring until weaning was unknown (two of these still accompany their mothers). The mean age at which 16 females first successfully produced a litter that survived until weaning was 7.5 years, with a range from 5 to 10 years of age.

During 1992-93, only no. 1348 did not wean her offspring as 2-year-olds; examination at her capture during 1992 indicated that she may have been wounded by a hunter and this could have influenced weaning. Two of her three 2-year-old offspring were killed by hunters during fall 1992. Five females (nos. 1303, 1308, 1311, 1324, and 1336) weaned their offspring as 2-year-olds; the radiocollars of two others failed prior to the period of weaning so their fate is unknown.

Mortality

No hunter kills were reported from the study area during spring 1993. One of three cubs of female no. 1308 and the unmarked yearling of female no. 1385 were not with their mothers by 26 August 1993, and were presumed dead. The site where female no. 1302 was killed by male no. 1601 during late September 1992, was examined but no sign was found of 1302's unmarked yearling. This female had been observed fighting with and routing a male during May 1992. If the yearling was not also killed, it could probably have survived alone over winter, but it was not located during aerial searches of the area during 1993.

Fifteen bears have been killed in the Wood River drainage that were taken illegally, suspected taken illegally, taken in defense of life or property, or taken at cabins or residences but legally reported as hunter-killed animals. In comparison, in other portions of the study area, three were killed in defense of life or property, two were recorded as hunter kills at cabins or residences, and four were suspected wounding losses or unrecovered defense of life or property kills. Of mortalities of these types, nine occurred to females, four to males, and two to bears of unknown sex.

All five illegal kills and four suspected illegal kills that occurred in the study area took place in the Wood River drainage. No illegal kills were confirmed or suspected in other portions of the study area. Of the illegal kills, no. 1342, a 2-year-old accompanied by her mother, no. 1321, was killed during 1983 with a snare placed at a cabin that had been previously damaged by bears. Bear no. 1317 was killed by hunters or big game guides in the Yanert or upper Wood River drainage during fall 1985, but was never presented to the ADF&G as required by regulation. Two bears, one marked and one unmarked were killed near a mining camp on St. George Creek near the Wood River during 1989. According to a witness, the bears were about 1/2 mi from the camp when they were stalked and killed. The radiocollar was destroyed and both bears buried with the use of heavy equipment. Female no. 1336 was illegally killed during 1992 in the upper Wood River drainage.

The four suspected illegal kills that took place in the Wood River drainage included two 2-year-old females that were collared near Glacier Creek on 6 May 1991, but not observed subsequently. Because no young-aged females have emigrated from the vicinity of their maternal home ranges during this study (Reynolds and Boudreau 1992), and because it is unlikely that the radiocollars carried by both of these bears failed at the same time, it is suspected that they were killed illegally. The radiocollar of 4-year-old female no. 1387 was located on mortality mode near a cabin on Rogers Creek during 1990, but a later search for the collar was unsuccessful. An adult female grizzly wearing a radiocollar was reported killed by a resident of the area during early October 1992. Although this bear could have been no. 1607, it was not presented for sealing at ADF&G so positive identification was not possible.

Of the seven bears killed in defense of life or property, four were killed in the Wood River drainage. Nos. 1325, 1367, and 1368 were all 2-year-olds, killed at mining sites during the year in which they were weaned. Mining operators sought advice on aversive conditioning or other means of avoiding killing nos. 1367 and 1368, but the bears continued to cause problems at the mine and they were shot. Adult female no. 1323 was accompanied by two yearling or 2-year-old offspring when she charged a sheep hunter on upper Gold King Creek and was shot.

Of the three killed in defense of life or property outside the Wood River drainage: no. 1369 was killed at a cabin in Lignite during 1987; an unmarked 3-year-old was killed by a hunter near Gillam Glacier during 1989; and no. 1626, an adult female with 2 yearlings, was killed when she attacked two hunters near Dry Creek, as previously described.

In addition to bears killed in defense of life or property, four bears have been killed at cabins or residences, but were taken under hunting license regulations. These mortalities include no. 1377, a 7-year-old male killed at a residence outside the study area north of Healy in 1991; no. 1611, a recently weaned 2-year-old killed at a residence near Gold King airstrip during 1991; no. 1379, a 7-year-old female killed at a cabin near Dry Creek, September 1992; and no. 1621, a 2-year-old that still accompanied his mother, at a trapping cabin near Gold King Creek, October 1992.

During the study, I suspected that four radio-collared adult females that were found dead were either killed in defense of life or property and not recovered or were wounded by hunters, escaped, and later died. No. 1318 was accompanied by two cubs in 1989 when she was killed 500 m from an airstrip used by sheep hunters near the West Fork of the Little Delta River. Similarly, no. 1341 also had two cubs in 1989 when she was found dead 0.5 km from a hunting camp and near an all-terrain vehicle trail at the junction of the East and West Forks of the Little Delta River. The remains of both nos. 1320 and 1331 were found near the western morraine of Hayes Glacier. When the mortality site of no. 1320 was first located on 30 August 1989, a sheep hunter's spike camp was observed 300 m away, but the hunters were

never contacted to determine if they had shot at a bear. No. 1331 died during 1990, 500 m from where no. 1320's remains were found.

Changes in Harvest Patterns

The population within the study area, estimated by the direct count method and adjusted for closure, declined from 72 bears during 1981 to 53 during 1992 (Reynolds 1993). The time necessary for the population to recover or stabilize will depend upon the levels of both recruitment and mortality. Compensatory recruitment by heavily-harvested grizzly bear populations has not been documented (Reynolds and Boudreau 1992, Miller 1993) so mortality will have to be reduced, especially of females, for population stability or recovery to occur. Hunter kills of no more than 3% of adult females, and 6-8% of bears $\geq$ 2 years of age were recommended to allow recovery of this population (Reynolds 1993). Because most grizzlies in this area are killed incidentally to moose or caribou hunts, and because the caribou hunting season in the area is closed, no further reduction in grizzly bear hunting seasons may be necessary. In addition, public education of the need for, and methods of, harvesting males rather than females has begun and may reduce the need for further restrictive management to allow recovery of this population.

CONCLUSIONS AND RECOMMENDATIONS

This is the first year of the third phase in a study to evaluate the effects of harvest on grizzly bear population dynamics. The primary objective during this phase will be to monitor the recovery or stabilization of the population and to document the accompanying changes in productive capacity.

It will be necessary to monitor the number and status of all adult females in the study area using radiotelemetry. Besides maintaining transmitters on females presently carrying collars, it will be essential to re-collar those females whose collars have failed or been shed. Intensive aerial searches of their established home ranges, coupled with radio-collaring and monitoring adult males to locate breeding females will be necessary. Female offspring of marked females should also be radio-collared to monitor their presence in the population and the rate at which they serve as recruits to the adult female cohort.

The pattern of hunter harvest should continue to be closely monitored and the take of females discouraged. Effectiveness of other methods besides season and bag limit management in reducing harvest of females should be explored.

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Table 1. Capture and marking characteristics of 132 bears captured in the northcentral Alaska Range, 1981-93.

Bear no. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1301 M	6	5/18/81	120(265)	Buchanan Creek	1.8/1.2 H	373/374	G/G
1302 F	3	5/19/81	75(165)	East Fork Delta	1.0/1.0 M	368/367	R/G
	8	6/12/86	114(250)	East Fork Delta	2.2 TEL M	280/281	O/IB
	11	5/12/89	109(241)	Buchanan Creek	4.5 TEL M	339/340	O/IB
1303 F	2	6/17/81	57(125)	Mystic Mountain	1.4/1.4 M	524/523	R/R
	4	6/27/83	82(180)	Hearst Creek	5.0 M99 M	3227/3214	R/R
	6	6/14/85	73(160)	Upper Gold King	2.0/2.0 M	486/487	R/R
	12	5/31/91	95(210)	Upper Moose Creek	1.0 TEL L	104/104	Y/W
1304 M	5	6/19/81	136(300)	West Fork Delta	2.4/2.0 M	451/452	IB/R
	11	5/21/87	255(560)	Threemile Creek	8.1 TEL M	430/431	W/mG
	13	6/7/89	245(540)	Slate Creek	7.0 TEL M	778/--	W/--
	15	6/1/91	272(600)	West Fork Delta	9.6 TEL M	136/137	W/mG
1305 F	24	6/19/81	114(250)	Slate Creek	A M	453/454	O/R
1306 M	2	5/24/82	44(97)	West Fork Delta	1.0/1.0 L	3151/3086	G/IB
1307 M	2	5/24/82	44(98)	West Fork Delta	1.0/1.0 H	3087/3152	IB/G
	5	6/17/85	114(250)[d]	Sheep Creek	2.4/2.6 L	3087/3152	IB/G
1308 F	6	5/25/82	111(245)	Dry Creek	-[e]	3001/3154	O/Pp
	8	6/20/84	120(265)	Dry Creek	5.0 M99 M	3001/471	O/Pp
	11	6/8/87	123(270)	Dry Creek	3.3 TEL M	528/529	O/Pp
	15	5/6/91	125(275)	Dry Creek	6.0 TEL M	150/149	W/R
1309 M	8	5/25/82	318(700)[d]	Dry Creek	A L	3153/3101	dB/Bk
1310 M	13	5/25/82	250(550)[d]	Buchanan Creek	2.0/2.0 M	No tags	
	15	6/20/84	241(530)	Molybdenum Ridge	4.0/2.0 M	467/473	O/W
	18	5/21/87	264(580)	Buchanan Creek	9.0 TEL M	414/413	Y/W
1311 F	12	5/26/82	120(265)	Molybdenum Ridge	1.9/2.1 M	3106/3107	W/W
	14	6/21/84	116(255)	Molybdenum Ridge	2.0/2.2 M	466/455	W/W
	17	6/8/87	123(270)[d]	Molybdenum Ridge	3.4 TEL M	571/570	W/W
	21	6/3/91	125(275)	Molybdenum Ridge	5.5 TEL M	139/140	W/W
	22	5/10/92	121(267)	Molybdenum Ridge	5.0 TEL M	249/250	W/W
1312 F	Cub	5/26/82	12(26)	Molybdenum Ridge	0.1/0.1 M	3104/3155	O/W[f]
1313 F	Cub	5/26/82	12(27)	Molybdenum Ridge	0.08/0.13 M	3156/3105	W/O[f]

