Alaska Department of Fish and Game
Division of Wildlife Conservation
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Investigation of Wolf Population Response to Intensive Trapping in the Presence of High Ungulate Biomass

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Research Final Performance Report
1 July 1997 – 30 June 2002
Federal Aid in Wildlife Restoration
Grant W-27-1 to 5, Project 14.17

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FEDERAL AID
FINAL RESEARCH REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
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PROJECT TITLE: Investigation of wolf population response to intensive trapping in the presence of high ungulate biomass

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FEDERAL AID GRANT PROGRAM: Wildlife Restoration

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

PROJECT NR.: 14.17

WORK LOCATION: Unit 20A

STATE: Alaska

PERIOD: 1 July 1997–30 June 2002

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Public controversy has accompanied wolf management in Alaska since before statehood. The controversy focused on periodic government wolf control programs that reduced wolf numbers in specific areas. Recently, the controversy has included arguments against wolf harvests by private hunters and trappers, even as wolf populations increased in the presence of statewide hunting and trapping. Those arguments are based upon the perception that harvest of wolves has a permanent, deleterious effect on wolf social structure and population viability. Proponents of wolf control often cite studies showing reduced wolf numbers result in increased ungulate populations and increased harvest of ungulates by humans. Many people on both sides of the argument believe public trapping is an effective method to reduce or regulate wolf numbers.

The effects of intensive wolf harvest are most often described by the response of their ungulate prey. In those instances where intensive wolf harvest has been studied relative to the effect on wolf populations, wolves were killed by aerial shooting, or by a combination of poisoning, shooting, and trapping. Although it is well documented that wolves are numerically resilient to trapping harvests, the specific effects of trapping on wolf population structure, and the permanence of those effects, have not been studied. Yet trapping has been, and will continue, as the most common method for harvesting wolves in Alaska.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS

High wolf numbers that existed in Unit 20A in the early 1950s were reduced by poisoning and aerial shooting to a density of approximately 4 wolves/1000 km^2 between 1954 and 1960. Moose numbers increased to extremely high densities (≥1300 moose/1000 km^2) by the mid-1960s, then crashed to a low density (165 moose/1000 km^2) by 1975. Following cessation of wolf control in 1960 wolves increased and attained densities of approximately 16 wolves/1000 km^2 by 1970. Beginning in 1976, wolves were again reduced by aerial shooting as part of a government wolf control program to a late winter 1979 density of 3 wolves/1000 km^2. Moose and caribou increased in response to the wolf control program and after cessation of wolf control in 1982 wolves increased to a density of 16 wolves/1000 km^2 by autumn 1991. Wolves were reduced during a third government wolf control program during the winter 1993–1994 to an estimated density of 6.5 wolves/1000 km^2 by April 1994. An additional 66 wolves removed during winter 1994–1995 did not further reduce, but held the wolf population stable at a late winter density of 6–7 wolves per 1000 km^2. This latest control program was conducted almost entirely using snares and traps deployed by both government and private trappers. Although some wolves were shot from the ground, aerial shooting and poisoning were prohibited.

Harvests of 15–40% have stabilized exploited wolf populations (Gasaway et al. 1983; Ballard et al. 1987; Fuller 1989), but the mechanisms by which unexploited or lightly exploited populations are regulated are not well established. Packard and Mech (1980) reviewed the concept of "intrinsic limitation" and found it inadequate to explain wolf population regulation in many cases. Although intrinsic limitation appears to have operated in some cases (Mech 1966; Pimlot 1967, cited by Packard and Mech 1980), in other cases wolf populations reached densities higher than what was perceived as the universal "saturation density" (Van Ballenberghe et al. 1975). While social factors probably "buffer" changes in wolf population response to changes in prey populations (Packard et al. 1983) nutrition probably has the greatest ultimate influence in population regulation. 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 undoubtedly contribute to difficulties in deciphering the influence of intrinsic social mechanisms.

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 occurs at a high density of approximately 675 moose/1000 km^2. After wolf control ended caribou numbers and sheep numbers stabilized, and based on 1995 and 1996 survival of juveniles, moose and sheep populations are probably increasing (Valkenburg and Keech 2002; K Whitten, personal communication).

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

OBJECTIVE 1: Document the effects of intensive trapping on wolf pack structure and viability based on a) breeding characteristics and productivity, b) ages and rates of dispersal, c) causes and rates of natural mortality, and d) spatial distribution of individuals and packs.

