

**Alaska Department of Fish and Game
Division of Wildlife Conservation**

**Federal Aid in Wildlife Restoration
Research Progress Report
1 July 1997- 30 June 1998**

**Investigation of Wolf Population Response
to Intensive Trapping in the Presence
of High Ungulate Biomass**

Mark E. McNay



Whitten

**Grant W-27-1
Study 14.17
May 1999**

STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
Frank Rue, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Wayne L. Regelin, Director

Persons intending to cite this material should receive permission from the author(s) and/or the Alaska Department of Fish and Game. Because most reports deal with preliminary results of continuing studies, conclusions are tentative and should be identified as such. Please give authors credit.

Free copies of this report and other Division of Wildlife Conservation publications are available to the public. Please direct requests to our publications specialist.

Mary Hicks
Publications Specialist
ADF&G, Wildlife Conservation
P.O. Box 25526
Juneau, AK 99802
(907) 465-4190

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of race, religion, color, national origin, age, sex, marital status, pregnancy, parenthood, or disability. For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648, or FAX 907-586-6595. Any person who believes she/he has been discriminated against should write to ADF&G, PO Box 25526, Juneau, AK 99802-5526 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

RESEARCH PROGRESS REPORT

STATE: Alaska **STUDY:** 14.17
COOPERATOR: Layne Adams
GRANT: W-27-1
STUDY TITLE: Investigation of Wolf Population Response to Intensive Trapping in the Presence of High Ungulate Biomass
AUTHOR: Mark E McNay
PERIOD: 1 July 1997–30 June 1998

SUMMARY

During winter 1993–1994, the state of Alaska used intensive trapping to conduct a wolf (*Canis lupus*) predation control program in Unit 20A of Interior Alaska. The wolf control program was prescribed to reduce wolf predation on the Delta caribou (*Rangifer tarandus*) herd. A precontrol wolf population estimate was compiled from harvest records and from wolf and wolf track observations made during 701 hours of flight time conducted to administer the program. In October 1993 a minimum of 243 wolves (14.8 wolves/1000 km²) in 22 packs ranged within the 16,367 km² surveyed portion of Unit 20A. The April 1994 estimated wolf population contained a minimum of 76 wolves (4.6 wolves/1000 km²) associated with 17 packs.

State trappers killed 99 wolves; 83 were snared, 3 were trapped, and 13 were shot from the ground. Simultaneous to the state wolf control program, private trappers killed 59 wolves within Unit 20A and salvaged 2 additional wolves they found dead of unknown causes. Private trappers and hunters snared 24 wolves, trapped 25 wolves, and shot 11 wolves. The combined state and private wolf kill resulted in a 69% reduction in the minimum wolf population from autumn to spring but only a 23% reduction in the number of wolf packs.

Trapping effort by state trappers resulted in 1086 snares and 6 traps set among 82 trap sites in winter 1993–1994. Wolves were caught at 31 of those sites during 102,760 trap nights, a catch rate of 1 wolf/1195 trap nights. State trappers caught an average of 2.7 wolves per successful trap site.

Postmortem examination was conducted on 119 of the state and private trapper-killed wolves. Fifty-two percent of the postmortem sample were wolves less than 1 year of age, 22% were 1 year of age, and 26% were 2 years of age or older. Among females 2 years or older available

for postmortem examination ($n = 18$), 12 (67%) displayed placental scars indicating pregnancy the previous spring. Among the 11 females older than 2 years, 10 (91%) displayed placental scars. Of the 6 females which did not display evidence of pregnancy for the previous year, 5 were aged 2 years and 1 was 4 years old. Based on placental scars, inutero litter sizes among pregnant females ranged from 4 to 9 ($\bar{x} = 6.2$, $n = 12$).

Following cessation of wolf control, I initiated this study to document the recovery of the Unit 20A wolf population following intensive trapping. Between March 1995 and June 1998, 134 wolves were captured 194 times in Unit 20A. Radio collars were placed on 104 of the captured animals, and 30 wolves were marked only with color-coded ear tags. Approximately 3000 locations of individual wolves were completed between March 1995 and June 1998. Fifty females of breeding age were scanned by ultrasound in late March and early April 1993–1998. Seven den sites were watched from the ground in late May and early June 1996–1998. Litter sizes were also determined from aerial observations in summer 1996–1998. Postmortem examination of 301 wolf carcasses taken by state and private trappers were completed between October 1993 and June 1998.

Key words: litter size, pregnancy rates, snaring, trapping, wolf control, wolves.

CONTENTS

SUMMARY	i
BACKGROUND	2
STUDY OBJECTIVES	3
JOB OBJECTIVES	4
STUDY AREA	5
METHODS	6
ESTIMATING WOLF POPULATION SIZE AND HARVEST	6
<i>Job 1</i>	6
METHODS OF WOLF HARVEST	7
<i>Job 1</i>	7
POSTMORTEM EXAMINATION	8
<i>Job 1</i>	8
WOLF CAPTURE AND HANDLING	8
<i>Jobs 2 through 10</i>	8
TELEMETRY LOCATIONS	8
<i>Jobs 2 through 10</i>	8
POSTMORTEM EXAMINATIONS	8
<i>Jobs 2 through 10</i>	8
PUP PRODUCTION AND SURVIVAL	9
<i>Jobs 2 through 10</i>	9
RESULTS AND DISCUSSION	9
WOLF POPULATION SIZE	9
<i>Job 1</i>	9
WOLVES KILLED	9
<i>Job 1</i>	9
TRAPPING EFFORT	10
<i>Job 1</i>	10
WOLF CAPTURE AND HANDLING	10
<i>Jobs 2 through 10</i>	10
TELEMETRY LOCATIONS	10
<i>Jobs 2 through 10</i>	10
POSTMORTEM EXAMINATION	10
<i>Jobs 2 through 10</i>	10
PUP PRODUCTION AND SURVIVAL	11
<i>Jobs 2 through 10</i>	11
CONCLUSIONS AND RECOMMENDATIONS	11
ACKNOWLEDGMENTS	11
LITERATURE CITED	11
Fig 1 Distribution of wolf tracks observed during aerial surveys of Unit 20A, October 1993–April 1994	14
Fig 2 Distribution of wolves killed by private and state trappers, October 1993–April 1994 ..	15
Table 1 Estimated pack size and harvest of 22 wolf packs in Unit 20A, October 1993–April 1994	16
APPENDIX A Pack histories of wolf packs in Unit 20A subjected to wolf control during October 1993–April 1994	17

BACKGROUND

The wolf population in Unit 20A has encountered 3 government wolf control programs since 1954 and continuous annual harvests by public hunters and trappers under liberal hunting and trapping regulations. In each case, government wolf control was applied to reduce wolf predation on moose (*Alces alces*) and caribou to reverse declines in those ungulate populations. Increasing the allowable harvest by hunters of those ungulates was a primary objective of wolf control. The history of that wolf harvest and wolf population response was documented by Gasaway et al (1983) and Boertje et al. (1996). A brief summary follows.

High wolf numbers in the early 1950s were reduced by poisoning and aerial shooting to a density of approximately 4 wolves/1000 km² between 1954 and 1960. Following cessation of wolf control in 1960, wolves increased and attained densities of 16 wolves/1000 km² by 1970. Moose increased to high densities (≥ 1300 moose/1000 km²) by the mid-1960s, then declined to a low density (165 moose/1000 km²) by 1975. Beginning in 1976, wolves were again reduced by aerial shooting to a density of 3 wolves/1000 km² by spring 1979. Wolf control ended in 1982. Moose, caribou, and wolf populations all increased during the 1980s and wolves reached a density of 16 wolves/1000 km² by autumn 1991. Wolves were reduced during a third government wolf control program during winters 1993–1994 and 1994–1995.

Each of the control programs removed most of the wolves; during programs of the 1950s and 1970s, entire wolf packs were killed. That history of periodic intense harvest caused redistribution of pack territories and affected reproductive success of surviving females. In contrast, within the adjacent Denali National Park, legal harvest of wolves has been prohibited since 1952. On lands added to the park by the Alaska National Interest Lands Conservation Act (ANILCA) in 1980, wolves were occasionally harvested by subsistence users and in some areas legally by sport hunters, but harvests were very low. Only 3 wolves were known to be harvested by humans within the entire 14,200 km² Denali Park and Preserve Conservation Unit between 1986 and 1992 (Meir et al. 1995).

The genetic relatedness (Lehman et al. 1992), social structure, natural mortality, dispersal, reproductive characteristics (Meir et al. 1995), and predation characteristics (Adams et al. 1995; Mech et al. 1995; Mech et al. 1998) of the unexploited Denali wolf population has been well documented. National Park Service biologists continued to monitor approximately 10 radiocollared packs within the park and preserve between 1992 and 1996 (B Dale, pers commun).

Harvests of 15–40% (Gasaway et al. 1983; Ballard et al. 1987; Fuller 1989) have stabilized wolf populations, but the mechanisms by which unexploited or lightly exploited populations are regulated are not always clear. Packard and Mech (1980) reviewed the concept of "intrinsic limitation" and found it inadequate to explain wolf population regulation in many cases. While social factors may buffer changes in wolf population response to changes in prey populations (Packard et al. 1983), nutrition probably has the greatest ultimate influence on population regulation in unexploited and lightly exploited wolf populations. Changes in prey vulnerability, time lags in the numerical response to changes in nutrition (Packard and Mech 1980), and

varying rates of exploitation by humans contribute to difficulties in deciphering the influence of intrinsic social mechanisms.

Wolf populations recovered rapidly in Unit 20A, at least numerically, following wolf control in the 1950s and 1970s. The rates of recovery are consistent with findings of high pregnancy rates and reproductive success of Alaskan wolves subjected to high rates of exploitation (Rausch 1967). Woolpy (1968; cited by Packard and Mech 1980) speculated that the uncharacteristically high pregnancy and birth rates followed the loss of social restrictions on breeding that resulted from high harvests which destroyed the social organization of the wolf population. If so, pregnancy rates among unexploited populations should be lower than among highly exploited populations.