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1314 M	6	5/27/82	116(255)	Iowa Ridge	2.1/1.9 H	3088/3002	dB/lB
1315 M	13	6/4/82	272(600)	Buchanan Creek	1.9/2.1 L	3102/3157	Bk/O
	15	5/17/84	295(650)	Hayes Creek	A H	3322/none	Bk/-
1316 M	11	6/7/82	236(520)	West Fork Delta	3.8/0.0 H	3089/3090	O/lB
1317 F	3	6/8/82	36(80)	Forgotten Creek	1.2/1.8 L	3091/3003	lB/O
	5	5/16/84	55(122)	Upper West Fork	A L	3486/3239	lB/O
	6	5/23/85	59(130)	Upper Wood River	7.0 M99 M	497/498	lB/O
1318 F	13	6/8/82	104(230)	Buchanan Creek	A L	3004/3103	W/G
	15	6/22/84	118(260)[d]	Slate Creek	A M	458/472	W/G
	18	6/2/87	105(230)[d]	Slate Creek	3.3 TEL M	--	--[f]
1319 M	Cub	6/8/82	12(26)	Buchanan Creek	0.15/0 L	3005/3092	R/Y
1320 F	17	6/8/82	102(225)	Trident Glacier	A M	3158/3093	G/B
	19	6/25/84	139(305)	East Hayes Creek	5.0 M99 M	463/461	G/B
	22	6/12/87	114(250)	Hayes Glacier	4.0 TEL M	517/518	mG/dB
1321 F	16	6/9/82	141(310)	Snow Mountain Gulch	2.1/1.9 M	3028/3108	G/W
	17	5/17/83	127(280)	Dry Creek	1.8/2.2 M	3028/3427	G/W
	19	7/22/85	218(480)	North VABM Wood	2.6/1.0 L	399/398	G/W
	23	6/6/89	170(375)	Dry Creek	-- TEL M	788/789	lG/W
1322 F	8	6/9/82	91(200)	Sheep Creek	1.9/2.1 M	3051/3159	W/lB
1323 F	11	6/10/82	95(210)	Mystic Mountain	1.9/2.1 M	3160/3030	G/G
	13	6/29/84	132(290)	VABM Wood	A M	579/582	G/G
1324 F	Cub	6/10/82	12(26)	Mystic Mountain	0.12/0 M	3027/3162	R/W[f]
	6	5/26/88	111(245)	Coal Creek	3.6 TEL L	159/160	Bk/W
	10	5/26/92	129(285)	Dry Creek	5.5 TEL L	121/122	Bk/W
1325 M	Cub	6/10/82	12(27)	Mystic Mountain	0.10/0 M	3161/3031	W/R[f]
	2	5/15/84	67(148)	Mystic Creek	1.0 M99 M	3233/3394	R/W
1326 F	4	6/18/82	93(205)	Buchanan Creek	2.2/1.8 M	3008/3163	W/R
	6	6/21/84	109(240)	Buchanan Creek	1.8/2.2 M	468/462	W/R
	7	6/27/85	111(245)	Slate Creek	2.4/1.6 L	426/427	W/W
1327 F	16	7/8/82	127(280)	Whistler Creek	2.2/1.8 M	3134/3192	G/R
	18	6/23/84	125(275)	Whistler Creek	A H	458/192	G/R

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1328 F	1	7/8/82	43(95)	Whistler Creek	0.9/1.1 M	3115/3014	dB/G
1329 F	13	7/9/82	120(265)	Buchanan Creek	2.4/1.6 M	3026/3111	W/R
1330 M	1	7/9/82	48(106)	Buchanan Creek	-- M	--/--	R/W
	3	6/28/84	102(225)	East Fork Delta	2.6/3.0 M	597/598	R/W
1331 F	4	7/10/82	77(170)	Trident Glacier	2.4/1.6 M	3120/3194	Bk/O
	9	5/20/87	114(250)[d]	East Hayes Creek	3.0 TEL M	519/520	Bk/Y
	12	5/15/90	111(245)	Trident Glacier	6.0 TEL H	196/197	Bk/Y
1332 F	5	7/12/82	104(230)	Gillam Glacier	2.4/1.6 M	394/190	R/dB
1333 F	16	7/13/82	141(310)	Buchanan Creek	A M	474/469	G/R
1334 M	1	7/13/82	49(108)	Buchanan Creek	1.0/1.0 M	395/392	Y/G
	3	6/27/84	107(235)	McGinnis Creek	A M	585/583	O/G
1335 F	1	7/13/82	38(84)	Buchanan Creek	1.0/1.0 M	32/456	G/Y
	3	6/25/84	80(175)	Gilliam Glacier	1.5/3.0 M	465/464	dB/G
1336 F	2	5/16/83	48(105)	Kansas Creek	1.0/1.0 M	3201/3204	Bk/mG
	3	6/26/84	89(195)	Copper Creek	2.0/3.0 M	470/595	Bk/mG
	4	6/17/85	102(224)	Wood River	A L	470/595	Bk/mG
	6	5/15/87	109(240)	Rogers Creek	2.2/2.0 M	521/522	Bk/mG
	8	5/17/89	145(320)	Upper Wood River	4.5 TEL M	330/329	Bk/mG
	11	5/7/92	116(255)	Wood River	6.0 TEL M	330/329	Bk/mG
1337 M	20	5/18/83	293(645)	Sheep Creek	3.5/3.5 L	3209/3205	R/O
	25	6/15/88	277(610)	Sheep Creek	A TEL H	364/363	O/R
1338 M	6	5/20/83	111(245)	Molybdenum Ridge	A M	3203/3202	O/Bk
1339 M	6	5/23/83	120(265)	Trident Glacier	-- M	3286/3351	IB/W
	7	5/17/84	168(370)	East Fork Delta	6.0 M99 H	3254/3398	IB/W
1340 F	3	5/23/83	71(157)	Hayes Creek	1.2/0.8 H	3277/3208	G/O
	4	5/19/84	91(200)[d]	Molybdenum Ridge	4.0 M99 M	3277/3208	mG/O
	5	6/27/85	100(220)	West Hayes Creek	2.4/1.6 L	590/596	mG/mG
1341 F	10	5/23/83	107(235)	NE Portage	1.5/1.5 H	3210/3428	R/dB
	12	6/13/85	107(235)[d]	East Fork Delta	2.0/2.0 M	442/none	O/-
	15	6/14/88	164(360)	East Fork Delta	7.0 TEL M	356/355	dkB/
1342 M	2	5/24/83	49(108)	Threemile Creek	0.6/1.2 M	3354/3207	W/dB

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1343 M	2	5/24/83	43(95)	Threemile Creek	0.6/1.2 M	3426/3285	R/B
1344 M	2	5/24/83	56(123)	Threemile Creek	0.6/1.2 M	3361/3433	IB/Bk
	3	6/23/84	123(270)	Hayes Creek	2.2/3.2 M	475/460	IB/Bk
1345 F	8	5/24/83	--	Upper West Fork	1.2/1.8 L	3206/3352	O/O
	10	5/23/85	105(230)[d]	Upper West Fork	7.0 M99 M	499/500	O/O
	14	5/13/89	118(260)	Upper Wood River	4.5 TEL M	445/446	O/O
1346 M	5	5/25/83	114(250)	Hayes Glacier	A M	3359/3356	IB/IB
	12	5/14/90	--	Trident Glacier	10.5 TEL M	192/193	mG/mG
	13	6/1/91	249(550)	Buchanan Creek	11.0 TEL M	192/193	mG/mG
1347 M	6	5/31/83	189(415)	Coal Creek	3.5 M99	None	Dead
1348 F	12	5/31/83	123(270)[d]	Mystic Mountain	A M	3363/3372	W/O
	15	5/16/86	116(255)	Wood River	2.4/1.6 M	235/236	W/O
	19	5/12/90	141(310)	Gold King	6.0 TEL M	117/118	W/O
	20	5/9/91	120(265)	SW Gold King	11.0 TEL H	117/118	W/O
	21	5/9/92	107(235)	Wood River	5.5 TEL M	117/118	W/O
1349 M	18	6/2/83	264(580)	O'Brien Creek	3.8/1.2 L	3364/3292	R/IB
1350 M	8	6/2/83	202(445)	Ptarmigan Creek	3.0/2.0 L	3432/3430	dB/R
	11	6/12/86	205(450)[d]	East Fork Delta	3.5 TEL L	273/272	dB/R
1351 F	14	6/23/83	114(250)[d]	Dry Creek	4.0 M99 M	3217/3390	dB/W
	16	6/10/85	111(245)	Little Delta River	2.0/2.0 M	477/436	dB/W
	18	5/19/87	130(285)	Dry Creek	A M	503/504	dB/W
1352 F	14	6/27/83	111(245)	West Fork Delta	--	3215/3316	O/W
1353 M	1	6/27/83	27(60)	West Fork Delta	--	3310/none	O/-
1354 F	1	6/27/83	12(27)	West Fork Delta	--	None/3314	-/O
1355 M	3	6/30/83	60(133)	East Fork Delta	4.0 M99 H	3232/3473	O/Bk
	5	6/3/85	70(155)	Whistler Creek	2.2/1.8 H	586/587	O/Bk
1356 M	2	6/30/83	50(110)	Little Delta River	2.0 M99 H	3234/3392	Bk/O
1357 M	2	5/15/84	63(138)	Dry Creek	1.1 M99 M	3323/3235	W/Bk
	3	6/24/85	93(205)	Dry Creek	1.5/1.5 M	447/448	W/Bk
1358 M	13	5/18/84	205(450)	Hayes Creek	A L	3318/3447	IB/dB
	15	5/20/86	236(520)	Trident Glacier	3.4/2.0 L	297/296	IB/dB

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1359 M	3	5/28/85	61(134)	Snow Mountain Gulch	4.0 M99 M	489/488	dB/O
1360 F	10	5/28/85	95(210)	Snow Mountain Gulch	7.0 M99 H	None	None
1361 F	3	5/28/85	63(138)	Dry Creek	4.0 M99 M	482/483	mG/R
	4	5/19/86	100(220)	Rogers Creek	1.7/2.0 L	274/275	G/Bk
1362 F	6	6/5/85	--	Glacier Creek	2.0/2.0 L	None	None
	6	6/24/85	114(250)	Threemile Creek	2.2/1.8 L	443/490	dB/dB
	9	5/15/88	--	Sheep Creek	5.0 TFI H	197/198	O/Y
1363 M	3	6/5/85	55(120)	Slide Creek	1.0/2.0 M	592/593	dB/lB
1364 M	Cub	6/14/85	7(15)	Gold King Creek	0.7/- M	None	None
1365 M	5	6/19/85	118(260)	Wood River	A M	476/441	lB/G
1366 M	8	7/22/85	234(515)	Tatlanika River	3.2/1.0 M	390/391	mG/R
1367 M	2	5/19/86	61(134)	Threemile Creek	1.4/2.0 M	400/241	lB/W
1368 F	2	5/19/86	48(106)	Threemile Creek	1.4/2.0 M	257/256	lB/lB
1369 M	2	5/19/86	68(150)	Threemile Creek	1.4/2.0 L	247/246	W/dB
1370 F	2	5/20/86	47(103)	Buchanan Creek	1.4/2.0 H	253/252	dB/Bk
	3	5/20/87	69(151)	Buchanan Creek	1.5/1.5	--	--
1371 M	2	5/20/86	57(126)	Buchanan Creek	1.4/2.0 M	269/268	Bk/dB
1372 M	2	5/20/86	72(158)	Ptarmigan Creek	1.4/2.0 M	387/386	lB/O
	5	5/17/89	186(410)	Chute Creek	7.0 TEL M	310/309	lB/O
1373 M	7	5/21/86	193(425)	Delta Creek	4.0/2.0 M	295/294	lB/R
1374 F	6	5/21/86	106(233)	Delta Creek	2.0/2.0 M	249/248	R/G
	9	6/9/89	147(325)	Delta River	6.0 TEL M	320/319	lG/lB
1375 M	6	6/13/86	186(410)	Sheep Creek	4.5 TEL L	276/277	Y/W
	9	5/13/89	281(620)	Mystic Creek	9.0 TEL L	439/440	O/W
	11	5/31/91	295(650)	Threemile Creek	14.0 TEL H	146/440	O/W
1376 F	14	6/13/86	130(285)	Hayes Creek	3.0 TEL M	279/278	G/O
1377 M	2	8/28/86	132(290)	Iowa Ridge	4.0 TEL L	505/507	Bk/R
1378 F[g]	2	5/20/86	59(130)[d]	Ptarmigan Creek	--	None	None
1379 F	2	5/15/87	67(148)	Sheep Creek	2.2/2.0 L	334/335	W/W
	4	6/6/89	102(225)	Dry Creek	3.5 TEL L	777/776	W/W