Dispersal and survival data were obtained from 33 wolves between ages 5 and 11 months that were radiocollared between March 1995 and February 1999. At least 58% of those wolves died before 36 months of age. Six radiocollared pups dispersed from the study area and contact was lost before their fate was determined, therefore mortality may have been higher. Eighty-eight percent of the mortality among wolves collared as pups was attributable to hunting and trapping, 12% of the mortality was from natural causes. Twenty-one of the 33 collared pups dispersed from their natal packs during the study; 74% of those dispersed between 12 and 24 months of age. Among 75 wolves estimated to be 12 months or older when radiocollared, 53 (71%) died during the study. Hunting and trapping accounted for 74% of that mortality, other wolves killed 10 of the 14 remaining wolves that succumbed during the study, 2 wolves starved, 1 died in an avalanche and 1 died of unknown natural causes. Only 13 (17%) wolves that were collared at age 2 years or older survived at the end of the study. Among collared wolves of all sex and ages a minimum of 58% were killed by humans, 16% died of natural causes, and 13% survived at the end of the study. Fate of the remaining 13% was unknown because radio contact was lost.

Annual minimum convex polygon home range sizes varied from 191–1805 km^2 and averaged 742 km^2 for 33 pack ranges defined by 30 or more annual locations.

OBJECTIVE 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.

Autumn densities of wolves within the study area ranged from 10.3–15.9 wolves per 1000 km^2. Despite annual harvests of 22–25%, the wolf population within the study area increased at annual finite growth rates of 1.065 between 1995 and 1998. The 1998 autumn density of 14.7 wolves per 1000 km^2 declined to 10.3 wolves per 1000 km^2 in autumn 1999 following a 35% harvest during winter 1998–1999. Based on regressions of ungulate biomass versus wolf density from study areas throughout North America (Messier 1995), the ungulate prey base in Unit 20A could support a wolf density of more than 20 wolves/1000 km^2, therefore it appeared that intensive trapping alone regulated the population below the level it would have reached in the absence of harvest. Natural mortality among this highly exploited population was low suggesting that harvest by hunters and trappers is to some degree compensatory, but because the population stabilized below its precontrol high some of the harvest was also additive and limited population growth. Harvest frequently disrupted social organization of packs and caused some packs to break apart before all members of the pack were killed. However new pack formation was rapid and radiocollared wolves that were displaced by harvest-caused dissolution of packs quickly joined new packs or found a mate and colonized a vacant territory.

IV. MANAGEMENT IMPLICATIONS

Intensive harvest of wolves in areas with high ungulate biomass can limit wolf population growth, but even under harvests that in other studies proved to be regulating, wolves may increase. The composition of the harvest in terms of the proportion of dominant versus subordinate animals in the harvest may be more of an indicator of the limiting effect of harvest than harvest numbers alone. Harvest limited wolf populations in the presence of high ungulate biomass will likely suffer from lower natural mortality rates than nonexploited wolf populations. Managers should not expect reductions in predation on prey species proportional to reductions in wolf numbers because harvest appears to be at least partially compensatory and because per capita consumption of prey is inversely related to pack size.

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

JOB 13: Analyze data and prepare figures and text for publication and oral presentations of the data.

Efforts during the last segment period focused on compilation and analysis of the following data sets: a) population estimates for all packs within the study area between 1993 and 1999, b) compiling and analyzing harvest data for years 1993–1999, c) home range maps for all packs, d) compiling necropsy data from 1993 through 1999, and e) compiling data from ultrasound scans that were conducted from 1996 through 1999.

The estimated wolf population within the 11,600-km^2 study area declined from 185 wolves in autumn 1993 to 136 wolves in autumn 1994 as a result of intensive trapping conducted during a Alaska Department of Fish and Game wolf control program. Wolf numbers increased to 171 wolves by autumn 1998, but harvest by private hunters and trappers reduced the population to 120 wolves by autumn 1999. Exploitation rates by private trappers varied between 22–35% of the annual fall populations between 1995 and 1999. During 1995 the population declined when the exploitation rate was 25%, but between 1999 and 2000 the population increased by 21% despite a harvest of 30%. Sex and age composition of the harvest, in addition to exploitation rate, appeared to be important in determining annual population growth rates.

Pregnancy rates determined from postmortem examination of harvested female wolves older than 2 years of age were 60% (n = 55), among wolves harvested between October 1993 and June 1999. Pregnancy rate determined by ultrasound was 72% among 68 live captured female wolves older than 2 years of age. Pregnancy rates were 47% (n = 32) and 94% (n = 36) among subordinate and dominate females, respectively. Pups from multiple litters survived in at least 3 different packs between May 1995 and May 1999. The largest observed litter was 16 pups that were seen in 3 different groups within the same pack during August 1995.

JOB 14: Write annual progress reports summarizing cumulative data and write final report at the end of the study period.

This report represents the final Federal Aid reporting requirement. Additional publications from this study are being prepared. A final research report that contains compiled data and thorough discussion of results is on track for publication by the Alaska Department Fish and Game in early winter 2003.

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

No additional federal aid-funded work was completed on this project.

VII. PUBLICATIONS

None.

VIII. RESEARCH EVALUATION AND RECOMMENDATIONS

None.

IX. PROJECT COSTS FROM LAST SEGMENT PERIOD ONLY

FEDERAL AID SHARE $10,818.17 + STATE SHARE $3,626.05 = TOTAL $14,504.22

X. Appendix

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