The most recent wolf control program (1993–1994) in Unit 20A was conducted to halt a precipitous decline in caribou numbers that occurred during a series of severe winters (Boertje et al. 1996). However, the moose population did not significantly decline during the severe winters, and now moose population density is approximately 675 moose/1000 km². After wolf control ended, caribou and sheep numbers stabilized, and based on 1995 and 1996 survival of juveniles, moose and sheep populations may be increasing (P Valkenburg and K Whitten, pers commun). Consequently, the reduced wolf population is recovering in the presence of relatively high and probably increasing prey numbers. Based on regressions of ungulate biomass versus wolf density from study areas throughout North America (Fuller 1989; Messier 1995), the ungulate prey base in Unit 20A could support a wolf density of 20–25 wolves /1000 km², a level 25–56% higher than previously recorded in Interior Alaska (Boertje et al. 1996). Therefore, if social limitation is of major importance (Haber 1996) in limiting wolf population size, it should have ample opportunity to express itself in the Unit 20A wolf population. If wolves do stabilize at moderate densities (i.e., about 15 wolves/1000 km²) in the absence of limiting harvest, we have a rare opportunity to examine the potential for a high-density ungulate–wolf equilibrium in which wolves are socially regulated below a level that food limitation is imposed and ungulates remain at high density, despite relatively high wolf numbers.

This progress report documents the status of packs subjected to wolf control during the winter 1993–1994, provides a detailed account of the precontrol wolf population, and the private and state harvest during wolf control.

STUDY OBJECTIVES

- 1 Document the effects of intensive trapping on wolf pack structure and viability based on breeding characteristics and productivity, ages and rates of dispersal, causes and rates of natural mortality, and spatial distribution of individuals and packs.
- 2 Evaluate those effects relative to current wolf harvest management practices in consideration of public concerns regarding the potential for long-term ill-effects arising from human exploitation of wolves.

JOB OBJECTIVES

The procedures for the proposed objectives are listed with each objective.

- 1 Compile results of ground-based wolf control conducted by intensive trapping in Unit 20A. Existing records contain data on composition of the harvest, geographical distribution of the harvest, distribution of harvest among packs, efficacy of the trapping effort, estimates of population size, and reproductive performance of the precontrol wolf population. These data will be compiled to serve as a basis for comparison to data collected during wolf population recovery.
- 2 During each year of the study, maintain a sample of at least 40 radiocollared wolves comprising at least 30 females in at least 10 packs that currently exist or arise within the core wolf control area. Radiomarked packs will be captured at least once each year to place radio collars on adult female wolves and to apply earmarks to juvenile females so that a known-aged sample of females is maintained within the population.
- 3 Determine pregnancy rates and fetal litter sizes using ultrasound scanning in early April each year. Radiocollared adult females (age ≥ 22 months) will be recaptured approximately 20–30 days following the end of the breeding season to determine frequency of pregnancy and inutero litter size. Other adult females that are not radiocollared but associated with the pack will also be captured and added to the collared sample of adult females.
- 4 Determine movements, dispersal activities, and denning locations of known pregnant females during the last half of pregnancy and during the first 2 weeks following the estimated parturition date for each female. Females that are known to be pregnant based on ultrasound results will be located approximately 3 times each week between early April and mid June. Parturition dates will be estimated based upon dates of den entrance.
- 5 Determine oversummer wolf pup survival. Selected dens will be monitored beginning 3 weeks after parturition to estimate litter sizes at birth. Dens will be viewed from the ground using spotting scopes. Late summer estimates of pup survival will be based on aerial observations of wolves at summer rendezvous sites or aerial observations of traveling packs during late September and early October.
- 6 Determine annual wolf population estimates during autumn and spring. Population estimates will be based on the maximum number of wolves seen in radiocollared wolf packs during early autumn plus additional wolves detected during aerial surveys that are not associated with packs. Fixed-wing aerial surveys will be conducted 2–5 days after a fresh snowfall during the autumn period (Oct–Nov) and during the spring period (Mar–Apr) to search for unmarked wolf packs.
- 7 Determine wolf pack territory size based on a minimum of 40 locations per wolf pack per year. During each month of the year, radiotracking flights will be conducted to determine wolf pack movements and annual home range size.

8. Cooperate with studies on moose and caribou to maintain accurate estimates of moose and caribou population size and distribution over time and relative to changes in wolf density. Periodic assistance will be provided to caribou and moose research programs to ensure that prey distribution data are regularly collected. We will conduct monthly caribou radiotracking and autumn moose distribution flights.
9. Investigate and determine the causes of wolf mortality. A helicopter will be used to visit sites where wolf mortality signals are detected. Remains of wolf carcasses will be collected and analyzed for cause of death when cause is not apparent from on-site evidence.
10. Determine sex and age of wolves taken by public trappers and hunters within the study area. The vulnerability of various sex and age classes to hunting and trapping will be determined by comparing the sex and age of the harvest with population sex and age composition estimated from radiolocation and capture data.
11. Conduct literature review. References to canid dispersal, mortality, reproductive success, and predator-prey relationships will be reviewed and incorporated into design of data analysis.
12. Analyze data and prepare figures and text for publication and oral presentations.
13. Write annual progress reports and a final report at the end of the study period.

STUDY AREA

The study area lies within Unit 20A (17,601 km²) of Interior Alaska. Elevations within the study area range from 110 to 4000 m, but most wolves and their prey are at elevations below 2000 m. As the terrain slopes upward from north to south, the habitat changes from poorly drained "flats" of boreal spruce forest underlain by permafrost through a zone of alpine shrubs and into an alpine community of grasses, sedges, and forbs. Elevations above 2000 m are often covered by permanent snow or glacial ice.

Wolves prey primarily on moose, caribou, and Dall sheep (*Ovis dalli*). A small herd of approximately 400 bison (*Bison bison*) occupy grass/sedge meadows along the eastern edge of the study area in summer and autumn. Bison are available as prey for 1 wolf pack within the study area. Other wolf prey include beavers (*Castor canadensis*), snowshoe hares (*Lepus americanus*) and ground squirrels (*Spermophilus undulatus*). Beavers are common in the drainages along the foothills of the Alaska Range. Snowshoe hare numbers increased during the study period as they approached the high of their 10-year cycle. Other potential ungulate predators include black bears (*Ursus americanus*), grizzly bears (*Ursus arctos*), coyotes (*Canis latrans*), wolverine (*Gulo gulo*), and lynx (*Felis lynx*). Golden eagles (*Aquila chrysaetos*) also prey on newborn caribou and Dall sheep.

The area is roadless except for seasonal mining trails and trails to homestead sites along the western boundary of the area. Two families occupy permanent homestead sites in the center of the study area. The community complexes of Healy/McKinley Park and Delta Junction/Fort

Greely lie outside the western and eastern boundaries, respectively. Denali National Park lies adjacent to the study area to the west. Access to the study area is by air via numerous airstrips associated with mining or guiding, or unimproved landing sites along streams and ridges.

METHODS

ESTIMATING WOLF POPULATION SIZE AND HARVEST

Job 1

During the wolf control program, state personnel were prohibited from using existing radiocollars to locate wolves within Unit 20A. Therefore, the number of packs and the number of wolves in each pack were estimated from sightings of wolves and wolf tracks seen during flights to administer the ground-based wolf control. When tracks were sighted they were followed from the air until wolves were seen or until the tracks could no longer be discerned. For each sighting, we recorded the location, number, and color of wolves. All data were plotted on a 1:250,000 topographical map. The latitude and longitude displayed on the aircraft's Global Positioning System (GPS) receiver was used to precisely determine location of sightings and tracks.

A portion of western Unit 20A was not surveyed for wolves or wolf tracks, and no wolves were reported harvested from that area. That unsurveyed area (361 km²) was excluded from calculations of minimum wolf population size and density. The area above 2000 m elevation (873 km²) was considered nonwolf habitat and was also excluded from density calculations. Density calculations were based on the remaining 16,367 km² of Unit 20A. Wolf control was not applied on 4837 km² of military land within Unit 20A, but we conducted regular overflights of those lands, frequently tracking wolves from within military lands to kill sites on state lands. Private trappers harvested wolves from military lands; therefore, military lands were included in our calculation of minimum population size and density.

Although some wolf packs had territories that ranged into Unit 20A from surrounding game management units, only those packs whose known range lay primarily within Unit 20A were included in the calculation of minimum population and density estimates. I did not increase the estimate by 10% to account for single wolves not associated with packs as in previous estimates of the Unit 20A wolf population (Boertje et al. 1996). Instead, I considered the estimate to reflect the minimum known population. Compilation of harvest records resulted in identification of some harvested wolves as single animals, not associated with a pack. Undoubtedly, other single wolves existed, were not harvested, and therefore were not included in the population estimate.

All sightings of wolves and wolf tracks were compiled on a single computer-generated map using the digitized locations of wolves and wolf tracks. This cumulative record allowed me to identify individual packs and their home ranges by circumscribing sightings of wolves and wolf tracks that were consistent in number and color composition over time. I gained additional insight into the identification of packs by comparing the number, color composition, and location of trapped wolves with presumed home ranges resulting from the cumulative map of wolf and track sightings. The chronology of the wolf harvest was compared with wolf and wolf

track sightings to support assumptions about initial pack size and pack affiliation of harvested wolves. When the chronology of harvest, harvest location, harvest color composition, or number of wolves harvested were inconsistent with the cumulative pack observations, I considered those harvested wolves to be unaffiliated with a particular pack at the time of their harvest (i.e., single wolves). To estimate trap site density, a convex polygon was drawn to include all trap sites set by state trappers. The polygon did not include 4837 km² of military lands that were closed to state trappers.