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1380 M	2	5/18/87	65(142)	West Fork Delta	2.2 TEL H	513/514	W/R
	3	5/17/88	109(240)	Buchanan Creek	3.2 TEL	175/174	W/R
1381 M	2	5/21/87	73(160)	Dry Creek	3.0 TEL M	481/480	lB/Bk
1382 F	3	5/15/88	68(150)	West Fork Delta	3.2 TEL M	169/170	R/Y
	4	6/7/89	84(185)	Buchanan Creek	4.0 TEL M	169/170	R/Y
1383 M	2[d]	6/12/87	77(170)	Coal Creek	A M	389/390	mG/dB
1384 M	7[d]	5/15/88	191(420)	Chute Creek	7.0 TEL M	960/959	W/Y
1385 F	2	5/15/88	68(150)	Upper Wood River	2.2 TEL H	168/167	lB/Y
	3	5/13/89	82(180)	Wood River	3.4 TEL M	--	lB/Y
	4	5/11/90	95(210)	Upper Wood River	A TEL H	--	--
	5	6/2/91	118(260)	West Fork Delta	5.5 TEL M	108/107	lB/Y
	7	5/9/93	86(190)	West Fork Delta	4.0 TEL M	108/107	lB/Y
1386 M	2	5/15/88	73(160)	Upper Wood River	2.2 TEL M	181/180	Bk/Y
	3	5/13/89	91(200)	Upper Wood River	3.4 TEL M	181/180	Bk/Y
	4	6/7/90	120(265)	Upper Wood River	7.0 TEL H[h]	790/791	Bk/Y
	5	5/31/91	156(345)	West Fork Delta	6.0 TEL H[h]	790/791	Bk/Y
1387 F	2	5/23/88	55(120)	Dry Creek	A TEL M	179/178	Y/R
	3	5/12/89	77(170)	Rogers Creek	3.4 TEL M	337/338	Y/R
	4	5/15/90	84(185)	Sheep Creek	A TEL M	190/191	--
1388 M	2	5/25/88	68(150)	Dry Creek	2.5 TEL M	153/154	Y/lB
1389 M	3	5/13/89	84(185)	Mystic Creek	4.5 TEL H	343/344	W/dB
1390 F	3	5/13/89	77(170)	Mystic Creek	3.4 TEL H	345/346	Y/Y
1391 F	2	5/13/89	68(150)	Dry Creek	2.8 TEL L	333/334	O/mG
	3	5/12/90	95(210)	Dry Creek	3.8 TEL M	333/334	O/mG
	4	5/7/91	109(240)	Forgotten Creek	5.5 TEL H	109/110	O/mG
	5	5/23/92	111(245)	Dry Creek	5.0 TEL L	109/898	O/mG
1392 M	2	5/13/89	89(195)	Dry Creek	2.8 TEL M	341/342	lG/O
	5	5/26/92	229(505)	Dry Creek	13.0 TEL L	881/882	mG/R
1393 M	2	5/17/89	66(145)	Molybdenum Ridge	3.5 TEL H	326/325	Bk/lB
	3	5/14/90	100(220)	Trident Glacier	4.4 TEL M	326/325	Bk/lB

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1394 F	2	5/17/89	59(130)	Molybdenum Ridge	3.5 TEL -	331/332	lB/Bk
	6	5/10/93	94(207)	Molybdenum Ridge	3.4 TEL M	165/166	lB/Bk
1395 M	2	5/17/89	86(190)	Molybdenum Ridge	3.1 TEL M	302/301	dkB/W
1396 M	13[d]	5/18/89	295(650)	Molybdenum Ridge	7.0 TEL M[h]	327/328	Y/O
1397 F	2	5/18/89	61(135)	Delta Creek	3.2 TEL M	314/313	O/O
	5	5/25/92	116(255)	East Fork Delta	5.5 TEL M	793/792	O/O
1398 F	8[d]	5/18/89	127(280)	Delta Creek	4.5 TEL M	315/316	W/Y
1399 M	2	5/18/89	66(145)	Delta Creek	3.2 TEL M	303/304	R/R
1400 M	8[d]	6/8/89	239(525)	Trident Glacier	7.0 TEL M[h]	425/426	R/lB
1601 M	9	6/9/89	193(425)	Whistler Creek	6.5 TEL M[h]	782/785	Gr/Y
	11	5/7/91	245(540)	Slate Creek	13.0 TEL L	125/126	Gr/Y
	12	10/4/92	340(750)[d]	Buchanan Creek	A TEL M	179/180	dB/W
1602 M	7	5/13/90	166(365)	Molybdenum Ridge	A TEL M	122/121	lB/Gr
	9	5/25/92	200(440)	East Fork Delta	7.0 TEL M	980/981	lB/Gr
1603 F	2	5/13/90	55(120)	Hayes Creek	3.6 TEL H	141/142	lB/dB
	3	5/8/91	70(155)	Whistler Creek	3.6 TEL M	128/127	lB/dB
	4	5/24/92	102/225	West Hayes Creek	6.0 TEL M	214/213	lB/dB
1604 F	2	5/13/90	48(105)	Buchanan Creek	3.4 TEL M	119/120	lB/R
	3	5/7/91	59(130)	Buchanan Creek	4.0 TEL H	101/120	lB/R
	4	5/25/92	95(210)	West Fork Delta	6.0 TEL M	101/889	lB/R
	5	5/8/93	82(180)	Buchanan Creek	5.0 TEL M	889/101	R/lB
	5	5/10/93	--	East Fork Delta	5.0 TEL M	889/101	R/lB
1605 F	2	5/13/90	59(130)	Buchanan Creek	3.6 TEL M	213/150	mG/lB
	3	5/8/91	68(150)	East Fork Delta	3.6 TEL M	213/293	mG/lB
	4	5/25/92	102(225)	Buchanan Creek	4.0 TEL M	213/293	mG/lB
	5	5/10/93	102(225)	East Fork Delta	3.2 TEL M	195/196	mG/lB
1606 M	2	5/13/90	50(110)	Buchanan Creek	A TEL M	143/144	R/dB
	3	5/8/91	70(155)	Gilliam Glacier	3.6 TEL M	143/144	R/dB
	5	5/8/93	105(230)	West Hayes Creek	5.4 TEL M	396/397	R/dB
1607 F	8	5/14/90	141(310)	Glacier Creek	5.5 TEL M	188/189	W/lB
1608 F	15	5/14/90	136(300)	Trident Glacier	5.5 TEL M	184/-	lG/-

Table 1. Continued.

Bear no. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1609 F	2	5/14/90	61(135)	Trident Glacier	3.2 TEL M	103/104	dB/mG
	3	5/7/91	77(170)	Trident Glacier	4.0 TEL M	103/102	dB/mG
	4	5/25/92	93(205)	Ptarmigan Creek	A TEL M	103/102	dB/mG
	5	6/29/93	107(235)	E. Hayes Creek	6.2 TEL M	103/102	dB/mG
1610 F	2	5/6/91	70(155)	Threemile Creek	3.4 TEL M	116/115	O/R
1611 M	2	5/6/91	91(200)	Threemile Creek	3.4 TEL M	106/105	Gr/O
1612 F	2	5/6/91	73(160)	Threemile Creek	3.4 TEL M	131/132	Y/mG
1613 M	7	6/2/91	177(390)	Wood River	12.0 TEL M	131/130	R/O
1614 M	4	6/1/91	109(240)	Hayes Creek	12.0 TEL H	144/145	lG/lG
1615 M	4[d]	6/3/91	125(275)	Hayes Creek	5.5 TEL H	112/111	R/W
1616 M	5	5/7/92	169(370)	Mystic Creek	14.0 TEL H	239/240	Y/R
1617 F	2	5/7/92	54(120)	Wood River	3.6 TEL M	847/848	R/lG
	3	5/9/93	43(95)	Wood River	3.6 TEL M	848/847	lG/R
1618 F	2	5/7/92	54(120)	Wood River	3.6 TEL M	209/210	lB/lG
	3	5/9/93	49(107)	Virginia Creek	3.6 TEL M	209/210	lB/lG
1619 F	2	5/7/92	68(150)	Bonnefield Creek	3.6 TEL L	201/202	R/R
1620 M	2	5/7/92	75(165)	Bonnefield Creek	3.6 TEL M	229/230	lB/lB
1621 M	2	5/7/92	82(180)	Bonnefield Creek	3.6 TEL L	147/148	mG/Y
1622 M	2[d]	5/9/92	100(220)	Wood River	3.6 TEL M	143/236	Y/Y
1623 F	2[d]	5/9/92	95(210)	Wood River	3.4 TEL M	127/126	O/dB
	3	5/9/93	93(205)	Wood River	3.6 TEL M	191/192	O/dB
1624 F	2	5/10/92	70(155)	Molybdenum Ridge	3.6 TEL M	245/246	dB/lB
	3	5/8/93	57(125)	Moybdenum Ridge	3.4 TEL M	245/246	dB/lB
1625 M	2	5/10/92	84(185)	Molybdenum Ridge	3.6 TEL M	243/244	R/Y
1626 F	16	5/23/92	109(240)	Dry Creek	6.0 TEL L	150/233	W/lB
1627 F	3	5/7/93	73(160)	Dry Creek	3.6 TEL M	997/998	Y/lB
1628 F	2	5/7/93	45(100)	Dry Creek	3.6 TEL M	173/174	lG/R
1629 F	2	5/7/93	41(90)	Dry Creek	3.6 TEL M	230/231	R/mG
1630 F	3[d]	5/7/93	59(125)	Wood River	3.6 TEL M	168/167	dB/lG
1631 F	5[d]	5/9/93	89(195)	Virginia Creek	5.6 TEL M	169/170	mG/O
1632 M	10[d]	5/10/93	277(610)	Tatlanika Creek	12.2 TEL M	161/162	lG/mG

Table 1. Continued.

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[a] Dosage in ml. No designation indicates use of phencyclidine hydrochloride/acepromazine maleate at 100 mg/ml concentration; use of M-99 is designated M99 at 1 mg/ml concentration; use of Telazol at 200 mg/ml concentrations is designated TEL; A denotes multiple injections with unknown effective dosage. Drug effects were as follows: L = light, M = optimum, H = heavy.

[b] Ear tag numbers, left/right.

[c] Marking designations:
Colors: R, red; G, light green; mG, medium green; Gr, gray; O, orange; lB, light blue; dB, dark blue; W, white; Bk, black; Pp, purple; Y, yellow.
Marker types: One or 2 color combinations were used for ear flags, e.g., O/W is orange in left ear, white in right ear; -/G is no flag, left; green, right.

[d] Estimated.

