

ENVIRONMENTAL ASSESSMENT

A Proposed Study of Wolf-Moose Relationships

In the Upper Susitna River Basin

Prepared By: Game Division, Alaska Department of Fish and Game

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APPENDIX

1. Summary of Moose Composition Count Data
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I. Description of Proposed Action and Alternatives

- A. Background Data. Moose populations in Alaska's Game Management Unit 13 have declined steadily since the early 1960's (A summary sheet of annual moose composition count data is attached as Appendix 1). Reasons commonly cited for this decline are severe winters, predation, and hunting.

Mortality attributable to hunting is not considered significant in the Unit 13 decline. Bulls have made up 90 percent of all moose taken in Unit 13 since 1969, and hunting during the last four years has been for bulls only. Bulls-only seasons can cause a long-term reduction in moose numbers only if there are too few bulls remaining to breed the cows. Of 59 adult cows examined by Department scientists in an area of Unit 13 in March, 1975, 51--86 percent--were bearing calves, a pregnancy rate comparable to that in protected moose populations with an abundance of bulls.

Winter is acknowledged as the most critical period for sub-Arctic moose populations under normal conditions. Deficiencies in forage quality and quantity are most likely to be apparent because of greater energy demands, and over-winter survival of moose--particularly calves--generally bears a direct relationship to the overall status of a moose herd. Predation intensity also seems to increase in winter, particularly when deep snow limits the ungulates' ability to avoid predators. Range forage deficiencies that result in weakened animals probably contributes to a higher predation rate as well.

In Unit 13, however, the annual rate of gain of moose populations currently appears to be most heavily impacted during the summer months rather than winter. Concomitant with the long-term decline in moose density, the number of calves in relation to the number of cows observed during the Department's November moose surveys has also declined (see Appendix 1). Composition counts in November, 1975, continued the long-term trend with a record low of about 15 calves for every 100 cows. Winter losses assume doubtful significance since a low percentage of moose calves are surviving through the summer.

The current age structure of cow moose in Unit 13 corroborates the long-term trend of poor calf survival. The average age of adult cows in Unit 13 is slightly more than 9 years, an old age for a moose. Of 133 cows captured during Department of Fish and Game moose tagging work over the last two years (1974 and 1975), only 23 were five years old or less. Almost 50 percent--62 cows--were ten years old or more. Such an age structure is about what would be expected without hunting (for cows) and if few young cows were being added to the population each year.

Moose calves are probably most vulnerable to predation during their first few weeks of life. The Department's research and the studies of biologists in other states and countries have repeatedly confirmed that wolves kill calves at a rate considerably higher than would be expected on the basis of chance encounters. Since calves are tiny in relation to adult moose, many more must be taken for the predators to receive an equivalent amount of food. When moose populations are at low densities, currently the case in Unit 13, biologists suspect that wolf predation on calves during the summer may be a significant limiting factor.

- B. Proposed Action. It is proposed to conduct a study of predator-prey relations involving wolves and moose in a portion of Alaska Game Management Unit 13. The study calls for the removal of wolves in a 3,200 square mile study area by mid-March, 1976, and the maintenance of a minimal wolf population in this area until July 1, 1978. The study area includes the upper Susitna River basin and is bounded as follows: the MacLaren River on the east; the Alaska Range on the north; the upper Nenana River, Brushkana Creek, Deadman Creek, and Watana Creek on the west; and the Susitna River to its junction with the MacLaren River on the south.

Wolves in the upper Susitna study area will be reduced to 10 percent or less of the initial wolf density. A minimum of 36 wolves occupied the study area as of December, 1975. An additional 13 wolves (known) occurred on peripheral portions and occasionally entered the study area. An estimated total of 400 wolves occupy the entire 22,000 square miles of Unit 13.

The project will consist of removing wolves from the study area by Department of Fish and Game employees using helicopters. Wolf carcasses will be collected when possible for studies on sex, age, and reproductive status of the packs. Stomach contents will be analyzed for food habits, and physiological condition of the animals will be assessed on the basis of hair mineral content, blood constituents, and carcass fat.

Moose populations will be monitored via aerial composition counts conducted in November of each year. Moose calf survival from birth until November in the experimental area will be compared to calf survival in adjacent populations where wolf numbers were not manipulated.

Radio-collared wolves in the region adjacent to the reduction area will be monitored until the radio batteries expire. Radios from animals killed in the study area will be placed on live wolves outside the area if possible.