Private trappers operated traplines independent of the state wolf control program within the study area during the period of wolf control. To document harvest by private trappers, state regulations require each harvested wolf pelt be tagged with a locking seal. Date of take, sex, color, location, method of take, and method of transport are recorded for each wolf pelt on a form at the time the pelt is presented for sealing.

METHODS OF WOLF HARVEST

Job 1

In the state wolf control program, wolves were killed primarily with the use of snares, but some wolves were trapped with foothold traps and some wolves were shot from the ground. I defined a trap site as a single location within a roughly 100 m radius where 1 or more traps or snares were placed, either associated with a naturally occurring bait, associated with bait placed by the trapper, or in the absence of bait, where wolves frequently traveled. Traps and snares were set beginning in late October 1993. All traps and snares were removed from the field by early April 1994.

Both state and private trappers established trap sites at locations of naturally occurring wolf-killed ungulates and around baits placed by the trapper. State trappers used carcasses of road-killed moose for bait. Private trappers commonly used the hide, bones, or entrails of hunter-killed moose for bait. Methods of setting snares and traps were similar for state and private trappers. In general, snares were placed in a line or circle around natural kills or baited sites. During winter 1993–1994, 1–29 snares ($\bar{x}=13$) were placed at each trap site, and private trappers commonly set similar numbers of snares per trap site. At each trap site, traps or snares were placed at distances of 1–100 m from bait.

In those instances when state trappers shot wolves from the ground, wolves were shot with rifles by landing the shooter near a wolf pack, then the shooter either stalked to within rifle range or waited until wolves moved into rifle range. State trappers accessed trap sites by helicopters or airplanes. Private trappers accessed trap sites primarily by snowmachine, but also by airplanes.

Each trapping site was numbered and identified with a GPS location. The number and type of traps and snares were recorded for each site. The number of trap nights at each site was calculated as the number of traps and snares at the site multiplied by the number of nights that each site was operational. If additional traps or snares were placed at a site, or traps or snares removed from a site, the number of trap nights was adjusted accordingly. We did not adjust trap nights for periodic snow/weather conditions that may have rendered traps or snares

temporarily inoperative. Trapping sites were checked from the air by helicopter or fixed-wing aircraft but were not visited on the ground unless trapped wolves or nontarget species were present. Traps and snares were deployed beginning October 1993 and removed in April 1994, redeployed in October 1994 and removed by early December 1994. Wolves killed by state trappers in the wolf control program were removed from the field by helicopter or by fixed-wing aircraft.

POSTMORTEM EXAMINATION

Job 1

We conducted a postmortem examination of wolves taken by government trappers during the control program. In addition, we purchased and examined about one-half of the wolf carcasses taken by private trappers within the study area. We recorded location, method and date of take, and body measurements. Female reproductive tracts were removed and dissected. We counted placental scars, excised and weighed xiphoid fat, noted injuries, and collected muscle and tissue samples for genetic and cesium analysis. Skulls were cleaned and 2 premolars (an upper and lower) were extracted for cementum aging from animals more than 1 year of age. First year animals were aged based on evidence of incomplete epiphysal closure in the radius and ulna. Pelts from control wolves were tanned and distributed to government and educational institutions for scientific and educational programs.

WOLF CAPTURE AND HANDLING

Jobs 2 through 10

We darted wolves from helicopters, using 3cc Palmer Cap-Chur darts loaded with 560 mg of Telazol®. Wolves were either eartagged or fitted with radio collars containing a mortality-sensing device (Telonics, Inc. Mesa, Arizona USA). In early April captures we scanned adult female wolves for pregnancy, litter size, and rumpfat thickness, using a portable ultrasound machine attached to a videotape recorder.

TELEMETRY LOCATIONS

Jobs 2 through 10

We conducted radiotracking flights from fixed-wing aircraft once each week (on average) between April 1995 and June 1998. Location, pack size, cover type, activity, and weather information were recorded for each wolf.

POSTMORTEM EXAMINATIONS

Jobs 2 through 10

We purchased carcasses from private trappers for wolves taken in Unit 20A during winters 1993–1994 through 1997–1998. We made standard measurements on each carcass and determined sex, age, color, and reproductive status. When possible we assigned a pack affiliation to each harvested wolf.

PUP PRODUCTION AND SURVIVAL

Jobs 2 through 10

Pregnant females were located on average once every 3 days during late April and early May during 1996 through 1998. Selected densities were observed using spotting scopes from the ground in late May and early June 1996–1998 to determine litter sizes of females that had been scanned with ultrasound in April. During June, July, and August 1995–1998, den sites were monitored from fixed-wing aircraft once each week to determine summer litter size. Autumn litter size was determined from radiotracking flights in late September through early November when pups were traveling with packs.

RESULTS AND DISCUSSION

WOLF POPULATION SIZE

Job 1

We flew approximately 700 hours of fixed-wing and helicopter flight time to administer the wolf control program from October 1993 through April 1994 in Unit 20A. The resulting cumulative map of wolf tracks depicted 185 sightings of wolf travel routes (Fig 1). Wolves were sighted in association with 74 of those track sightings. We compiled a pack history, describing the history of each of the identified packs from field notes, harvest records, and the cumulative track map (Appendix A). Autumn 1993 and spring 1994 wolf population estimates were based on the pack history.

The minimum autumn wolf population was estimated to be 243 wolves within the 16,367 km² surveyed portion of Unit 20A (14.8 wolves/1000 km²; Table 1). The estimate included 233 wolves in 22 packs, plus 10 additional harvested wolves for which pack affiliation was unknown. The minimum spring population within the surveyed portion of the study area was 76 wolves (4.6 wolves/1000 km²), 73 wolves in 17 surviving packs of 2 or more wolves and 3 wolves that survived as single wolves from precontrol packs. Estimated pack sizes in October 1993 ranged from 3 to 27 wolves ($\bar{x} = 10.6$, $n = 22$). Two of the autumn 1993 packs were thought to be extirpated during the wolf control program. Three additional packs were believed to have a single survivor of the original autumn pack in April 1994. Estimated pack sizes in early April 1994 ranged from 2–12 wolves ($\bar{x} = 4.3$, $n = 17$).

WOLVES KILLED

Job 1

Known mortality totaled 161 wolves between October 1993 and April 1994. State trappers killed 99 wolves. Private trappers and hunters killed an additional 60 wolves. Two wolves were found dead of unknown causes, and private trappers salvaged their pelts. Those 2 wolves were included in the calculation of minimum population size. Eighty-three of the 99 wolves killed by state trappers were snared, 3 were trapped, and 13 were shot from the ground. Private trappers snared 24 wolves, trapped 25 wolves, and shot 11 wolves.

Among the 161 wolves killed by both state and private trappers during winter 1993–1994, 68 were males and 83 were females, and sex was not determined for 10 wolves. Of 119 carcasses examined from the combined state and private trapper wolf kill, 62 (52%) were less than 1 year of age, 26 (22%) were yearlings, and 31 (26%) were older than 2 years. Eighteen reproductive tracts of females older than 2 years were examined; 12 (67%) displayed placental scars, indicating they had successfully bred the previous year. Inutero litter size, based on those placental scars, ranged from 4–9 fetuses ($\bar{x} = 6.2$). Of the 6 females that did not display placental scars, 5 were 2 years old and 1 was 4 years old.

TRAPPING EFFORT

Job 1

State trappers placed 1086 snares and 6 traps among 82 trap sites during winter 1993–1994, a cumulative effort of 102,760 trap nights. Wolves were caught at 31 trap sites. Eighty-six wolves were caught in snares and traps, a catch rate of 1 wolf per 1195 trap nights and 2.8 wolves per successful trap site. A convex polygon drawn to include all 82 state trap sites encompassed 6935 km², a trap site density of 11.8 trap sites/1000 km². Density of individual state traps and snares was 158/1000 km². Seventeen private trappers took 49 wolves in traps or snares. The number of trap sites used by private trappers and the number of traps and snares deployed was unknown. Wolf kill locations by both private and state trappers are shown in Figure 2.

WOLF CAPTURE AND HANDLING

Jobs 2 through 10

Between March 1995 and April 1998, 134 wolves were captured 194 times within Unit 20A. Fifty females older than 21 months were scanned with ultrasound for pregnancy in late March or early April 1996, 1997, and 1998. Capture and ultrasound data were entered into databases for future compilation and analysis.

TELEMETRY LOCATIONS

Jobs 2 through 10

Approximately 3000 locations of individual wolves were obtained between March 1995 and June 1998. Over 2900 telemetry locations have been entered into a computer database for future compilation and analysis.

POSTMORTEM EXAMINATION

Jobs 2 through 10

Postmortem examination of 301 wolf carcasses taken by state and private trappers was completed between October 1993 and June 1998. Data from those examinations have been entered into a computer database for future compilation and analysis.

PUP PRODUCTION AND SURVIVAL

Jobs 2 through 10

Seven den sites were watched from the ground in late May and early June between 1996 and 1998. We also determined litter sizes from aerial observations during summers 1996, 1997, and 1998. Data for pup production and survival will be compiled and reported the next reporting period.

CONCLUSIONS AND RECOMMENDATIONS

During winter October 1993–1994, intensive snaring and trapping substantially reduced the wolf population in Unit 20A. However, a single winter of intensive snaring and trapping proved to be relatively ineffective in reducing the number of wolf packs within the population. Seventeen of the estimated 22 wolf packs survived with 2 or more members in April 1994. Further analysis of the sex and age composition of the harvested wolves is required to determine if breeding adults were commonly removed from packs, or whether breeding adults tended to survive intensive trapping. During the next reporting period, I will compile data regarding the estimated population in autumn 1994 when the intensive trapping program was applied between October and December.