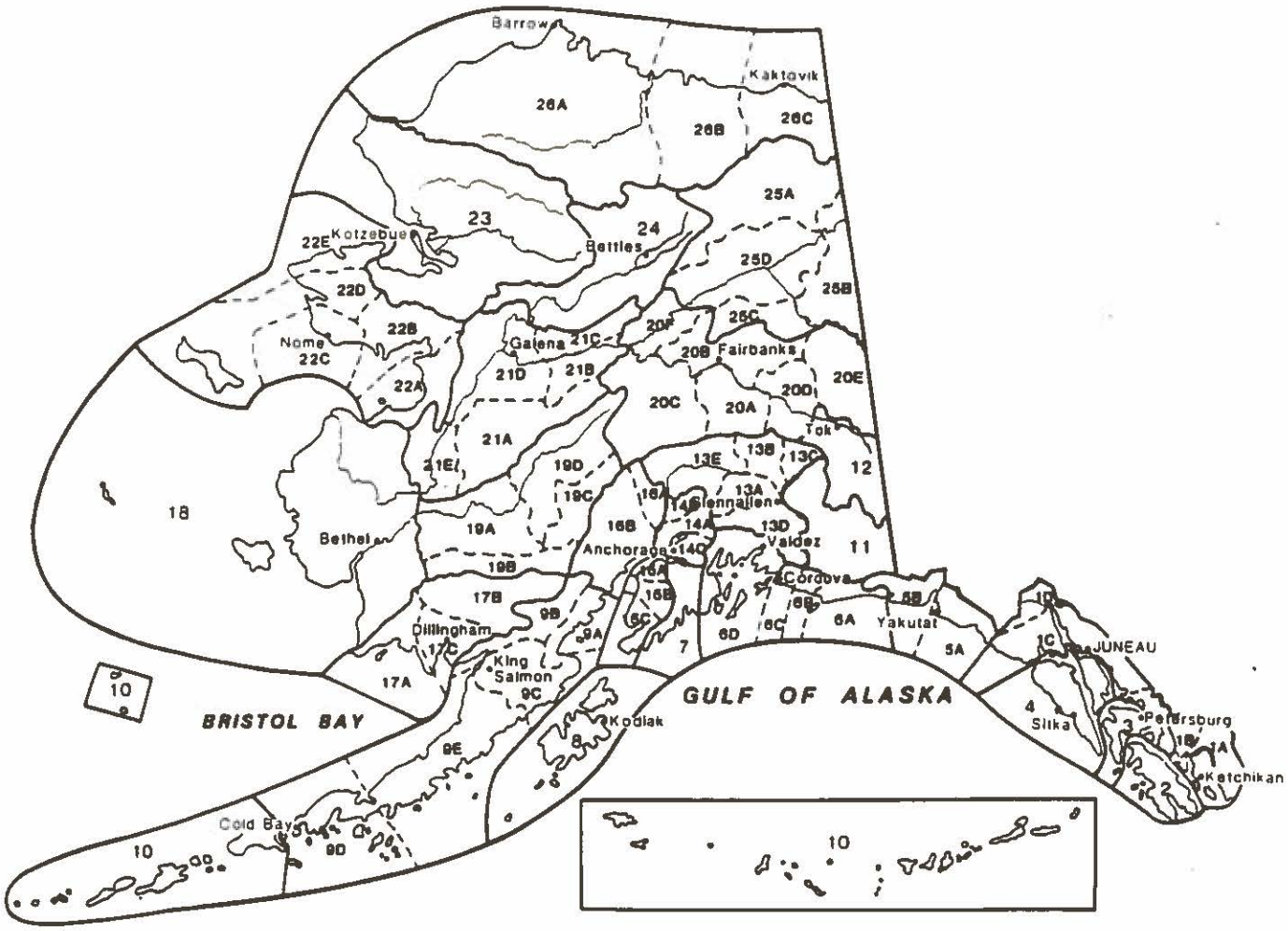
[e] Data collected but not recorded.

[f] Ear tags only and not ear flagging material were used to mark cubs of the year; therefore, for these bears only, marker colors indicate ear tags and not ear flags.

[g] Bear No. 1378, an offspring of No. 1311, was darted but not immobilized on 20 May 1986. We left her with her mother to recover from the darting chase, but she was killed by hunters before we returned. We include her in this table for ease of data analysis.

[h] Dosages of Telazol administered at a concentration of 300 mg/ml, instead of the usual 200 mg/ml.

Alaska's Game Management Units



Federal Aid in Wildlife Restoration

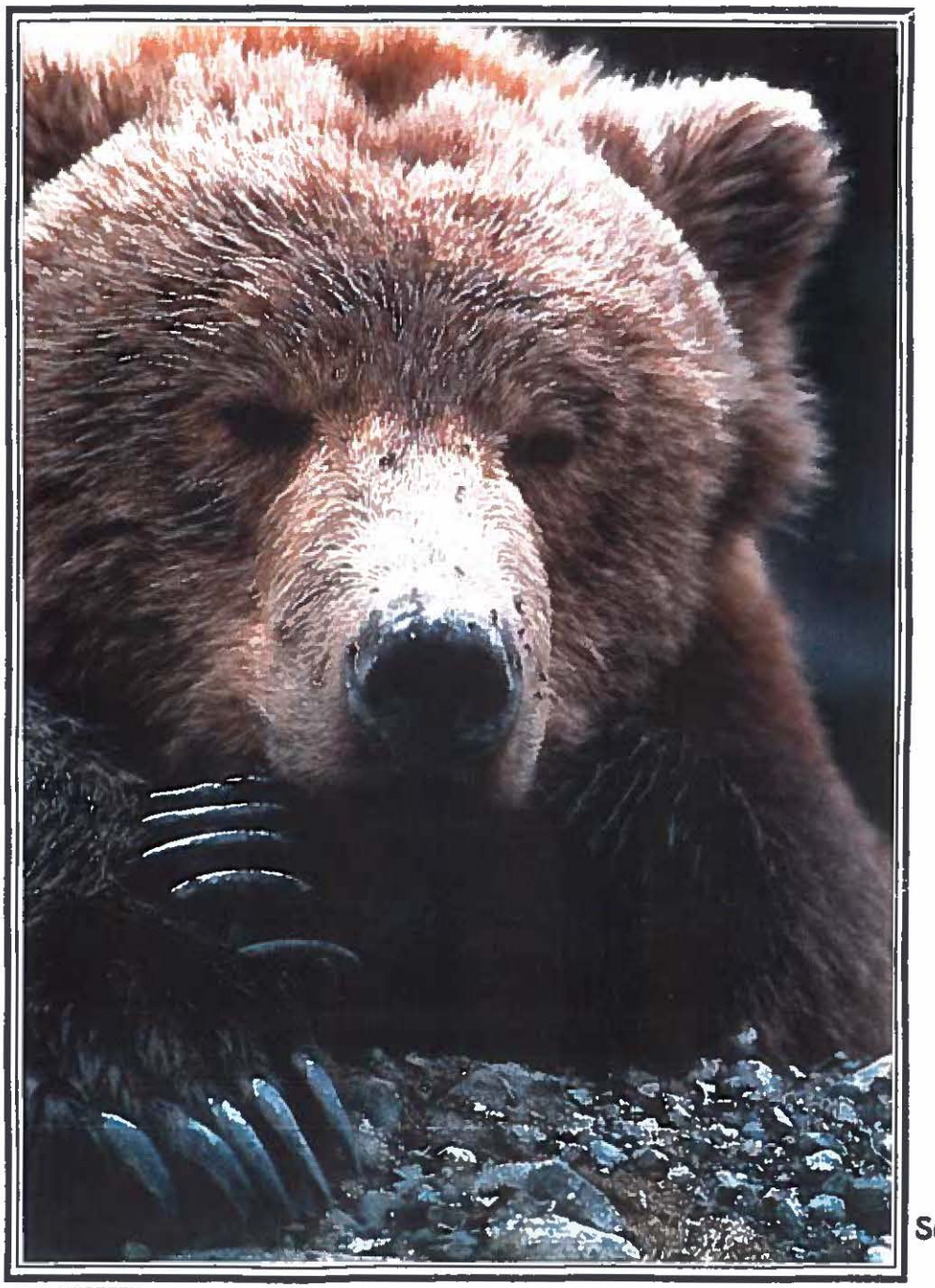
The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program then allots the funds back to states through a formula based on each state's geographic area and the number of paid hunting license holders in the state. Alaska receives 5% of the revenues collected each year, the maximum allowed. The Alaska Department of Fish and Game uses the funds to help restore, conserve, manage, and enhance wild birds and mammals for the public benefit. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes necessary to be reponsible hunters. Seventy-five percent of the funds for this project are from Federal Aid.

Alaska Department of Fish and Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report
1 July 1995- 30 June 1996

Effects of Harvest on Grizzly Bear Population Dynamics in the Northcentral Alaska Range

Harry V Reynolds, III



KEN WHITTEN

Grant W-24-4
Study 4.25
September 1996

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RESEARCH PROGRESS REPORT

STATE: Alaska **STUDY NO.:** 4.25

COOPERATOR: US Army, Fort Richardson and Fort Wainwright

GRANT NO.: W-24-4

STUDY TITLE: Effects of Harvest on Grizzly Bear Population Dynamics in the Northcentral Alaska Range

AUTHOR: Harry V Reynolds, III

PERIOD: 1 July 1995-30 June 1996

SUMMARY

During 1996 the third phase in a long-term investigation of the effects of harvest on grizzly bear (*Ursus arctos horribilis*) population dynamics continued in a 3160-km^2 area of the northcentral Alaska Range. The total population size declined during the first 2 phases, and the adult female segment of the population was stable at 21 to 23 from 1981 to 1989 but declined to 14 by 1993. During the third phase, the recovery rate will be determined for both the total population and the productive female segment of the population. During 1996, 37 bears were captured and 22 were radiocollared, primarily to maintain the sample of radiocollared adult females. Two eartag transmitters were deployed on breeding males, bears which often shed standard radiocollars. Of 13 bears fitted with special mortality sensors, all bears survived during the monitoring period except 1 which was mortally wounded but not located by the person who shot it in defense of life or property. Twenty-three adult females were present in the area, compared with 14 in 1993, 15 in 1994, and 18 in 1995.

Key words: grizzly bear, harvest rates, Interior Alaska, mortality, population dynamics, recovery rates, reproductive biology, *Ursus arctos.*

CONTENTS

BACKGROUND

An understanding of the effects of different levels of hunter harvest on grizzly bear (*Ursus arctos horribilis*) population density, structure, and dynamics is necessary for effective management. In addition, rates of recovery and mechanisms of response to high levels of harvest must be included in analyses for management models to reflect real-life situations. Although recent studies have increased our knowledge on some of these aspects of population dynamics, additional information is necessary to clarify the extent and direction of population response to, and recovery from, high harvest levels. Further, as demands on grizzly bear habitat and populations increase, more intensive management will be required using models based on observed harvest and recovery rates of specific segments of the population.

To determine sustainable harvest levels for grizzly bears, it is crucial to be able to document responses in population numbers or density to various harvest rates (Miller et al. 1987; Reynolds et al. 1987; Miller 1990*a,b,c*, 1993). It is equally important to understand the mechanisms of population responses to harvest (such as compensatory production or survival) through long-term observation of individuals (Reynolds et al. 1987, Schwartz and Franzmann 1991, Reynolds and Boudreau 1992). Use of harvest data alone is inadequate for timely determination of population trend or calculation of sustainable harvest rates (Harris and Metzgar 1987).

Documentation of population response to exploitation is necessary to fully realize the benefits from this long-term study. Additional data on population production, survival, compensatory behavior, and emigration rates will make assessment of future direction of these investigations more effective. Because of characteristics of production and survival, grizzly bear populations respond very slowly to forces that may change population status. For instance, because Alaska Range grizzly bears do not usually produce surviving young

until they reach 7 years of age, and the mean interval between litters is 4.1 years (Reynolds 1990, Reynolds and Boudreau 1990), the effects of compensatory production or survival cannot be documented until additional litters are weaned and provide potential recruitment to the population, approximately 7 years.

This study was initiated in 1981 as a 3-phase study. It has been conducted in a 3160-km^2 study area of representative northern Alaska Range habitat in Unit 20A. The study area is large enough to include the entire home ranges of 66% of females under observation for at least 5 years, and 17% of males.

Phase I was completed in 1985; it emphasized the gathering of baseline information on the population biology (Reynolds 1982; Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987). Harvest level during the years 1965 through 1980 was generally moderate (i.e., 5.6% of the estimated population); however, from 1981 to 1985 it increased to about 12%. By 1985, at the end of Phase I, the population had already begun to decline.

Initially, study design called for low to moderate levels of harvest to occur during Phase I while baseline data were collected. This was to be followed by higher harvest levels during Phase II, while data were collected on individuals and on population response to increased harvest. However, grizzly bear harvest by hunters, supplemented in part by capture mortality, resulted in the 12% harvest level during Phase I. Even though this harvest was higher than indicated in the study design, this circumstance strengthened rather than detracted from the investigation. The early high harvest level allowed monitoring of reproductive responses over a longer period of time.