- C. Purpose of the Action. The purpose of the proposed action is to quantitatively assess the impact of wolf predation upon summer survival of moose calves in a 3,200 square mile study area in Game Management Unit 13.
- D. Action Components. The proposed action will consist of the following components:
1. Collection of wolves in the study area during the winters of 1975-76, 1976-77, and 1977-78.
 2. Survey and inventory of moose populations and reproductive performance during each summer and fall of the proposed action.
 3. Survey and inventory of summer moose calf survival in the area of the proposed action and in adjacent areas not impacted by the proposed action.
 4. A continuation of the monitoring of radio-collared wolves outside the impacted study area year round until termination of the action.
- E. Alternatives to Proposed Action.
1. No Action. A factual data base is essential for the rational management of wildlife. This is especially true for wolves and other predators because of potential or perceived conflicts arising with humans for the use and consumption of a resource. Wildlife managers should have objective decision-making powers for the disposition of such conflicts, and such objectivity can be gained only via intensive research efforts. No action would mean wolves would continue to be managed in Alaska on the basis of an inadequate data base.
 2. Alternative Location. No significant mitigating or enhancing measures are anticipated by the selection of an alternative location.
 3. Alternative Methods. The only alternative method is live-capturing and transplanting wolves. Besides being cost-prohibitive, there is no known feasible site to which the animals could be transplanted. Transplanting would also result in sacrificing data expected to be gained in the collection of biological specimens.

II. Description of Existing Environment

A. Non-Living Components

1. Land. The Upper Susitna Basin is characterized by extremes in topography, varying from the level or gently undulating

terrain of Monahan Flats through rolling foothills to the rugged mountains of the Alaska Range. Elevation varies from about 600 meters at the bottom of gorges in the southern portion of the area to mountains exceeding 1800 meters.

The area has a geologic structure comprised of igneous, sedimentary, and metamorphic rock bases. Igneous intrusions are of both Quaternary and Tertiary volcanic rock and Tertiary and Mesozoic intrusive rocks which are mainly granitic but include small ultramafic and mafic bodies. Some Paleozoic and Precambrian metamorphic areas occur. The remainder of the area is primarily Mesozoic in origin, comprised of sandstone and shale.

Although only a small percentage of the State has received detailed geologic study, impressions are that about 25 percent of the bedrock is covered by unconsolidated deposits of gravel and silt; this is particularly true for the northern half of the study area.

The soils in the area of the proposed action are impacted by permafrost, although the permafrost is generally discontinuous in nature.

2. Water. Several major rivers occur in the study area: the headwaters and upper reaches of the Susitna River, the headwaters and upper reaches of the MacLaren River, and the headwaters and upper reaches of the Nenana River. These rivers are glacial in origin and carry large amounts of glacial silt for a majority of the year. The rivers flow wide and rapid, are commonly braided and shallow in places, and provide only a minimal barrier to the larger animal species inhabiting the area. The rivers freeze in winter and are then used as travel lanes by terrestrial wildlife.

Dozens of spring rivelets and intermittent streams occur in the study area. These eventually drain into one of the three large rivers. The MacLaren River joins the Susitna and eventually flows to Cook Inlet. The Nenana River turns west, then north, to flow into the Yukon River.

Both glacial and spring water lakes and ponds dot the area. The lower study area contains ephemeral and persistent bogs.

B. Living Components

1. Flora. Plant communities within the area are varied and reflect past fire history, permafrost conditions, and elevation. Most of this area is categorized as moist alpine tundra and is dominated by alder-willow thickets consisting of American

green alder, thinleaf alder, resin birch and several willow species. The understory vegetation consists of low mat herbaceous and shrubby plants such as blueberry, spirea, crowberry, labrador tea, mountain cranberry and numerous lichen species typically associated with alpine tundra communities. Lowland areas along the Upper Susitna River, Watana Creek, Jay Creek, and parts of the MacLaren River are dominated almost exclusively by stands of black spruce. Riparian willow and lowland alder are common along the gravel bars and river banks.

2. Fauna. Moose and caribou are the dominant ungulates in this region. Although the moose population has declined steadily over the past few years, there are some indications that the caribou herd is slowly increasing. Over 1400 moose were counted by Alaska Department of Fish and Game biologists in the fall of 1975 within the boundaries of the experimental area. The population estimate for the Nelchina caribou herd in the summer of 1975 was slightly above 10,000 animals. Because of seasonal migration patterns and variations in annual movements, however, no population estimate within the experimental area is feasible.