ACKNOWLEDGMENTS

Rodney Boertje, Toby Boudreau, Ed Crain, Bruce Dale, Lisa Fox, Danny Grangaard, Cathie Harms, Kirstin Hunter, Mark Keech, Laura McCarthy, Tom Seaton, Jeff Selinger, Patrick Valkenburg, Brad Scotton, Jack Whitman, and Randy Zarnke assisted in collection of field or necropsy data. Rob DeLong, Sandy Kennedy, and Tom Seaton assisted in compiling and entering data. Beth Lenart assisted in the preparation of the cumulative track sighting map and Laura McCarthy provided editorial expertise for this progress report. Pilots Jonathan Larrivee, Dennis Miller, Rick Swisher and Marty Webb flew helicopter or fixed surveys and provided logistical support for several aspects of this project.

LITERATURE CITED

- ADAMS LG, BW DALE, AND LD MECH. 1995. Wolf predation on caribou calves in Denali National Park, Alaska. Pages 245–260 in LN Carbyn, SH Fritts, and D Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication 35.
- BALLARD WB, JS WHITMAN, AND CL GARDNER. 1987. Ecology of an exploited wolf population in southcentral Alaska. *Wildlife Monographs* 98.
- BOERTJE RD, P VALKENBURG, AND ME MCNAY. 1996. Increases in moose, caribou, and wolves following wolf control in Alaska. *Journal of Wildlife Management* 60(3):474–489
- FULLER TK. 1989. Population dynamics of wolves in north-central Minnesota. *Wildlife Monographs* 105.

- GASAWAY WC, RO STEPHENSON, JL DAVIS, PEK SHEPHERD, AND OE BURRIS. 1983. Interrelationships of wolves, prey, and man in interior Alaska. *Wildlife Monographs* 84.
- HABER GC. 1996. Biological, conservation, and ethical implications of exploiting and controlling wolves. *Conservation Biology* 10(4):1068–1081.
- LEHMAN N, P CLARKSON, LD MECH, TJ MEIR, AND RK WAYNE. 1992. A study of the genetic relationships within and among wolf packs using DNA fingerprinting and mitochondrial DNA. *Behavioral Ecology and Sociobiology* 30:83–94.
- MECH LD, LG ADAMS, TJ MEIR, JW BURCH, AND BW DALE. 1998. The wolves of Denali. University of Minnesota Press.
- , TJ MEIR, JW BURCH, AND LG ADAMS. 1995. Patterns of prey selection by wolves in Denali National Park, Alaska. Pages 223–244 in LN Carbyn, SH Fritts, and D Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication 35.
- MEIR TJ, JW BURCH, LD MECH, AND LG ADAMS. 1995. Pack structure and genetic relatedness among wolf packs in a naturally-regulated population. Pages 293–302 in LN Carbyn, SH Fritts, and D Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication 35.
- MESSIER F. 1995. On the functional and numerical responses of wolves to changing prey densities. Pages 187–197 in LN Carbyn, SH Fritts, and D Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication 35.
- PACKARD JM AND LD MECH. 1980. Population regulation in wolves. Pages 135–150 in MN Cohen, RS Malpass, and HG Klein, editors. Biosocial mechanisms of population regulation. Yale University Press, New Haven, Connecticut.
- , ———, AND US SEAL. 1983. Social influences on reproduction in wolves. Pages 78–85 in LN Carbyn, editor. Wolves in Canada and Alaska: their status, biology, and management. Canadian Wildlife Service. Report Series 45.
- RAUSCH RA. 1967. Some aspects of the population ecology of wolves in Alaska. *American Zoologist* 7:253–265
- WOOLPY JH. 1968. The social organization of wolves. *Natural History* 77:46–55.


PREPARED BY:

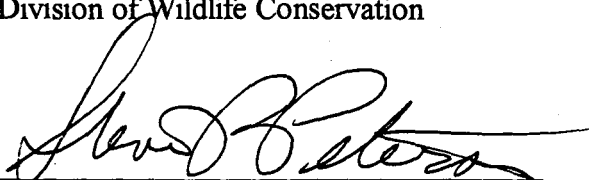
Mark E McNay
Wildlife Biologist III

SUBMITTED BY:

Kenneth R Whitten
Research Coordinator

APPROVED BY:


Wayne L. Regelin, Director
Division of Wildlife Conservation


Steven R Peterson, Senior Staff Biologist
Division of Wildlife Conservation

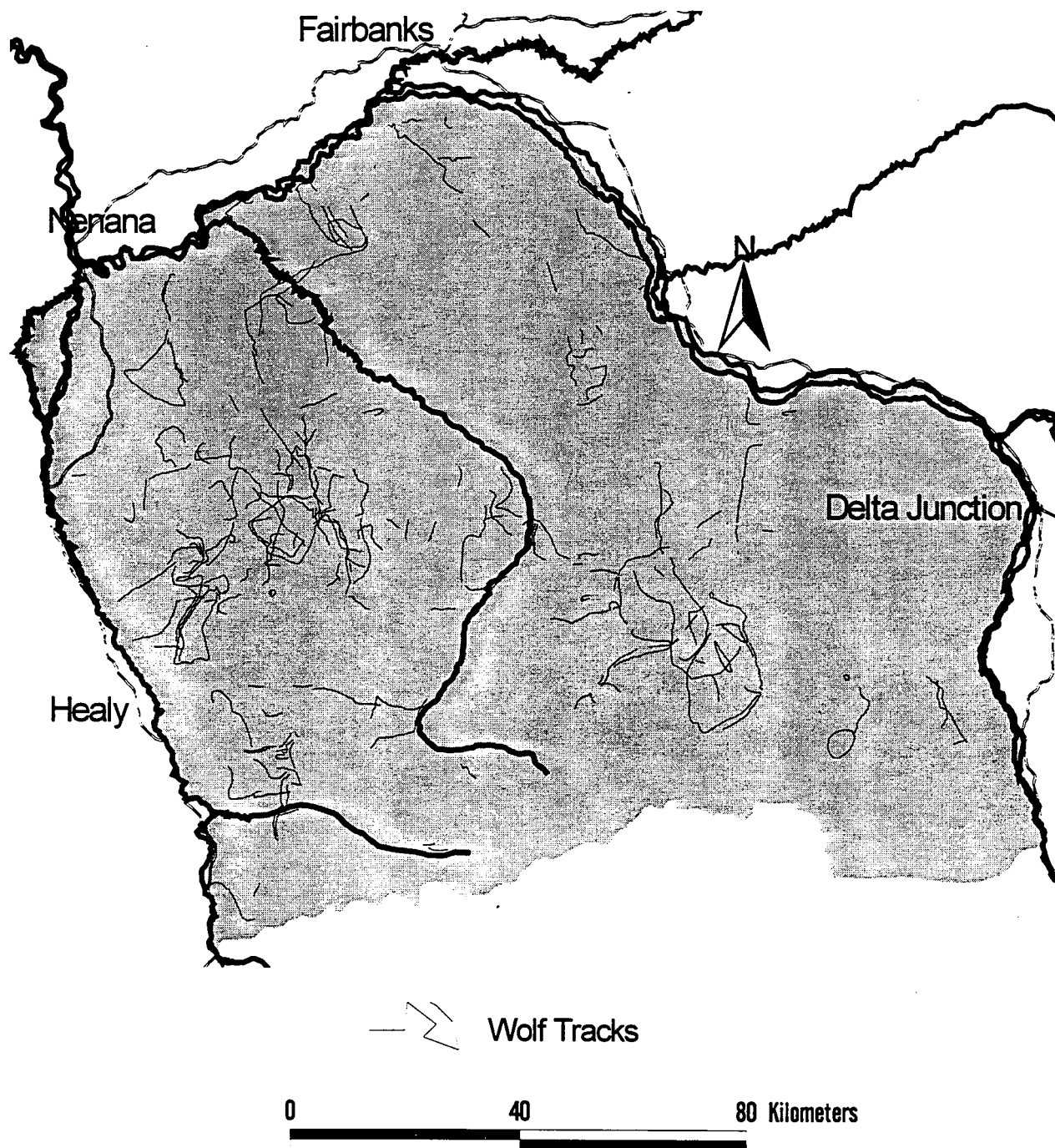


Fig 1 Distribution of wolf tracks observed during aerial surveys of Unit 20A, October 1993–April 1994