Phase II, which continued from 1986 through 1991, was designed to measure grizzly bear population response to human-caused mortality. Throughout this period, mean annual harvest rates continued at 11% (Reynolds 1989, 1990; Reynolds and Boudreau 1992). Alaska Department of Fish and Game (ADF&G) staff monitored changes in estimated population size and productivity. During 1986 a mark-recapture density estimate was conducted (Reynolds et al. 1987). Changes in reproductive performance of adult females and survival rates of young bears showed nonconclusive evidence for compensatory production and survival; additional data from subsequent years will be necessary to substantiate any trends.

Following the completion of Phase II, a second mark-recapture density estimate was conducted in 1992 (Reynolds 1993*a*) for comparison with the 1986 estimate (Reynolds et al. 1987). No changes in density could be detected between the 2 time periods because the estimates displayed wide confidence intervals, primarily because of low density within the search areas. However, annual direct count estimates, based on intensive capture and presence of individual bears within home ranges in the area, indicated that by 1992 the population of bears $\geq$ 2 years of age declined by 20% since 1981.

Patterns of movement or fidelity to maternal or established home ranges indicated that all females remained in the vicinity of their maternal home ranges and none emigrated from

the study area. All males weaned or captured as 2- or 3-year-olds emigrated from their maternal or established home ranges within 2 years. Males ≥ 4 years of age apparently left their maternal home ranges to immigrate to the study area; none of these later emigrated from the study area although some had home ranges that extended beyond the study area boundaries.

Several other intensive studies documented declining populations (Craighead et al. 1974; Knight and Eberhardt 1984, 1985; McLellan 1989*a*,*b*,*c*). Harvest models that have been developed are complex and illustrate the difficulty of using harvest data to predict population changes (Tait 1983, Harris and Metzgar 1987, Miller and Miller 1990, Miller 1993). Miller (1990*a*) estimated a sustainable harvest rate of 8% in Unit 13 in Alaska but concluded a number of potential biases remained to be investigated. Other studies addressed aspects of population biology or density of grizzly bears in Interior Alaska (Dean 1976; Murie 1981; Ballard et al. 1982; Miller and Ballard 1982; Miller 1984, 1987, 1990*a*,*b*, 1993).

Before the effects of various harvest rates can be assessed, the following information should be available: 1) population density or size, 2) population structure, 3) movement patterns, 4) home range size, 5) mortality and survival rates, and 6) reproductive potential including age at first breeding, litter size, and interval between litters (Craighead et al. 1974; Reynolds 1974, 1976, 1978, 1980; Bunnell and Tait 1980, 1981; McLellan 1989*a*; Miller 1990*c*; Miller and Miller 1990). The approach taken in this study is to monitor these characteristics annually so harvest can be related to potential population responses.

OBJECTIVE

Following reductions in human-caused mortality rates, determine the rate and length of time necessary for recovery of the female segment of a grizzly bear population which had declined by 32% from 1981-1988 levels; specifically, determine the recovery responses in the dynamics of the population, including female population size, total population size, and production and survival of offspring.

STUDY AREA

The 3160-km^2 (1220-mi^2) study area is located in the mountains and foothills of the northcentral Alaska Range within Unit 20A. The study area boundaries did not include mountainous areas above 1800 m (6000 ft), glaciers, or heavily forested portions of the Tanana Flats where searches were not attempted and few observations were made. The boundaries are the Gold King Creek and Wood River drainages downstream from Virginia Creek to the west, the crest of the Alaska Range to the south, the Delta Creek drainage to the east, and the southern edge of the Tanana Flats (approx. 64°07'N) to the north. It includes portions of 2 US Army reservations, Fort Wainwright and Fort Greely.

Elevation in the area ranges from 500 to 3700 m (1500 to 12,000 ft). Most rivers flow northerly through U-shaped, glacially formed valleys and are fed by active glaciers. Tree line is at approximately 900 m (3000 ft). Dense patches of willow (*Salix* spp.) or alder

(*Alnus crispa*), which bears use for cover, may be present up to an elevation of approximately 1200 m (4000 ft).

METHODS

Methods used to capture bears and measure population variables have been described in previous reports (Reynolds 1982, 1993*b*, 1994; Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987, Taylor et al. 1989, Reynolds and Boudreau 1992). Standardized weight and measurement data were collected (Kingsley et al. 1988).

RESULTS AND DISCUSSION

The primary emphasis of the work accomplished during 1993-1996 was to monitor the presence of all adult females living within the study area. As funding allowed, I also replaced radiocollars on adult females and those 2- to 5-year-old females that will enter the adult cohorts if they survive. In addition, I monitored measures of reproductive status, reproductive performance, and possible compensatory changes in population dynamics.

BEARS CAPTURED AND RADIOCOLLARED

During 1996, 37 bears were captured; 22 of these were radiocollared (Table 1). Captures included 24 females and 13 males: 13 (12 females, 1 male) were recaptured to replace radiocollars, and 24 had not been captured previously. Of those not previously captured, 14 were cubs or yearlings of marked females, 5 were 2-year-old offspring of marked females, 2 were females captured on the extreme southeast edge of the study area, 1 was a 4- or 5-year-old female captured on the West Fork of the Little Delta River; and 2 were 4- or 5-year-old males. Transmitters on 13 bears captured in 1995 contained special mortality sensors; 12 bears survived through the monitoring period, and 1 was shot in defense of life or property.

No capture mortalities occurred for the ninth consecutive year with 199 captures; this is in part due to the use of Telazol® (tiletamine HCL and zolazepam HCL, Fort Dodge Lab., Fort Dodge, IA) as an immobilizing drug (Taylor et al. 1989) and to experience gained in avoiding other hazards related to immobilization (Reynolds 1992).

We captured 171 individual bears in the study area from 1981 through 1996 (Table 1). In addition, 157 bears were recaptured to replace radiocollars. From 1981 to 1983, initial captures were made of bears of all sex and age classes. Since 1983, most initial captures were of offspring of previously captured bears. Radiocollars have been placed on 141 bears: 50 on young-age males ($\leq$ 5 years), 21 on adult males ($\geq$ 6 years), 43 on young-age females, and 27 on adult females. Radiocollars were not placed on 30 bears because they were cubs or yearlings (23), 2- and 4-year-olds (3), or capture-related mortalities (4).

Females Present in the Population

By May 1996, 23 adult females (≥ 6 years of age) were assumed present in the population, compared with 21 to 23 during 1982 through spring 1989 (Reynolds 1993*a*,*b*). Adult females assumed present in the population included 7 observed with cubs, 5 observed with yearlings, 1 observed with 2-year-olds, 1 observed unaccompanied by offspring, and 4 assumed to be alive whose collars have failed. Each of the latter females met the criteria for inclusion in the estimated population as described in Reynolds (1994).

For comparison, the minimum numbers of adult females present in the study area were 11 in 1992, 14 in 1993, 15 in 1994, and 18 in 1995 (Reynolds 1993*a*, 1994, 1995). These increases could be due to a combination of factors including: 1) a decline in human-caused mortality; 2) the production of strong cohorts in 1988 and 1989; and 3) high survival rates in both young-aged and adult female segments of the population since 1993.

Four females (nos. 1345, 1362, 1397, and 1608) were not observed during 1995 but were assumed present in the population (Reynolds 1994). Intensive search efforts resulted in location and recapture of female nos. 1362 and 1608. In 1995 a marked female with an unreadable tattoo was killed by a hunter in the Yanert River drainage, the area of last observation for no. 1345. Genetic fingerprinting analysis of this hunter-killed female may show whether it is no. 1345. No. 1397 was not located during searches of her former home range.

Status of Productive Females

For comparison, 13 females produced an observed total of 26 cubs during 1995. Female nos. 1607 and 1636 each produced 3 cubs, nos. 1348, 1385, 1391, 1394, 1603, 1623, 1624, 1627, and 1651 each produced 2 cubs, and nos. 1631 and 1654 each produced 1 cub. This was the highest total production of cubs by the population that has been observed since the study began.

In 1996 none of 3 5-year-old females known in the population produced cubs, but each was observed consorting with adult males. In comparison, during 1995, 5-year-old female nos. 1623, 1624, 1627, and 1636 produced cubs, but no. 1617 did not. Female nos. 1603 and 1631 produced their first litters at age 7.

Mortality

Between July 1995 and 20 September 1996 hunters reported killing 4 bears in the study area, including marked female nos. 1391 and 1398. Of 2 unmarked males, one was a 3-year-old killed in the East Fork of the Little Delta River in fall 1995 and the other was about 7 years old and killed on the northwestern edge of the study area on 12 September 1996. In addition, 2 marked grizzlies were killed outside the study area, including male no. 1620, killed along the Tanana River, east of its confluence with the Little Delta River. The other was a female killed along Moose Creek in the Yanert River drainage whose tattoo was unreadable, but was possibly no. 1345. In addition, female no. 1324 was shot and mortally wounded during July 1996 at a remote cabin near Gold King Airstrip.

Seven other mortalities were observed or assumed to have occurred. Female no. 1605 was killed by another bear in June 1995, and I assumed that neither of her 2 yearling offspring survived. The single yearling offspring of no. 1398 disappeared in 1995 and was assumed dead. No. 1398 was accompanied by 3 cubs in June 1996; neither she nor her cubs were observed during aerial relocation flights, and the hunter who killed her in September claimed that she was alone.

CONCLUSIONS AND RECOMMENDATIONS

This is the final year of the third phase in a study to evaluate effects of harvest on grizzly bear population dynamics. The primary objective during this phase is to monitor the recovery or stabilization of the population and to document the accompanying changes in productive capacity.

We consider it especially important to use radiotelemetry to monitor the number and status of all adult females in the study area. Female offspring of marked females should also be radiocollared to monitor their presence in the population and the rate at which they serve as recruits to the adult female cohort.

Hunter harvest should continue to be closely monitored and the take of females discouraged. ADF&G staff should explore the effectiveness of other methods besides season and bag limit management in reducing harvest of females.

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Table 1 Capture and marking characteristics of 171 bears captured in the northcentral Alaska Range, 1981-1996

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1301 M	6	5/18/81	120 (265)	Buchanan Creek	1.8/1.2 H	373/374	G/G
1302 F	3	5/19/81	75 (165)	East Fork Delta	1.0/1.0 M	368/367	R/G
	8	6/12/86	114 (250)	East Fork Delta	2.2 TEL M	280/281	O/lB
	11	5/12/89	109 (241)	Buchanan Creek	4.5 TEL M	339/340	O/lB
1303 F	2	6/17/81	57 (125)	Mystic Mountain	1.4/1.4 M	524/523	R/R
	4	6/27/83	82 (180)	Hearst Creek	5.0 M99 M	3227/3214	R/R
	6	6/14/85	73 (160)	Upper Gold King	2.0/2.0 M	486/487	R/R
	12	5/31/91	95 (210)	Upper Moose Creek	1.0 TEL L	104/104	Y/W
1304 M	5	6/19/81	136 (300)	West Fork Delta	2.4/2.0 M	451/452	lB/R
	11	5/21/87	255 (560)	Threemile Creek	8.1 TEL M	430/431	W/mG
	13	6/7/89	245 (540)	Slate Creek	7.0 TEL M	778/--	W/--
	15	6/1/91	272 (600)	West Fork Delta	9.6 TEL M	136/137	W/mG
1305 F	24	6/19/81	114 (250)	Slate Creek	A M	453/454	O/R
1306 M	2	5/24/82	44 (97)	West Fork Delta	1.0/1.0 L	3151/3086	G/lB
1307 M	2	5/24/82	44 (98)	West Fork Delta	1.0/1.0 H	3087/3152	lB/G
	5	6/17/85	114 (250)[d]	Sheep Creek	2.4/2.6 L	3087/3152	lB/G
1308 F	6	5/25/82	111 (245)	Dry Creek	-[e]	3001/3154	O/Pp
	8	6/20/84	120 (265)	Dry Creek	5.0 M99 M	3001/471	O/Pp
	11	6/8/87	123 (270)	Dry Creek	3.3 TEL M	528/529	O/Pp
	15	5/6/91	125 (275)	Dry Creek	6.0 TEL M	150/149	W/R
	18	5/30/94	129 (285)	Dry Creek	6.0 TEL M	332/333	W/R
	19	6/6/95	129 (285)	Dry Creek	7.2 TEL M	332/333	W/R
1309 M	8	5/25/82	318 (700)[d]	Dry Creek	A L	3153/3101	dB/Bk
1310 M	13	5/25/82	250 (550)[d]	Buchanan Creek	2.0/2.0 M	No tags	
	15	6/20/84	241 (530)	Molybdenum Ridge	4.0/2.0 M	467/473	O/W
	18	5/21/87	264 (580)	Buchanan Creek	9.0 TEL M	414/413	Y/W
1311 F	12	5/26/82	120 (265)	Molybdenum Ridge	1.9/2.1 M	3106/3107	W/W
	14	6/21/84	116 (255)	Molybdenum Ridge	2.0/2.2 M	466/455	W/W
	17	6/8/87	123 (270)[d]	Molybdenum Ridge	3.4 TEL M	571/570	W/W
	21	6/3/91	125 (275)	Molybdenum Ridge	5.5 TEL M	139/140	W/W