Wolves are the dominant predator in this region. Population estimates have been discussed elsewhere in this document.

Brown bears are common throughout the area. Although their diet consists primarily of carrion and vegetable matter, they may be important predators during late spring and summer upon moose and caribou calves. No population estimates for brown bears are available, but it is sufficiently large in Unit 13 to support an annual harvest of approximately 50 bears.

Dall sheep are present but not common within the area. There are scattered populations in the mountainous regions adjacent to the western boundaries of the experimental area. Sheep may occasionally serve as an alternate prey species for wolves in this region.

Wolverine, red fox, lynx, and beaver are the most common furbearers in the area. Coyotes, land otters, lynx, weasels and martens are also present.

Willow ptarmigan are the dominant upland bird and inhabit high elevations.

- C. Ecological Interrelationships. Ecological processes likely to be impacted by the proposed action have been alluded to elsewhere in this document. An ecological perturbation of faunal constituents is part of the design of the proposed action. The impact of such a perturbation is discussed in Section III(A)(1)(b).

- D. Human Use. Presently the human use in this area is limited. Two lodges and three to five guiding outfits operate in the area on a seasonal basis. The Denali highway, a gravel road from Cantwell to Paxon, intersects the area. Its use is seasonal, however, and visitor use is restricted to summer and early fall. Seasonal visitor use consists of hunting during early fall, and sightseeing, camping, canoeing, and backpacking during the summer. The area has less than ten full time residents-- primarily trappers and prospectors.

III. Analysis of Proposed Action

A. Environmental Impacts

1. Anticipated Impacts

a. Non-living Components. No significant impacts resulting from the proposed action are anticipated on non-living components.

b. Living Components. Impacts on various components of the animal community are anticipated since a significant short-term perturbation of one trophic level is part of the considered design of the proposed action. The study design (see Appendix 2) provides for the removal of most or all wolves from the 3,200-square-mile upper Susitna study area. A direct, adverse impact will accrue to the local wolf population for the period of the study and for some time thereafter. An adverse impact may also result in the denial of the opportunity for hunters and trappers to take wolves and by limiting the opportunity of others to observe or otherwise experience wolves in a non-consumptive manner in the immediate area of the study.

Beneficial direct impacts from the proposed action will include an improved understanding and appreciation of predator-prey relationships which should enhance the ability of management agencies to rationally manage animal populations. The action would also provide additional data on the sex and age composition of wolf packs, the reproductive status of different pack members, and information on the physiological condition of wolves exploiting a declining prey base.

Impact of the action on the status and density of wolves in all of Unit 13 is expected to be nominal in the short term and negligible following project termination. License holders legally killed 103 wolves in Unit 13 during the 1974-75 regulatory year. The proposed action would increase this figure by a maximum of one-third. Hunters and trappers normally using the area may lessen their efforts to remove wolves as a result of the proposed action with a consequent decline in the legal harvest overall.

The long-term impact of the proposed action on the status of wolves in the study area is expected to be negligible after the termination of the study in 1978. Wolves should re-colonize the area within a few years via immigration. The high reproductive potential of female wolves may hasten the process. Female wolves are sexually mature at two years of age, produce five to eight pups per litter, and are capable of reproducing every year, provided food is abundant.

The purpose of the proposed action is to assess the impact of wolf removal on the ungulate (moose and caribou) populations within the study area. Direct impacts on the ungulates are expected to be either positive--by an increase in density via improved calf survival--or neutral--no significant numerical response--as a result of the proposed action. Possible ancillary impacts could include an increase in the number of ungulates available for human use and a greater number of predators after the study is terminated provided that the initial removal of predators resulted in an expanded prey base. A possible adverse ancillary impact could result if the ungulates expanded at an unanticipated rate and caused a decline in range carrying capacity.

The impact of the proposed action on other predators is uncertain. It is unknown to what extent brown bears actively prey on ungulates. Provided brown bears are active predators on ungulates, the removal of competitors could provide an expanded food base for bears. The impact of the action would have the opposite effect if brown bears depended on usurping or scavenging wolf kills to significantly supplement their food supply.

2. Mitigating Measures Included in the Proposed Action. The collection of wolves will be done by Division of Game employees to insure that wolves are removed only from the designated area. The humane and efficient collection of animals is most assured by the use of rotary aircraft. Use of rotary aircraft will also facilitate retrieval of biological specimens and will enhance the scientific return of the proposed action.