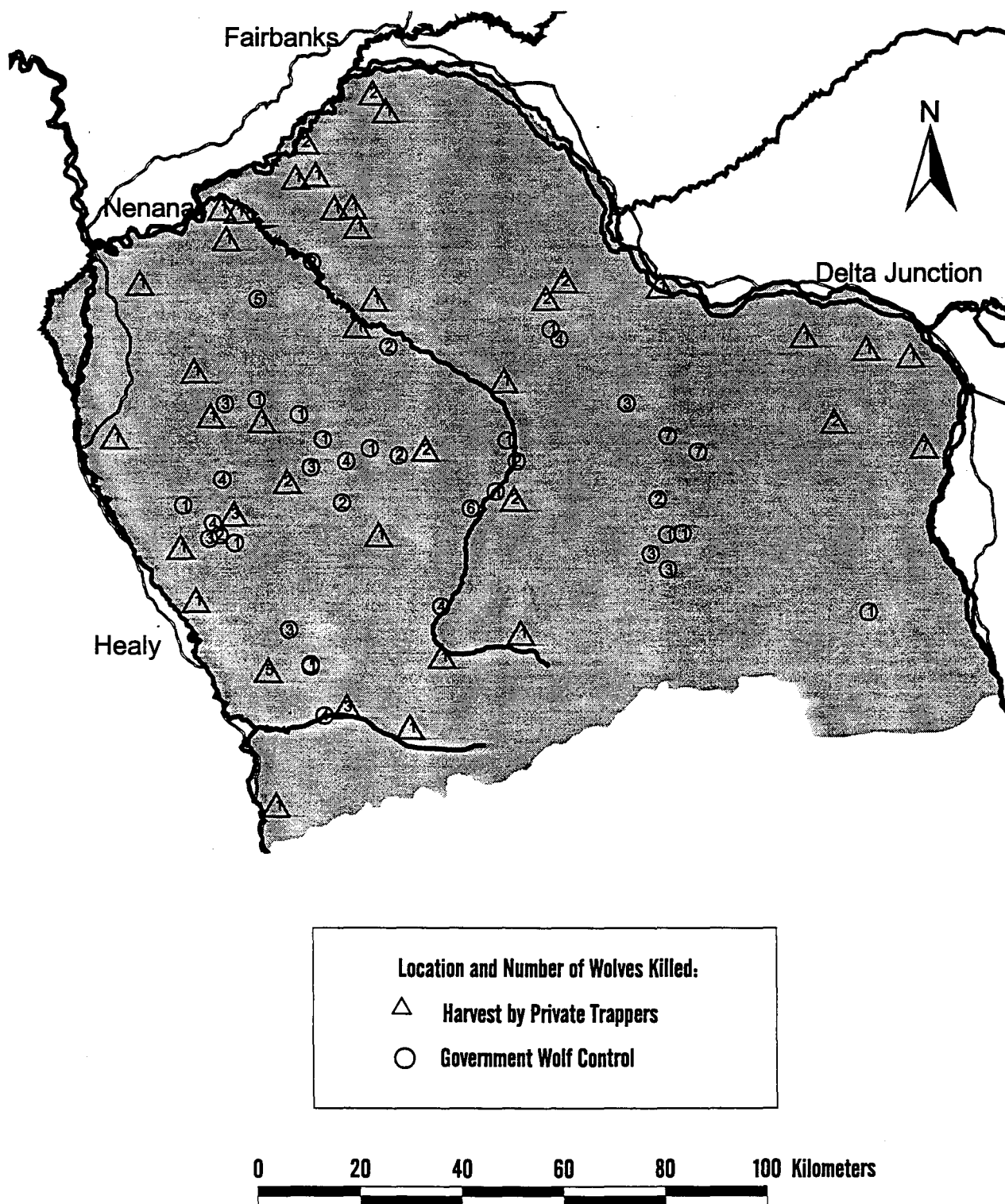


Fig 2 Distribution of wolves killed by private and state trappers, October 1993–April 1994

Table 1 Estimated pack size and harvest of 22 wolf packs in Unit 20A, October 1993–April 1994

Pack name	Estimated pack size		Harvest		
	Autumn	Spring	Department	Private	Trapping total
Cody	8	2	5	1	6
Yanert	27	11	6	10	16
Rainbow	17	8	0	9	9
Mystic	4	3	1	0	1
Jumbo	13	3	9	1	10
100-mile	9	5	1	3	4
Tata	12	1	11	0	11
Coal Creek	7	0	5	2	7
Spirk	12	2	9	1	10
Ptarmigan	3	3	0	0	0
Iowa Ridge	18	1	17	0	17
Newman Creek	8	4	4	0	4
East Fork	7	4	3	0	3
Healy	4	0	3	1	4
Blair Lakes	10	5	1	4	5
Wood River	15	3	9	2	11
Steep Creek	11	4	4	3	7
Clear Creek/Salchaket	17	7	0	5	5
Crooked Creek	8	3	0	5	5
Whiskey Island	4	2	0	2	2
Rex Dome	13	1	8	4	12
Totatlanika	6	4	0	2	2
Unknown Pack Assoc.	10	0	3	7	10
Totals	243	76	99	62	161

APPENDIX A Pack histories of wolf packs in Unit 20A subjected to wolf control during October 1993–April 1994

**PACK HISTORY OF WOLF PACKS IN UNIT 20A
OCTOBER 1993–APRIL 1994**

TATA PACK

The size and range of this pack was based on 8 sightings of wolves and 4 sightings of wolf tracks primarily within the upper portions of the Tatlanika River drainage. The pack ranged west to at least Bonnifield Creek and east to Buzzard Creek. Tracks were also followed to the north onto the Tanana Flats along Fish Creek. Between 30 October and 1 December, 7 wolves were snared and 4 were shot by state trappers within the range of this pack. No harvest by private trappers was recorded. The autumn estimate of 12 wolves was based on a sighting of 9 wolves on 14 November after 3 wolves had been previously killed from this pack. Spring pack size was estimated by subtracting known harvest from estimated autumn pack size. The breeding pair was removed from this pack.

Autumn pack size and color composition: 12 gray

Spring pack and color composition size: 1 gray

Wolves killed by state trappers: 11 gray

Wolves killed by private trappers and hunters: 0

Total harvest: 11 gray

CODY PACK

The Cody Creek pack traveled in the upper portions of the Wood River drainage and appeared to center their activities near the mouth of Cody Creek. The greatest single count of the Cody pack was an observation of 7 grays in mid October. In late October a track of more than 6 wolves traveled to a trap site near the mouth of Cody Creek where 1 wolf was caught. A wolf had previously been caught at this site a few days earlier. By 15 November, state trappers had taken 5 grays from the trap site near Cody Creek. On 3 January a track of 3 wolves was followed on the upper Wood River, indicating the autumn pack was at least 8. A private trapper took 1 additional wolf in February and the spring pack size was estimated to be 2 wolves.

The harvest from this pack consisted of 3 pups, 1 yearling female, and 1 4-year-old female which had not produced pups the previous year based on the absence of placental scars. The sixth harvested wolf was eaten in the snare by other wolves, and its sex and age were undetermined. Therefore at least 1 of the alpha pair, if not both, appeared to survive until late spring.

Autumn pack size and color composition: 8 gray

Spring pack size and color composition: 2 gray

APPENDIX A Continued

Wolves killed by state trappers: 5 gray
Wolves killed by private trappers and hunters: 1 gray
Total harvest: 6 gray

YANERT PACK

This pack numbered a minimum of 27 wolves in early October 1993. Twenty-three were seen on a moose kill on 19 November, but prior to that date 4 wolves had been ground shot by state trappers. The Yanert pack ranged throughout the Yanert River drainage, the Moody Creek drainage, and occasionally ventured into the Healy Creek and Carlo Creek drainages. This large pack appeared to have a larger home range than other mountain packs in Unit 20A. Moose densities in the Yanert River drainage were lower than in other areas of Unit 20A, but caribou were seasonally abundant.

In addition to the 4 wolves shot from the ground, 2 wolves were snared by state trappers. Two private trappers took a total of 10 wolves from the Yanert territory. The spring pack size estimate of 11 wolves was based on estimate autumn pack size minus the known harvest.

Autumn pack size and color composition: 27 gray
Spring pack size color composition: 11 gray
Wolves killed by state trappers: 6 gray
Wolves killed by private trappers and hunters: 10 gray
Total harvest: 16 gray

HEALY PACK

A small pack occupied the Healy Creek drainage in October 1993. Their tracks were sighted in mid October and on 26 November a pack of 4 grays was seen feeding on a fresh kill in Coal Creek. State trappers set snares around that kill site and caught 3 gray wolves; all were eaten by other wolves after they were caught in snares. It is unknown whether those wolves were eaten by the remaining wolf in the pack or by the large Yanert pack which occasionally ranged into that area of Healy Creek. A private trapper shot a single gray wolf in lower Healy Creek in December which was probably the remaining Healy Creek wolf.

Autumn pack size and color composition: 4 gray
Spring pack size and color composition: 0
Wolves killed by state trappers: 3 grays
Wolves killed by private trappers and hunters: 1 gray
Total harvest: 4 gray

JUMBO PACK

The Jumbo Pack ranged in the Western Foothills between Jumbo, Walker, and Rex Domes. The best single sighting of the Jumbo pack occurred on 23 October, when we saw 5 blacks and 1 gray in 1 group, and 2 black wolves about 5 miles behind the main group on the same

APPENDIX A Continued

day. Adding the kill from this home range to periodic sightings resulted in an initial estimate of 13 wolves; 11 black and 2 gray.

State trappers took the alpha male and 2 pups (all black) on 27 October on Elsie creek. On the same day state trappers shot 2 additional black pups. On the next day, 28 October, 2 black pups were snared near the Liberty Bell Mine, and on 14 November a black and gray pup were snared at the same trap site. A private trapper found a dead black wolf near the Liberty Bell Mine in December, bringing the total mortality before 1 January to 9 blacks and 1 gray.

On 16 February, 2 black and 1 gray were seen near Jumbo Dome after tracking them for more than 20 miles. On 21 March, 2 black and 1 gray were again sighted near the Ferry Trail east of California Creek. No wolves were harvested from this pack after December and we believe the alpha female survived.

Autumn pack size and color composition: 13 (11 black and 2 gray)

Spring pack size and color composition: 3 (2 black and 1 gray)

Wolves killed by state trappers: 9 (8 black and 1 gray)

Wolves killed by private trappers and hunters: 1 black (found dead)

Total harvest: 10 (9 black and 1 gray)

REX DOME PACK

The Rex Dome pack territory abutted that of the Jumbo pack to the north, but the Rex Dome pack contained primarily gray wolves, while the Jumbo pack was primarily black wolves. The Rex Dome pack's range included the area surrounding Rex Dome and extended north into the Tanana Flats along the Totatlanika River. The best observation of this pack occurred on 28 October when 11 wolves, 3 black and 8 gray were seen stalking a moose north of Rex Dome. The wolves subsequently killed a moose in this area and state trappers used the kill as a trap site.

State trappers killed 7 wolves (1 black, 6 gray) from this pack between 23 October and 15 November, including the alpha male and alpha female. A private trapper caught 2 grays and 1 black also in early November, and a private hunter shot a gray yearling male from a group of 1 gray and 2 blacks on 8 January near the Rex Trail. State trappers took a black pup in February.