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	22	5/10/92	121 (267)	Molybdenum Ridge	5.0 TEL M	249/250	W/W
	25	6/11/95	118 (260)	Molybdenum Ridge	7.0 TEL M	--	--
1312 F	Cub	5/26/82	12 (26)	Molybdenum Ridge	0.1/0.1 M	3104/3155	O/W[f]
1313 F	Cub	5/26/82	12 (27)	Molybdenum Ridge	0.08/0.13 M	3156/3105	W/O[f]
1314 M	6	5/27/82	116 (255)	Iowa Ridge	2.1/1.9 H	3088/3002	dB/lB
1315 M	13	6/4/82	272 (600)	Buchanan Creek	1.9/2.1 L	3102/3157	Bk/O
	15	5/17/84	295 (650)	Hayes Creek	A H	3322/none	Bk/-
1316 M	11	6/7/82	236 (520)	West Fork Delta	3.8/0.0 H	3089/3090	O/lB
1317 F	3	6/8/82	36 (80)	Forgotten Creek	1.2/1.8 L	3091/3003	lB/O
	5	5/16/84	55 (122)	Upper West Fork	A L	3486/3239	lB/O
	6	5/23/85	59 (130)	Upper Wood River	7.0 M99 M	497/498	lB/O
1318 F	13	6/8/82	104(230)	Buchanan Creek	A L	3004/3103	W/G
	15	6/22/84	118 (260)[d]	Slate Creek	A M	458/472	W/G
	18	6/2/87	105 (230)[d]	Slate Creek	3.3 TEL M	--	--
1319 M	Cub	6/8/82	12 (26)	Buchanan Creek	0.15/0 L	3005/3092	R/Y[f]
1320 F	17	6/8/82	102 (225)	Trident Glacier	A M	3158/3093	G/B
	19	6/25/84	139 (305)	East Hayes Creek	5.0 M99 M	463/461	G/B
	22	6/12/87	114 (250)	Hayes Glacier	4.0 TEL M	517/518	mG/dB
1321 F	16	6/9/82	141 (310)	Snow Mountain Gulch	2.1/1.9 M	3028/3108	G/W
	17	5/17/83	127 (280)	Dry Creek	1.8/2.2 M	3028/3427	G/W
	19	7/22/85	218 (480)	North VABM Wood	2.6/1.0 L	399/398	G/W
	23	6/6/89	170 (375)	Dry Creek	---- TEL M	788/789	lG/W
1322 F	8	6/9/82	91 (200)	Sheep Creek	1.9/2.1 M	3051/3159	W/lB
1323 F	11	6/10/82	95 (210)	Mystic Mountain	1.9/2.1 M	3160/3030	G/G
	13	6/29/84	132 (290)	VABM Wood	A M	579/582	G/G
1324 F	Cub	6/10/82	12 (26)	Mystic Mountain	0.12/0 M	3027/3162	R/W[f]
	6	5/26/88	111 (245)	Coal Creek	3.6 TEL L	159/160	Bk/W
	10	5/26/92	129 (285)	Dry Creek	5.5 TEL L	121/122	Bk/W
	12	5/27/94	125 (275)	Mystic Mountain	6.0 TEL M	121/122	Bk/W
	13	6/6/95	--	Wood River Bluffs	7.2 TEL M	121/122	Bk/W
1325 M	Cub	6/10/82	12 (27)	Mystic Mountain	0.10/0 M	3161/3031	W/R[f]

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	2	5/15/84	67 (148)	Mystic Creek	1.0 M99 M	3233/3394	R/W
1326 F	4	6/18/82	93 (205)	Buchanan Creek	2.2/1.8 M	3008/3163	W/R
	6	6/21/84	109 (240)	Buchanan Creek	1.8/2.2 M	468/462	W/R
	7	6/27/85	111 (245)	Slate Creek	2.4/1.6 L	426/427	W/W
1327 F	16	7/8/82	127 (280)	Whistler Creek	2.2/1.8 M	3134/3192	G/R
	18	6/23/84	125 (275)	Whistler Creek	A H	458/192	G/R
1328 F	1	7/8/82	43 (95)	Whistler Creek	0.9/1.1 M	3115/3014	dB/G
1329 F	13	7/9/82	120 (265)	Buchanan Creek	2.4/1.6 M	3026/3111	W/R
1330 M	1	7/9/82	48 (106)	Buchanan Creek	-- M	--/--	R/W
	3	6/28/84	102 (225)	East Fork Delta	2.6/3.0 M	597/598	R/W
1331 F	4	7/10/82	77 (170)	Trident Glacier	2.4/1.6 M	3120/3194	Bk/O
	9	5/20/87	114 (250)[d]	East Hayes Creek	3.0 TEL M	519/520	Bk/Y
	12	5/15/90	111 (245)	Trident Glacier	6.0 TEL H	196/197	Bk/Y
1332 F	5	7/12/82	104 (230)	Gillam Glacier	2.4/1.6 M	394/190	R/dB
1333 F	16	7/13/82	141 (310)	Buchanan Creek	A M	474/469	G/R
1334 M	1	7/13/82	49 (108)	Buchanan Creek	1.0/1.0 M	395/392	Y/G
	3	6/27/84	107 (235)	McGinnis Creek	A M	585/583	O/G
1335 F	1	7/13/82	38 (84)	Buchanan Creek	1.0/1.0 M	32/456	G/Y
	3	6/25/84	80 (175)	Gillam Glacier	1.5/3.0 M	465/464	dB/G
1336 F	2	5/16/83	48 (105)	Kansas Creek	1.0/1.0 M	3201/3204	Bk/mG
	3	6/26/84	89 (195)	Copper Creek	2.0/3.0 M	470/595	Bk/mG
	4	6/17/85	102 (224)	Wood River	A L	470/595	Bk/mG
	6	5/15/87	109 (240)	Rogers Creek	2.2/2.0 M	521/522	Bk/mG
	8	5/17/89	145 (320)	Upper Wood River	4.5 TEL M	330/329	Bk/mG
	11	5/7/92	116 (255)	Wood River	6.0 TEL M	330/329	Bk/mG
1337 M	20	5/18/83	293 (645)	Sheep Creek	3.5/3.5 L	3209/3205	R/O
	25	6/15/88	277 (610)	Sheep Creek	A TEL H	364/363	O/R
1338 M	6	5/20/83	111 (245)	Molybdenum Ridge	A M	3203/3202	O/Bk
1339 M	6	5/23/83	120 (265)	Trident Glacier	-- M	3286/3351	lB/W
	7	5/17/84	168 (370)	East Fork Delta	6.0 M99 H	3254/3398	lB/W
1340 F	3	5/23/83	71 (157)	Hayes Creek	1.2/0.8 H	3277/3208	G/O

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	4	5/19/84	91 (200)[d]	Molybdenum Ridge	4.0 M99 M	3277/3208	mG/O
	5	6/27/85	100 (220)	West Hayes Creek	2.4/1.6 L	590/596	mG/mG
1341 F	10	5/23/83	107 (235)	NE Portage	1.5/1.5 H	3210/3428	R/dB
	12	6/13/85	107 (235)[d]	East Fork Delta	2.0/2.0 M	442/none	O/-
	15	6/14/88	164 (360)	East Fork Delta	7.0 TEL M	356/355	dkB/
1342 M	2	5/24/83	49 (108)	Threemile Creek	0.6/1.2 M	3354/3207	W/dB
1343 M	2	5/24/83	43 (95)	Threemile Creek	0.6/1.2 M	3426/3285	R/B
1344 M	2	5/24/83	56 (123)	Threemile Creek	0.6/1.2 M	3361/3433	lB/Bk
	3	6/23/84	123 (270)	Hayes Creek	2.2/3.2 M	475/460	lB/Bk
1345 F	8	5/24/83	--	Upper West Fork	1.2/1.8 L	3206/3352	O/O
	10	5/23/85	105 (230)[d]	Upper West Fork	7.0 M99 M	499/500	O/O
	14	5/13/89	118 (260)	Upper Wood River	4.5 TEL M	445/446	O/O
1346 M	5	5/25/83	114 (250)	Hayes Glacier	A M	3359/3356	lB/lB
	12	5/14/90	--	Trident Glacier	10.5 TEL M	192/193	mG/mG
	13	6/1/91	249 (550)	Buchanan Creek	11.0 TEL M	192/193	mG/mG
	16	5/28/94	254 (560)	Delta Creek	7.6 TEL M	192/193	None
1347 M	6	5/31/83	189 (415)	Coal Creek	3.5 M99	None	Dead
1348 F	12	5/31/83	123 (270)[d]	Mystic Mountain	A M	3363/3372	W/O
	15	5/16/86	116 (255)	Wood River	2.4/1.6 M	235/236	W/O
	19	5/12/90	141 (310)	Gold King	6.0 TEL M	117/118	W/O
	20	5/9/91	120 (265)	SW Gold King	11.0 TEL H	117/118	W/O
	21	5/9/92	107 (235)	Wood River	5.5 TEL M	117/118	W/O
1349 M	18	6/2/83	264 (580)	O'Brien Creek	3.8/1.2 L	3364/3292	R/lB
1350 M	8	6/2/83	202 (445)	Ptarmigan Creek	3.0/2.0 L	3432/3430	dB/R
	11	6/12/86	205 (450)[d]	East Fork Delta	3.5 TEL L	273/272	dB/R
1351 F	14	6/23/83	114 (250)[d]	Dry Creek	4.0 M99 M	3217/3390	dB/W
	16	6/10/85	111 (245)	Little Delta River	2.0/2.0 M	477/436	dB/W
	18	5/19/87	130 (285)	Dry Creek	A M	503/504	dB/W
1352 F	14	6/27/83	111 (245)	West Fork Delta	--	3215/3316	O/W
1353 M	1	6/27/83	27 (60)	West Fork Delta	--	3310/none	O/-
1354 F	1	6/27/83	12 (27)	West Fork Delta	--	None/3314	-/O