Our initial estimate of 13, 9 gray and 4 black, was calculated using the chronology of harvest in association with the sightings of 28 October and 8 January. A single black wolf probably survived from this pack.

Autumn pack size and color composition: 13 (9 gray and 4 black)

Spring pack size and color composition: 1 black

Wolves killed by state trappers: 8 (2 black and 6 gray)

Wolves killed by private trappers and hunters: 4 (1 black and 3 gray)

Total harvest: 12 (9 gray and 3 black)

APPENDIX A Continued

STEEP PACK

The Steep Creek pack occupied a territory along the northern foothills of the Alaska Range centered around the upper Totatlanika River. The Steep Creek pack was first sighted on 4 November when 4 grays and 1 black were seen near a fresh moose kill near VABM TATA. Prior to that sighting private hunters and trappers had killed 1 black and 2 gray wolves within the pack's range. Subsequent sightings and harvest from within the pack's range indicated the initial autumn population size was 11 wolves; 4 blacks and 7 grays.

State trappers took 4 wolves from the Steep Creek pack between December and March, and private hunters and trappers took 3 wolves between September and early November.

Although the color composition and number of this pack is similar to that of the Rex Dome pack and the Totatlanika pack, the Rex Dome pack was virtually eliminated early in the winter, while the Steep Creek pack persisted as a group of at least 6 until March. The Totatlanika pack of 2 gray and 2 black was seen on the Totatlanika near the range of the Steep Creek pack on 6 March, a distance of approximately 30 miles direct line from a 7 March sighting of the Steep Creek pack near the Jackson airstrip. In addition, the wolves seen on the Totatlanika were near a track segment that had previously tied into the Totatlanika pack at the mouth of the Totatlanika on the Tanana River. These observations supported the conclusion of separate packs.

None of the female wolves taken by state trappers were reproductively active adults, and at least 2 of the 3 wolves taken by private trappers and hunters were pups. Therefore, at least 1 and probably both of the alpha pair survived.

Autumn pack size and color composition: 11 (4 black and 7 gray)

Spring pack size and color composition: 4 (3 black and 1 gray)

Wolves killed by state trappers: 4 gray

Wolves killed by private trappers and hunters: 3 (1 black and 2 gray)

Total harvest: 7 (6 gray and 1 black)

TOTATLANIKA PACK

This pack's range included the western Tanana Flats from the Tanana River to within about 5 miles of the foothills. Its range appeared to abut that of the Rex Dome and Steep Creek packs to the south and southeast. Initial evidence of the pack was based on 21 October sighting of a track of about 5 wolves on the Totatlanika River 4 miles upstream of the mouth. A track of 6–9 wolves in December and a track of 4–5 wolves on 1 February were seen in the same area. A long track from the Tanana River to within 5 miles of the foothills along the Totatlanika was followed during a wolf survey on 18 February, we estimated 5–6 wolves from the track. The only sighting of the pack occurred on 6 March when 2 blacks and 2 grays were seen near an old Kill on the Totatlanika about 8 miles north of the foothills. Using that sighting and the prior harvest, we estimated an autumn pack size of 6 wolves containing both blacks and grays.

APPENDIX A Continued

A trapper reported taking a female wolf of unspecified color in the upper portion of the Fish Creek drainage in January; he estimated 4 in the pack from tracks at his set. The same trapper later took a gray female near Nenana on the Tanana River from a pack of 2. That wolf was taken in early March and may have been from the Totatlanika pack or may have been from an unidentified pair. For the purpose of the estimate, the March wolf was considered a Totatlanika wolf. No wolves were taken by state trappers from this pack.

Autumn pack size and color composition: 6 (2 blacks and 3 grays plus 1 unknown color)

Spring pack size and color composition: 4 (2 blacks and 2 grays)

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 2 (1 gray and 1 unknown)

Total harvest: 2 (1 gray and 1 unknown)

WOOD RIVER PACK

The Wood River pack occupied a territory along the lower Wood River near the Wood River Buttes. The pack ranged west to the Tatlanika River and south to within a few miles of the Alaska Range foothills. The pack was sighted on 3 occasions. On 17 November and 1 December 15 grays were seen, and on 9 December 9 grays were seen.

State trappers took 9 gray wolves from this pack's range between 1 December and 31 January. Private trappers took 2 grays. None of the wolves taken by state trappers were older than 2 years of age, and 1 of those taken by a private trapper was a yearling, the age of the remaining harvested wolf was not estimated. Therefore, at least 1 of the alpha pair survived until spring.

Autumn pack size and color composition: 15 gray

Spring pack size and color composition: 4 gray

Wolves killed by state trappers: 9 gray

Wolves killed by private trappers and hunters: 2 gray

Total harvest: 11 gray

CLEAR-SALCHAKET PACK

A large group of wolves occupied the Clear Creek/Salchaket Slough area in autumn 1993. The pack ranged south to Blair Lakes, east to the Tanana River, and west to Willow Creek. Several sightings of a large number of wolves (about 12–20) in the Clear Creek area and of a smaller groups (about 5–7) in the Salchaket area indicated there may be 2 separate packs. However the apparent range of the larger pack appeared to encompass the unrealistically small range of the smaller group. The smaller group was consistently seen in an area of concentrated wintering moose, while the larger group was seen throughout its larger range. For the purposes of the population estimate, these 2 groups were combined into a single pack.

The entire range of this large group of wolves lay within the boundaries of a military reservation. The prescription for the wolf control program specifically excluded military lands from wolf control operations by the state, but the military lands were open to trapping by private trappers.

APPENDIX A Continued

Autumn pack size of the group of 17 wolves was based on the sighting of 3 black and 2 gray wolves in the Salchaket group on 7 November, and the observation of a track of 12–14 wolves north of Blair Lakes on the same day. On 23 November 1 black and 2 grays were seen in the Salchaket group and 6 black and 5 grays in the Clear Creek group, by 2 separate aircraft at approximately the same time. On 21 November, 6 blacks and 6 grays had been seen in the Clear Creek group near the mouth of Salchaket Slough. Assuming the 2 groups were separate at that time of these sightings, the autumn group size was 17; 9 blacks and 8 grays. Military helicopter pilots reported seeing a pack of approximately 20 wolves (mixed blacks and grays) in the Willow Creek area prior to our sightings. This indicates the pack had split into 2 smaller groups, 1 occupying the northern portion of its range and the second Clear Creek group moving over the entire range. However, at times the group may have traveled as a single pack, as suggested by a sighting of 14 wolves by a local pilot on the Tanana River near the town of North Pole in late January. This was after 2 wolves had been harvested from the Salchaket group.

In March, observations of a track of 2 wolves was seen twice in the Salchaket area, and a group of 5 was tracked on 3 different days within the range of the Clear Creek group. On 21 March, 3 blacks and 2 grays were tracked east of Clear Creek Butte on the same day a fresh track of the pair was found on the Tanana River near Salchaket Island. The discrepancy between autumn pack size minus harvest and spring pack size could easily have been the result of dispersal and spring breeding activity during March. It is probable that a pack of 17 wolves would contain several subordinate wolves of breeding age.

Five wolves were harvested from this pack by private trappers on military lands.

Autumn pack size and color composition: 17 (9 black and 8 gray)

Spring pack size and color composition: 7 (4 black and 3 gray)

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 5 (2 black and 3 gray)

Total harvest: 5 (2 black and 3 gray)

WHISKEY PACK

A small group of wolves was repeatedly sighted near Whiskey Island on the Tanana River in the northern portion of Unit 20A. It is likely this pack ranged north across the river into Unit 20B. Evidence of this pack was first recorded with the sighting of 1 black and 2 grays near the mouth of the Wood River on 17 November. Private trappers snared 2 wolves west of whiskey Island on 7 January. One of the trappers saw 2 additional wolves (a black and a gray) near his trap site. Tracks of 2–3 wolves were also observed near the mouth of the Wood River on 1 February and 26 February.

The sightings of this pack were confined to the area along the Tanana River between Whiskey Island and Wood River, a distance of about 8 miles. Territories of the Wood River pack, the Crooked Creek pack, and the Lower Tatlanika pack also converged in this area. Therefore it seems unlikely that the Whiskey group ranged very far south into Unit 20A, but probably

APPENDIX A Continued

occupied an area to the north of the Tanana River in Unit 20B. A wintering concentration of moose existed along the Tanana between Whiskey Island and the mouth of the Wood River and could have resulted in frequent visits by the Whiskey pack to the area between Whiskey Island and the mouth of the Wood River.

Autumn pack size and color composition: 4 (1 black, 2 gray, and 1 unknown)

Spring pack size and color composition: 2 (1 black and 1 unknown color)

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 2 gray

Total harvest: 2 gray

CROOKED CREEK PACK

The Crooked Creek pack ranged along the Tanana River between Willow Creek and the Wood River south to near Wood River Buttes. This pack was similar in size and color composition to the adjacent Clear Creek pack. A pack of 8 wolves (4 black and 4 gray) were first sighted on 20 November near Willow Creek, the following day the Clear Creek pack (6 black and 6 gray) was sighted at the mouth of Salchaket Slough approximately 10 miles to the north. Tracks from those packs indicated they were separate groups of wolves. On both 9 December and 12 December fresh tracks of 6–8 wolves were observed near Crooked Creek, 36 miles east of a 10 December sighting of the Clear Creek pack of 5 grays and 5 blacks on the Tanana River near Eielson Air Force Base. Those sightings again supported the existence of a separate Crooked Creek pack, although the pack size and color composition were similar between the Crooked Creek and Clear Creek packs. On 28 December, 24 January, and 7 February tracks of 6–8 wolves were sighted in the Crooked Creek drainage.

Harvest from the Crooked Creek pack was entirely by private trappers. A gray male was snared in December, a gray yearling was harvested in late January, and 2 black pups and a gray yearling were taken in February. A gray 2-year-old male was found dead by a trapper near the mouth of Crooked Creek in early January, apparently killed by other wolves. It was unknown whether that wolf was from the Crooked Creek pack or was a wolf trespassing into the Crooked Creek territory. Tracks of the Crooked Creek pack crossed the Tanana River to the north and their territory probably ranged into Unit 20B.

Fresh tracks of the Crooked Creek pack were observed on 3 days during March in the area between Willow Creek and Crooked Creek. In each case, observers estimated only 3–4 wolves in the pack. This pack size was consistent with the February harvest by private trappers. None of the wolves taken by private trappers were breeding adults, suggesting the alpha pair survived.

Autumn pack size and color composition: 8 (4 black and 4 gray)

Spring pack size and color composition: 3 (2 black and 1 gray)

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 5 (3 gray and 2 black)

Total harvest: 5 (3 gray and 2 black)

APPENDIX A Continued

BLAIR LAKES PACK

On 7 November a track of 6-7 wolves was observed south of Blair Lakes hills and a track of 12-14 approximately 5 miles to the north of Blair Lakes hills. These 2 tracks indicated the Blair and Clear Creek packs existed as separate packs sharing a common territory boundary near Blair Lakes. A track of 6 with a sighting of 1 black and 2 grays was the first sighting of the Blair Lakes pack on 23 November. On the same day, the Clear Creek pack of 6 blacks and 5 grays was seen near Clear Creek Butte. This concurrent sighting of both provides clear evidence of their separate identities. In late January we sighted a track of an estimated 10 wolves 5 miles south of Blair Lakes, then on 15 February we saw 3 blacks and 5 grays south of Blair Lakes on Dry Creek.

The range of the Blair Lakes pack probably included the Blair Lakes hills and lands to the east. The Clear Creek pack ventured to within a few miles of Blair Lakes to the north, and the Spirk pack occupied the Dry Creek Flats south of Blair Lakes. Military Restricted area R-2211, lays immediately east of Blair Lakes and it is likely the Blair pack ranged within that area, but overflights of the restricted area were generally prohibited by the military and we were unable to conduct wolf track surveys within the restricted area following a fresh snowfall.

Prior to the 15 February sighting, a private trapper had taken 1 black and 1 gray near Elbow Lake in late January. Therefore autumn pack size was a minimum of 10 wolves; 4 black and 6 gray. A second trapper took 1 black and 1 gray on 13 March south of Blair Lakes, and state trappers killed 1 black pup south of Blair Lakes on 30 March. Subtracting known harvest from the 15 February sighting resulted in a spring pack size estimate of 5 wolves; 1 black and 4 gray.

Autumn pack size and color composition: 10 (4 black and 6 gray)

Spring pack size and color composition: 5 (1 black and 4 gray)

Wolves killed by state trappers: 1 black

Wolves killed by private trappers and hunters: 4 (2 black and 2 gray)

Total harvest: 5 (3 black and 2 gray)

SPIRK PACK

This pack of 12 gray wolves occupied the flats portion of the Dry Creek drainage south of Blair Lakes and north of Iowa Ridge between Delta Creek and Dry Creek. The pack was named after VABM Spirk which was near the center of their range. The first track of this pack was seen on 4 November and extended along Dry Creek from near Blair Lakes south to the foothills of the Alaska Range. Eleven grays were sighted on the same day near the midpoint of this track by a separate aircraft. The wolves were near a fresh moose kill which was set by state trappers and 4 gray wolves were killed at this site on 12 November. When the 4 wolves were captured, a fifth wolf escaped in the presence of state trappers, by breaking the snare cable below the snare lock. A wolf with this type of snare around its neck was taken by a private trapper in December on the Tanana River downstream from the mouth of the Little Delta River. We believe this wolf to be from the Spirk pack. On 17 November we followed a

APPENDIX A Continued

track from the Tanana Flats near Dry Creek into the foothills north of Iowa Ridge and saw 8 grays moving south into the foothills. Three gray wolves were taken a few miles northwest of this sighting on 21 November.

Subsequent harvest and sightings of this pack indicated that only a pair remained in March. State trappers took 9 wolves from this pack and a private trapper took 1 gray. The last evidence of the Spirk pack was seen on 9 March when a pair entered a trap site near the center of the pack's range, 1 wolf was caught in a snare but escaped by pulling out of the snare loop. Harvest from this pack included 2 adult females that had been previously reproductively active. No adult males were taken and it appeared the alpha male survived.

Autumn pack size and color composition: 12 gray

Spring pack size and color composition: 2 gray

Wolves killed by state trappers: 9 gray

Wolves killed by private trappers and hunters: 1 gray

Total harvest: 10 gray

NEWMAN CREEK PACK

The Newman Creek pack numbered 6 gray wolves in early November. They occupied a range that included the drainage of the West Fork of the Little Delta River, and the mountainous portion of the Dry Creek drainage. Their territory appeared to be centered around Newman Creek. A track of 6 was first sighted on 8 November traveling from the West Fork over the divide into Newman Creek and on 27 November a fresh track of 6 was followed to near the headwaters of Dry Creek where the track was lost in fog. The only 2 sightings of the pack occurred on 21 December when 1 gray was seen associated with a track of an estimated 6 wolves extending west from a trap site located on the Little Delta River, and on 15 February when 4 wolves were tracked from the upper west fork to a fresh kill north of Iowa Ridge. A track of 4 wolves was seen on 7 February that led from upper Snow Mountain Gulch into Slide Creek, an area where we had found 3 kills attributed to the Newman Creek pack. Moose and caribou kills made by this pack were located in the upper west fork near McIntyre Creek, on the north slope of Iowa Ridge, near Newman Creek, and in the Slide Creek drainage west of Dry Creek.

State trappers killed 2 wolves at the Little Delta River trap site on 14 December that were believed to be from the Newman Creek pack. The original pack size of 6 was reduced to 4 by late December and remained at 4 at least until mid February. The last evidence of the Newman Creek pack was seen during the breeding season on 9 March when a pair of tracks were seen at the moose kill made by the pack on 15 February. No harvest was reported from within the range of this pack by private trappers. A previously reproductively active female and a pup were taken from this pack. Therefore, it is likely the alpha female was killed and the alpha male survived.

Autumn pack size and color composition: 6 gray

Spring pack size and color composition: 4 gray

Wolves killed by state trappers: 2 gray

APPENDIX A Continued

Wolves killed by private trappers and hunters: 0
Total harvest: 2 gray

EAST FORK PACK

The East Fork pack originally numbered 7 gray wolves and occupied an area of the mountains and foothills centered around the East Fork of the Little Delta River between the West Fork of the Little Delta and Delta Creek. Initial sighting of 7 tracks on 4 November in the Upper East Fork was followed by a sighting of 3 grays on 8 November in the same area. Two wolves believed to be from the East Fork pack were caught in snares near Buchanan Creek about 20 November and were entirely consumed by other wolves. We believe the wolves were eaten by the Iowa Ridge pack, a pack of 18 grays that occupied a territory west of Buchanan Creek. We saw the remaining 5 grays of the East Fork pack on 26 November traveling east toward Delta Creek. A track of 5 was followed on Delta Creek on 30 November that turned west on the north side of the foothills back toward the East Fork. Five grays were seen on Buchanan Creek on 14 December and a track of 5 was followed from Buchanan Creek to the upper East Fork on 15 February. The pack remained at 5 at least until early March when their track was followed to the trap site near Buchanan Creek. A single pup was caught at that site on 9 March.

The last evidence of the pack was on 18 March when a track of 3+ wolves was followed to a recent kill on upper Buchanan Creek. State trappers killed 3 wolves from this pack. The sex and age of the wolves eaten by other wolves was unknown, the other captured wolf was a pup. No harvest by private trappers was reported from this area. The fate of the breeding pair was unknown.

Autumn pack size and color composition: 7 gray
Spring pack size and color composition: 4 gray
Wolves killed by state trappers: 3 gray
Wolves killed by private trappers and hunters: 0
Total harvest: 3 gray

IOWA RIDGE PACK

The Iowa Ridge pack of 18 grays occupied a territory that surrounded Iowa Ridge and included portions of the Dry Creek drainage and both east and west fork drainages of the Little Delta River. The apparent territory was small compared to those of other packs and 4 other wolf packs were identified that overlapped the range of the Iowa Ridge pack. However, in winter 1993, the center of the Iowa Ridge territory contained high numbers of wintering caribou and moose and it seems likely that the apparent restricted movements of the Iowa Ridge pack and the encroachment of neighboring packs reflected the concentration of prey within the center of this pack's range. In addition, the Iowa Ridge pack was reduced from 18 wolves to a pair of wolves by the end of December; therefore, we had little opportunity to observe movements of the pack that represented their entire range, and neighboring packs could easily trespass once the Iowa Ridge pack was reduced in both number and social structure.

APPENDIX A Continued

The pack of 18 grays was first seen on 7 November on Iowa Ridge. On 27 November, a track of an estimated 8 wolves was seen leaving a trap site where 7 wolves from the pack were caught in snares. The pack moved south to another trap site made near a moose killed by this pack and 3 more wolves were caught. The pack made a moose kill on 13 December near the west fork of the Little Delta River and state trappers stalked and shot the alpha male. Between 13 December and 31 December, 5 more wolves were caught by state trappers near the center of the pack's range. In February a yearling male was caught on a trap set near a kill the pack had made earlier in the fall. This represented the last evidence of the Iowa Pack, and harvest accounted for 17 of the estimated 18 animals in the pack. Three previously reproductively active females were taken from this pack. Their estimated ages were 6, 7, and 8 years. Only 1 male older than age 1 year was taken from the pack, he was 5 years old.