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1355 M	3	6/30/83	60 (133)	East Fork Delta	4.0 M99 H	3232/3473	O/Bk
	5	6/3/85	70 (155)	Whistler Creek	2.2/1.8 H	586/587	O/Bk
1356 M	2	6/30/83	50 (110)	Little Delta River	2.0 M99 H	3234/3392	Bk/O
1357 M	2	5/15/84	63 (138)	Dry Creek	1.1 M99 M	3323/3235	W/Bk
	3	6/24/85	93 (205)	Dry Creek	1.5/1.5 M	447/448	W/Bk
1358 M	13	5/18/84	205 (450)	Hayes Creek	A L	3318/3447	lB/dB
	15	5/20/86	236 (520)	Trident Glacier	3.4/2.0 L	297/296	lB/dB
1359 M	3	5/28/85	61 (134)	Snow Mountain Gulch	4.0 M99 M	489/488	dB/O
1360 F	10	5/28/85	95 (210)	Snow Mountain Gulch	7.0 M99 H	None	None
1361 F	3	5/28/85	63 (138)	Dry Creek	4.0 M99 M	482/483	mG/R
	4	5/19/86	100 (220)	Rogers Creek	1.7/2.0 L	274/275	G/Bk
1362 F	6	6/5/85	--	Glacier Creek	2.0/2.0 L	None	None
	6	6/24/85	114 (250)	Threemile Creek	2.2/1.8 L	443/490	dB/dB
	9	5/15/88	--	Sheep Creek	5.0 TEL H	197/198	O/Y
	16	9/28/95	173 (380)	3-Mile Creek	7.5 TEL L	834/833	lB/lB
1363 M	3	6/5/85	55 (120)	Slide Creek	1.0/2.0 M	592/593	dB/lB
1364 M	Cub	6/14/85	7 (15)	Gold King Creek	0.7/- M	None	None
1365 M	5	6/19/85	118 (260)	Wood River	A M	476/441	lB/G
1366 M	8	7/22/85	234 (515)	Tatlanika River	3.2/1.0 M	390/391	mG/R
1367 M	2	5/19/86	61 (134)	Threemile Creek	1.4/2.0 M	400/241	lB/W
1368 F	2	5/19/86	48 (106)	Threemile Creek	1.4/2.0 M	257/256	lB/lB
1369 M	2	5/19/86	68 (150)	Threemile Creek	1.4/2.0 L	247/246	W/dB
1370 F	2	5/20/86	47 (103)	Buchanan Creek	1.4/2.0 H	253/252	dB/Bk
	3	5/20/87	69 (151)	Buchanan Creek	1.5/1.5	--	--
1371 M	2	5/20/86	57 (126)	Buchanan Creek	1.4/2.0 M	269/268	Bk/dB
1372 M	2	5/20/86	72 (158)	Ptarmigan Creek	1.4/2.0 M	387/386	lB/O
	5	5/17/89	186 (410)	Chute Creek	7.0 TEL M	310/309	lB/O
1373 M	7	5/21/86	193 (425)	Delta Creek	4.0/2.0 M	295/294	lB/R
1374 F	6	5/21/86	106 (233)	Delta Creek	2.0/2.0 M	249/248	R/G
	9	6/9/89	147 (325)	Delta River	6.0 TEL M	320/319	lG/lB
1375 M	6	6/13/86	186 (410)	Sheep Creek	4.5 TEL L	276/277	Y/W

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	9	5/13/89	281 (620)	Mystic Creek	9.0 TEL L	439/440	O/W
	11	5/31/91	295 (650)	Threemile Creek	14.0 TEL H	146/440	O/W
1376 F	14	6/13/86	130 (285)	Hayes Creek	3.0 TEL M	279/278	G/O
1377 M	2	8/28/86	132 (290)	Iowa Ridge	4.0 TEL L	505/507	Bk/R
1378 F[g]	2	5/20/86	59 (130)[d]	Ptarmigan Creek	--	None	None
1379 F	2	5/15/87	67 (148)	Sheep Creek	2.2/2.0 L	334/335	W/W
	4	6/6/89	102 (225)	Dry Creek	3.5 TEL L	777/776	W/W
1380 M	2	5/18/87	65 (142)	West Fork Delta	2.2 TEL H	513/514	W/R
	3	5/17/88	109 (240)	Buchanan Creek	3.2 TEL	175/174	W/R
1381 M	2	5/21/87	73 (160)	Dry Creek	3.0 TEL M	481/480	lB/Bk
1382 F	3	5/15/88	68 (150)	West Fork Delta	3.2 TEL M	169/170	R/Y
	4	6/7/89	84 (185)	Buchanan Creek	4.0 TEL M	169/170	R/Y
1383 M	2[d]	6/12/87	77 (170)	Coal Creek	A M	389/390	mG/dB
1384 M	7[d]	5/15/88	191 (420)	Chute Creek	7.0 TEL M	960/959	W/Y
1385 F	2	5/15/88	68 (150)	Upper Wood River	2.2 TEL H	168/167	lB/Y
	3	5/13/89	82 (180)	Wood River	3.4 TEL M	--	lB/Y
	4	5/11/90	95 (210)	Upper Wood River	A TEL H	--	--
	5	6/2/91	118 (260)	West Fork Delta	5.5 TEL M	108/107	lB/Y
	7	5/9/93	86 (190)	West Fork Delta	4.0 TEL M	108/107	lB/Y
	9	6/9/95	125 (275)	Upper Wood River	4.0 TEL M	258/259	lB/Y
	10	6/3/96	111 (245)	Big Grizzly Creek	7.0 TEL M	258/259	lB/Y
1386 M	2	5/15/88	73 (160)	Upper Wood River	2.2 TEL M	181/180	Bk/Y
	3	5/13/89	91 (200)	Upper Wood River	3.4 TEL M	181/180	Bk/Y
	4	6/7/90	120 (265)	Upper Wood River	7.0 TEL H[h]	790/791	Bk/Y
	5	5/31/91	156 (345)	West Fork Delta	6.0 TEL H[h]	790/791	Bk/Y
1387 F	2	5/23/88	55 (120)	Dry Creek	A TEL M	179/178	Y/R
	3	5/12/89	77 (170)	Rogers Creek	3.4 TEL M	337/338	Y/R
	4	5/15/90	84 (185)	Sheep Creek	A TEL M	190/191	--
1388 M	2	5/25/88	68 (150)	Dry Creek	2.5 TEL M	153/154	Y/lB
1389 M	3	5/13/89	84 (185)	Mystic Creek	4.5 TEL H	343/344	W/dB
1390 F	3	5/13/89	77 (170)	Mystic Creek	3.4 TEL H	345/346	Y/Y

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1391 F	2	5/13/89	68 (150)	Dry Creek	2.8 TEL L	333/334	O/mG
	3	5/12/90	95 (210)	Dry Creek	3.8 TEL M	333/334	O/mG
	4	5/7/91	109 (240)	Forgotten Creek	5.5 TEL H	109/110	O/mG
	8	6/7/95	123 (270)	Slate Creek	7.0 TEL M	336/337	O/mG
	5	5/23/92	111 (245)	Dry Creek	5.0 TEL L	109/898	O/mG
1392 M	2	5/13/89	89 (195)	Dry Creek	2.8 TEL M	341/342	lG/O
	5	5/26/92	229 (505)	Dry Creek	13.0 TEL L	881/882	mG/R
1393 M	2	5/17/89	66 (145)	Molybdenum Ridge	3.5 TEL H	326/325	Bk/lB
	3	5/14/90	100 (220)	Trident Glacier	4.4 TEL M	326/325	Bk/lB
1394 F	2	5/17/89	59 (130)	Molybdenum Ridge	3.5 TEL -	331/332	lB/Bk
	6	5/10/93	94 (207)	Molybdenum Ridge	3.4 TEL M	165/166	lB/Bk
	7	5/28/94	125 (275)	Molybdenum Ridge	6.0 TEL M	165/166	lB/Bk
	9	6/2/96	142 (313)	Delta Creek	7.0 TEL M	126/166	lB/none
1395 M	2	5/17/89	86 (190)	Molybdenum Ridge	3.1 TEL M	302/301	dkB/W
1396 M	13[d]	5/18/89	295 (650)	Molybdenum Ridge	7.0 TEL M[h]	327/328	Y/O
1397 F	2	5/18/89	61 (135)	Delta Creek	3.2 TEL M	314/313	O/O
	5	5/25/92	116 (255)	East Fork Delta	5.5 TEL M	793/792	O/O
1398 F	8[d]	5/18/89	127 (280)	Delta Creek	4.5 TEL M	315/316	W/Y
	13	5/8/94	147 (325)	Trident Glacier	5.6 TEL L	-/316	-/Y
	15	6/2/96	127 (280)	Trident Glacier	6.4 TEL M	271/272	-/-
1399 M	2	5/18/89	66 (145)	Delta Creek	3.2 TEL M	303/304	R/R
1400 M	8[d]	6/8/89	239 (525)	Trident Glacier	7.0 TEL M[h]	425/426	R/lB
1601 M	9	6/9/89	193 (425)	Whistler Creek	6.5 TEL M[h]	782/785	Gr/Y
	11	5/7/91	245 (540)	Slate Creek	13.0 TEL L	125/126	Gr/Y
	12	10/4/92	340 (750)[d]	Buchanan Creek	A TEL M	179/180	dB/W
1602 M	7	5/13/90	166 (365)	Molybdenum Ridge	A TEL M	122/121	lB/Gr
	9	5/25/92	200 (440)	East Fork Delta	7.0 TEL M	980/981	lB/Gr
	11	5/28/94	238 (525)	East Fork Delta	10.5 TEL L	338/339	lB/mG
1603 F	2	5/13/90	55 (120)	Hayes Creek	3.6 TEL H	141/142	lB/dB
	3	5/8/91	70 (155)	Whistler Creek	3.6 TEL M	128/127	lB/dB
	4	5/24/92	102 (225)	West Hayes Creek	6.0 TEL M	214/213	lB/dB

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	6	5/30/94	113 (250)	West Hayes Creek	5.6 TEL M	348/349	lB/dB
	8	6/4/96	111 (244)	East Hayes Glacier	7.0 TEL M	237/238	lB/dB
1604 F	2	5/13/90	48 (105)	Buchanan Creek	3.4 TEL M	119/120	lB/R
	3	5/7/91	59 (130)	Buchanan Creek	4.0 TEL H	101/120	lB/R
	4	5/25/92	95 (210)	West Fork Delta	6.0 TEL M	101/889	lB/R
	5	5/8/93	82 (180)	Buchanan Creek	5.0 TEL M	889/101	R/lB
	5	5/10/93	--	East Fork Delta	5.0 TEL M	889/101	R/lB
1605 F	2	5/13/90	59 (130)	Buchanan Creek	3.6 TEL M	213/150	mG/lB
	3	5/8/91	68 (150)	East Fork Delta	3.6 TEL M	213/293	mG/lB
	4	5/25/92	102 (225)	Buchanan Creek	4.0 TEL M	213/293	mG/lB
	5	5/10/93	102 (225)	East Fork Delta	3.2 TEL M	195/196	mG/lB
	7	5/3/95	98 (215)?	Gillam Glacier	6.0 TEL H	195/196	mG/lB
1606 M	2	5/13/90	50 (110)	Buchanan Creek	A TEL M	143/144	R/dB
	3	5/8/91	70 (155)	Gillam Glacier	3.6 TEL M	143/144	R/dB
	5	5/8/93	105 (230)	West Hayes Creek	5.4 TEL M	396/397	R/dB
1607 F	8	5/14/90	141 (310)	Glacier Creek	5.5 TEL M	188/189	W/lB
	13	6/7/95	143 (315)	Glacier Creek	7.2 TEL M	330/331	lG/W
1608 F	15	5/14/90	136 (300)	Trident Glacier	5.5 TEL M	184/-	lG/-
	19	5/30/94	127 (280)	Trident Glacier	5.6 TEL M	172/-	lG/-
	21	6/1/96	120 (265)	Trident Glacier	7.0 TEL M	172/-	lG/-
1609 F	2	5/14/90	61 (135)	Trident Glacier	3.2 TEL M	103/104	dB/mG
	3	5/7/91	77 (170)	Trident Glacier	4.0 TEL M	103/102	dB/mG
	4	5/25/92	93 (205)	Ptarmigan Creek	A TEL M	103/102	dB/mG
	5	6/29/93	107 (235)	E. Hayes Creek	6.2 TEL M	103/102	dB/mG
1610 F	2	5/6/91	70 (155)	Threemile Creek	3.4 TEL M	116/115	O/R
1611 M	2	5/6/91	91 (200)	Threemile Creek	3.4 TEL M	106/105	Gr/O
1612 F	2	5/6/91	73 (160)	Threemile Creek	3.4 TEL M	131/132	Y/mG
	6	5/3/95	125 (275)	Lower Sheep Creek	6.0 TEL M	16/22	R/lG
	6	6/8/95	127 (280)	Snow Mtn. Gulch	7.2 TEL M	16/22	R/lG
	7	6/3/96	109 (240)	Threemile Creek	7.0 TEL M	16/22	R/lG
1613 M	7	6/2/91	177 (390)	Wood River	12.0 TEL M	131/130	R/O