Autumn pack size and color composition: 18 gray

Spring pack size and color composition: 1 gray

Wolves killed by state trappers: 17 gray

Wolves killed by private trappers and hunters: 0

Total harvest: 17 gray

RAINBOW LAKE PACK

The existence of the Rainbow pack is based on the harvest of 9 wolves by 4 different private trappers in the Rainbow Lakes area, and on the 13 March observation of a track of about 8 wolves that traveled 10 miles along the Tanana River near Rainbow Lake. All the harvest was taken by private trappers before the 13 March track sighting.

The home range of this pack crossed the boundary of military restricted area R-2202. State wolf control was not applied to that area and survey efforts were limited by the restricted airspace and land status. Of the 9 harvested wolves, 5 were black and 3 were gray. The harvest was reported from the Delta River, lower 100-Mile creek, and lower Delta Creek indicating that some of those wolves could have been members of the 100-mile pack whose range encompassed the upper portions of 100-Mile Creek. However, observations and harvest from the 100-Mile pack during winters 1993 and 1994 never included any black wolves, and in October 1994 we saw a pack of 11 mixed blacks and grays along lower 100-Mile Creek on the same day we saw the 100-Mile pack of 12 grays on upper 100-Mile Creek. Therefore, we believed most of the harvest came from the Rainbow Lakes pack. The age composition of the harvest from this pack was unknown.

Autumn pack size and color composition: 17 wolves (mixed black and gray)

Spring pack size and color composition: 8 wolves

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 9 (5 black and 4 gray)

Total harvest: 9 (5 black and 4 gray)

APPENDIX A Continued

100-MILE PACK

Tracks of the 100-Mile pack were seen in the upper portions of the 100-Mile drainage beginning in January. A single gray wolf was shot from a pair at a moose kill by state trappers 17 February, and a track of 7 wolves was followed for several miles from the same area on 18 March. Private trappers reported taking 2 gray wolves within the apparent range of the 100-Mile pack during February and 1 gray in March. The trapper who trapped the wolves in February estimated that 7 wolves remained in the pack. In early April tracks of 3 wolves were observed at a trap site on upper 100-Mile creek. The state killed wolf was an adult female that had not been previously reproductively active. Age of the other harvested wolves was unknown.

Using the chronology of harvest and track sightings we estimated that the preharvest pack consisted of about 9 wolves, 3 were taken in February and 1 in March, leaving a spring pack size estimate of 5 wolves. The fate of the alpha pair was unknown.

Autumn pack size and color composition: 9 gray

Spring pack size and color composition: 5 gray

Wolves killed by state trappers: 1 gray

Wolves killed by private trappers and hunters: 3 gray

Total harvest: 4 gray

PTARMIGAN PACK

A small pack of wolves apparently occupied the Ptarmigan Creek/Delta Creek area within military restricted area R-2205 during winter 1993. A pair of tracks were observed in this area on 13 March, and 3 tracks were observed at an old kill site on 18 March. No harvest by either state or private trappers was reported from this pack.

Autumn pack size and color composition: 3

Spring pack size and color composition: 3

Wolves killed by state trappers: 0

Wolves killed by private trappers and hunters: 0

Total harvest: 3

COAL CREEK PACK

Tracks of the Coal Creek pack were first seen near St. George Creek in mid October. Subsequent track sightings indicated the pack ranged along the Wood River from the Tanana Flats south to Mystic Creek and west to St. George Creek. We believe the pack numbered approximately 7 wolves (4 blacks and 3 grays) in October. All were killed by late March. The alpha female was killed by state trappers on Coal Creek in late October, a female pup was taken on the Tanana Flats near the Wood River by a private trapper in December, 2 pups and 2 yearlings were taken in mid February at the site where the alpha female had been snared, and the alpha male was killed by a private trapper on Bonnifield Creek in mid March.

APPENDIX A Continued

Three other wolves were taken within the suspected home range of this pack during the spring. Two males (a yearling and a 3-year old) appeared to be single animals when caught and were thought to be dispersing animals, not associated with the original Coal Creek pack. A 2-year-old female was caught in the same set with the 7-year-old alpha male in mid March by a private trapper. He reported that tracks of only 2 wolves were present at the trap site which was at the northern edge of the pack's presumed range. It seems likely that they had paired after the remainder of the Coal Creek pack had been killed in mid February and we assumed the 2-year-old female was not a part of the original pack. Therefore it appears that all members of this pack were killed by late March.

Autumn pack size and color composition: 7 (4 black and 3 gray)

Spring pack size and color composition: 0

Wolves killed by state trappers: 5 (4 black and 1 gray)

Wolves killed by private trappers and hunters: 2 gray

Total harvest: 7 (4 black and 3 gray)

MYSTIC PACK

A small pack of 4 wolves appeared to be sandwiched between the Coal Creek pack and the Newman Creek pack along the Wood River drainage of the mountains and foothills. Sightings of this pack were confined to the area along the Wood River between the Japan Hills and Mystic Creek. The Coal Creek pack was thought to use this same area, but the Mystic pack may have ranged further south along the Wood River and into the Mountains on either side of the Wood. The only known pack south of the Mystic pack along the Wood was the Cody pack whose home range appeared to start about 10 miles south of Mystic Creek.

We originally sighted tracks of an estimated 3 wolves and saw 1 black in late October. On 2 occasions (Jan and Mar) we sighted 1 black and 2 grays near Mystic creek. The pack was identifiable because 1 of the grays had only 3 feet. State trappers had snared a wolf by the foot on the Wood River in late November. The wolf chewed off the foot to escape the snare. That 3-legged wolf was seen clearly during the March sighting.

The only suspected harvest from this pack was a yearling gray female taken by state trappers in early March. Therefore, the alpha pair probably survived. It is possible that this pack was a part of the Coal Creek pack that spent time separated from the main pack, but near the center of the Coal Creek pack's range.

Autumn pack size and color composition: 4 (1 black and 3 gray)

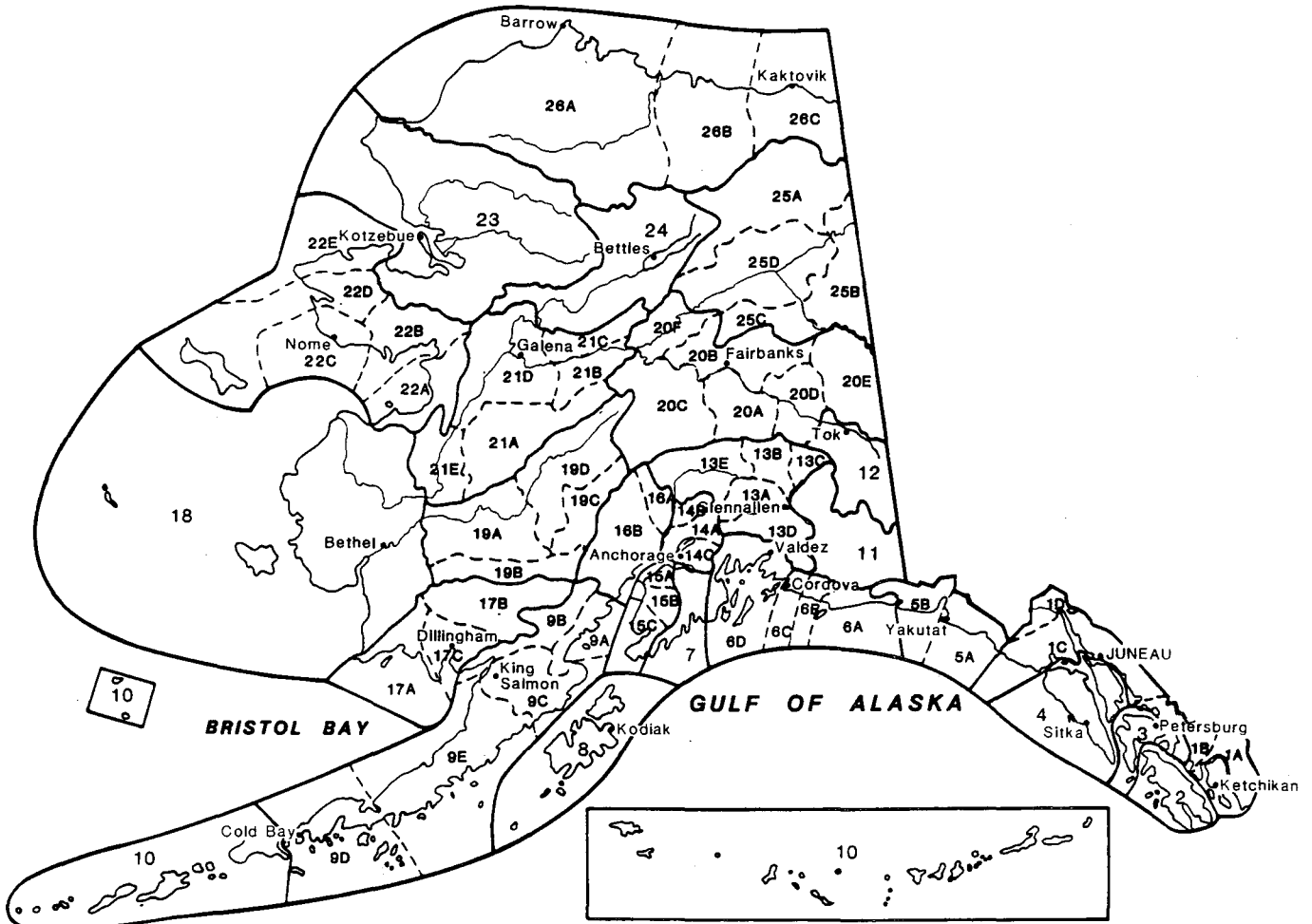
Spring pack size and color composition: 3 (1 black and 2 gray)

Wolves killed by state trappers: 1 gray

Wolves killed by private trappers and hunters: 0

Total harvest: 1 gray

Alaska's Game Management Units



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 allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.



Whitten