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	11	5/29/95	211 (465)	West Fork Delta	12.9 TEL H	10/9	W/dB
	11	6/7/95	--	West Fork Delta	14.0 TEL M	10/9	W/dB
1614 M	4	6/1/91	109 (240)	Hayes Creek	12.0 TEL H	144/145	lG/lG
1615 M	4[d]	6/3/91	125 (275)	Hayes Creek	5.5 TEL H	112/111	R/W
1616 M	5	5/7/92	169 (370)	Mystic Creek	14.0 TEL H	239/240	Y/R
1617 F	2	5/7/92	54 (120)	Wood River	3.6 TEL M	847/848	R/lG
	3	5/9/93	43 (95)	Wood River	3.6 TEL M	848/847	lG/R
	4	5/27/94	84 (185)	Wood River	3.6 TEL M	848/847	lG/R
	5	6/9/95	105 (230)	Kansas Creek	7.0 TEL M	374/118	lG/R
	6	5/4/96	120 (265)	Kansas Creek	4.2 TEL M	374/118	lG/R
1618 F	2	5/7/92	54 (120)	Wood River	3.6 TEL M	209/210	lB/lG
	3	5/9/93	49 (107)	Virginia Creek	3.6 TEL M	209/210	lB/lG
1619 F	2	5/7/92	68 (150)	Bonnefield Creek	3.6 TEL L	201/202	R/R
1620 M	2	5/7/92	75 (165)	Bonnefield Creek	3.6 TEL M	229/230	lB/lB
1621 M	2	5/7/92	82 (180)	Bonnefield Creek	3.6 TEL L	147/148	mG/Y
1622 M	2[d]	5/9/92	100 (220)	Wood River	3.6 TEL M	143/236	Y/Y
1623 F	2[d]	5/9/92	95 (210)	Wood River	3.4 TEL M	127/126	O/dB
	3	5/9/93	93 (205)	Wood River	3.6 TEL M	191/192	O/dB
	5	6/6/95	107 (235)	VAMB Mystic	7.2 TEL M	191/192	O/dB
	6	6/3/96	111 (245)	Mystic Creek	7.0 TEL M	191/192	O/dB
1624 F	2	5/10/92	70 (155)	Molybdenum Ridge	3.6 TEL M	245/246	dB/lB
	3	5/8/93	57 (125)	Molybdenum Ridge	3.4 TEL M	245/246	dB/lB
	4	5/28/94	98 (215)	Molybdenum Ridge	6.0 TEL M	245/217	dB/lB
	5	6/2/96	110 (243)	S. Molybdenum Ridge	6.5 TEL M	123/217	-/-
1625 M	2	5/10/92	84 (185)	Molybdenum Ridge	3.6 TEL M	243/244	R/Y
1626 F	16	5/23/92	109 (240)	Dry Creek	6.0 TEL L	150/233	W/lB
1627 F	3	5/7/93	73 (160)	Dry Creek	3.6 TEL M	997/998	Y/lB
	5	5/29/95	109 (240)	Slide Creek	6.0 TEL H	378/379	Y/lB
1628 F	2	5/7/93	45 (100)	Dry Creek	3.6 TEL M	173/174	lG/R
	3	5/8/94	64 (140)	West Fork Delta	3.6 TEL M	173/174	lG/R
	4	5/3/95	84 (185)	Buchanan Creek	4.5 TEL L	173/174	lG/R

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
	5	5/6/96	112 (247)	Forgotten Creek	5.8 TEL L	173/174	-/R
1629 F	2	5/7/93	41 (90)	Dry Creek	3.6 TEL M	230/231	R/mG
	3	5/8/94	59 (125)	West Fork Delta	3.6 TEL M	231/230	mG/R
1630 F	3[d]	5/7/93	59 (125)	Wood River	3.6 TEL M	168/167	dB/lG
1631 F	5[d]	5/9/93	89 (195)	Virginia Creek	5.6 TEL M	169/170	mG/O
	7[d]	6/10/95	127 (280)	Upper Wood River	7.2 TEL M	169/375	mG/O
1632 M	10[d]	5/10/93	277 (610)	Tatlanika Creek	12.2 TEL M	161/162	lG/mG
	11	5/30/94	281 (620)	Mystic Creek	13.4 TEL M	372/373	lG/mG
1633 M	3[d]	5/8/94	66 (145)	Trident Glacier	6.4 TEL H	238/239	Gy/lB
1634 F	Cub	5/27/94	8 (18)	Mystic Mountain	0.25 TEL L	-/988	-/-
	1	6/6/95	52 (115)	Wood River Bluffs	4.7 TEL M	7/8	Bk/lB
	2	5/4/96	86 (190)	Mystic Mtn.	3.8 TEL M	7/8	-/-
1635 F	Cub	5/27/94	6 (14)	Mystic Mountain	0.25 TEL L	157/-	-/-
	1	6/6/95	52 (115)	Wood River Bluffs	4.7 TEL M	19/20	W/Y
1636 F	4[d]	5/27/94	129 (285)	Mystic Mountain	6.0 TEL M	382/383	dB/Y
	5[d]	6/5/95	111 (245)	Coal Creek	7.2 TEL M	383/382	Y/dB
1637 M	4[d]	5/27/94	188 (415)	Mystic Mountain	7.0 TEL M	992/993	mG/W
1638 M	1	5/28/94	54 (120)	Delta Creek	3.6 TEL M	358/359	Y/mG
1639 M	4[d]	5/29/94	220 (485)	East Fork Delta	10.5 TEL M	354/355	Bk/R
	6	6/1/96	262 (578)	Trident Glacier	13.0 TEL M	354/-	-/-
1640 M	2	5/2/95	80 (175)	Dry Creek	4.5 TEL M	13/14	W/mG
	2	6/8/95	64 (140)	Dry Creek	6.0 TEL M	13/14	W/mG
1641 F	2	5/2/95	57 (125)	Dry Creek	4.5 TEL M	23/24	R/W
	2	6/7/95	61 (135)	Dry Creek	5.5 TEL M	23/24	R/W
1642 F	6[d]	5/2/95	125 (275)	Healy Creek	6.0 TEL M	4/3	lB/R
1643 M	Cub	6/6/95	13 (29)	VAMB Mystic	0.5 TEL H	17/-	-/-
1644 M	Cub	6/6/95	11 (24)	VAMB Mystic	0.5 TEL ?	-/18	-/-
1645 M	4[d]	6/7/95	120 (265)	Forgotten Creek	7.2 TEL ?	5/6	lB/W
1646 F	3	6/7/95	61 (135)	Upper West Fork	7.2 TEL M	328/329	O/R
	4	6/4/96	83 (185)	West Fork Little Delta	5.0 TEL M	328/329	O/R
1647 M	5[d]	6/9/95	270 (595)	Virginia Creek	13.2 TEL L	11/12	lB/W

Table 1 Continued

Bear no./sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1648 M	2	5/4/96	96 (212)	Chute Creek	A TEL M	113/114	mG/mG
1649 F	2	5/4/96	86 (190)	Chute Creek	3.8 TEL	171/172	W/lG
1650 M	5[d]	5/5/96	163 (359)	Trident Glacier	7.4 TEL M	293/294	lB/W
1651 F	7[d]	5/5/96	85 (187)	Trident Glacier	5.6 TEL M	267/268	lB/Y
1652 F	1	5/5/96	28 (62)	Trident Glacier	2.4 TEL M	119/120	lB/Gy
1653 M	1	5/5/96	28 (62)	Trident Glacier	2.4 TEL M	135/136	0/Y
1654 F	17[d]	5/5/96	128 (283)	Trident Glacier	5.8 TEL M	141/142	W\Bk
1655 M	1	5/5/96	57 (126)	Trident Glacier	4.0 TEL M	104/110	Gy/Y
1656 M	2	5/6/96	--	Molybdenum Ridge	4.2 TEL M	259/260	R/G
1657 F	2	5/6/96	--	Molybenum Ridge	4.0 TEL M	253/254	Y/W
1658 F	4[d]	5/6/96	89 (196)	O'Brien Creek	4.2 TEL M	149/150	dB/G
1659 M	4[d]	6/1/96	156 (345)	West Fork Little Delta River	9.0 TEL M	273/274	mG/lG
1660 M	2	6/1/96	88 (195)	Trident Glacier	4.6 TEL M	247/248	O/lG
1661 M	1	6/2/96	45 (100)	Molybdenum Ridge	3.0 TEL M	228/229	-/-
1662 F	1	6/2/96	23 (50)	Molybdenum Ridge	3.0 TEL M	192/191	-/-
1663 M	1	6/2/96	45 (100)	Molybdenum Ridge	3.0 TEL M	231/232	Y/R
1664 F	1	6/2/96	29 (65)	Molybdenum Ridge	3.0 TEL M	297/298	-/-
1665 F	1	6/3/96	48 (105)	Glacier Creek	3.0 TEL M	289/290	lB/O
1666 M	1	6/3/96	50 (110)	Glacier Creek	3.0 TEL M	287/288	O/W
1667 F	1	6/3/96	45 (100)	Glacier Creek	3.0 TEL M	279/280	lG/lG
1668 M	1	6/3/96	29 (63)	Big Grizzly Creek	2.5 TEL M	277/278	lG/lB
1669 F	1	6/3/96	32 (70)	Big Grizzly Creek	2.0 TEL M	286/285	W/O
1770 F	1	6/4/96	44 (96)	East Hayes Creek	3.5 TEL M	296/295	R/dB
1771 M	1	6/4/96	43 (95)	East Hayes Creek	3.5 TEL M	102/101	lB/O

[a] Dosage in ml. No designation indicates use of phencyclidine hydrochloride/acepromazine maleate at 100 mg/ml concentration; use of M-99 is designated M99 at 1 mg/ml concentration; use of Telazol® at 200 mg/ml concentrations is designated TEL; A denotes multiple injections with unknown effective dosage. Drug effects were as follows: L = light, M = optimum, H = heavy.

[b] Ear tag numbers, left/right.

Table 1 Continued

[c] Marking designations:

Colors: R, red; G, light green; mG, medium green; Gr, gray; O, orange; lB, light blue; dB, dark blue; W, white; Bk, black; Pp, purple; Y, yellow.

Marker types: One or 2 color combinations were used for ear flags, e.g., O/W is orange in left ear, white in right ear; -/G is no flag, left; green, right.

[d] Estimated.

[e] Data collected but not recorded.

[f] Ear tags only and not ear-flagging material were used to mark cubs of the year; therefore, for these bears only, marker colors indicate ear tags and not ear flags.

[g] Bear No. 1378, an offspring of No. 1311, was darted but not immobilized on 20 May 1986. We left her with her mother to recover from the darting chase, but she was killed by hunters before we returned. We include her in this table for ease of data analysis.

[h] Dosages of Telazol® administered at a concentration of 300 mg/ml, instead of the usual 200 mg/ml.