3. Residual Impacts. Residual impacts are the same as those impacts discussed in section III(A)(1)(b).

B. Relationship Between Local Short-Term Use of Man's Environment and the Maintenance of Long-Term Productivity. The long-term potentially beneficial impacts of an improved understanding of predator-prey relationships should be considered in relation to the immediate and adverse impact on consumptive and non-consumptive use of wolves by the public. The significance of the adversely impacted values will persist for the length of time that wolves are limited or absent from the area in question.

The degree of and the time required for the recovery of wolves in the study area following cessation of the action will probably depend on (1) the response of prey populations in the study area to the proposed action and (2) wolf populations and wolf-prey ratios in adjacent areas. The post-action wolf population is expected to return to pre-action levels provided the prey population remains at pre-action density and wolf numbers

adjacent to the area remain similar. A widespread decrease in wolf numbers throughout the region resulting from a reduced prey base may be reflected in a reduced wolf population in the study area although such a circumstance would not be a consequence of the action. An increase in ungulate density because of the action would probably be of local significance only, but, should this occur, the post-action wolf population could exceed pre-action densities regardless of the status of wolves and their prey in adjacent areas. Successful re-occupation of the study area by wolves will likely also depend on continued successful production of young in adjacent areas since it is typically young animals that disperse. Should food scarcity limit reproduction in adjacent regions, the recovery of wolves in the study area may be delayed, even though wolf densities in surrounding areas persist at pre-action levels.

- C. Irreversible and Irretrievable Commitments of Resources. The proposed action does not involve the irreversible commitment of a resource. Since various types of uses of wolves by the public will be curtailed in the study area for the period of the action and for some time thereafter, this aspect of the proposed action constitutes an irretrievable commitment of the wolf resource for the period specified.

IV. Persons, Groups, and Government Agencies Consulted. After being reviewed and approved by the Program Review Committee of the Alaska Department of Fish and Game, Game Division, the proposed action was submitted for review through normal channels provided for by the Federal Aid in Wildlife Restoration Act and subsequently approved for funding.

V. Intensity of Public Interest. Public interest in the proposed action is considerable. Views regarding the action range from demands for a total moratorium on wolf hunting in Alaska to demands for programs of much larger scale than the proposed action. Much of the public opposition appears to stem from the perception that the action is cruel and inhumane, that basic ecological relationships in the area may be impaired, and that the status of wolves in Alaska may be threatened as a result. Public support for the action is based on the premise that wolves have contributed significantly to reduced big game herds and that wolves are currently very abundant in Alaska. Much of the voiced opposition is from the 48 contiguous states while most support is from Alaskans.

VI. Recommendations. The environmental impact of the proposal has been reviewed, and it is concluded that there would be no negative impact on the land area and little significant impact on the faunal elements other than wolves for the period of the action and for some time thereafter. No significant impact on the wolf population inhabiting the remaining 18,000 square miles of Unit 13 is anticipated, nor is it anticipated that the long-term status of wolves will be irreparably harmed in the immediate area of the proposed action after cessation of the action.

The direct adverse impacts of wolf removal from the area of the proposed action will functionally deny public use or appreciation of wolves in that area. Presumably this impact can be mitigated if members of the public are willing to make use of the areas of Unit 13.

There will be significant positive benefits accruing from the proposed action in the form of a more meaning data base from which wolves and their prey can be managed by State and Federal agencies.

The proposed action is not a major action from the standpoint of wolves and wolf populations in Game Management Unit 13 nor should the overall quality of the environment be affected significantly. Therefore, based on the environmental assessment above, an environment impact statement is not recommended.

VII. Signatures

Prepared by: _____

Concurrence: _____

Approval: _____

Appendix 1. Summary of Moose Composition Count Data for Game Management Unit 13,
1952-Present

B.G.D.I.F. Code: C-2 Sex and Age Ratios

MOOSE G.M.U. 13 Specific Area Nelchina Basin - All Count Areas

19 52- Submitted by: _____

Date	Tot. ♂ per 100 ♀	Sm. ♂ per 100 ♀	Sm. ♂ Per 100 Lq ♂	Sm. ♂ % in Herd	Sm. ♂ Per 100 ♂ calves	Calves per 100 ♀	Incidence of twins per 100 ♀ w/calf	Calf % in herd	Animals per hour	Total Sample
1952	60.9	13.5	28.6	6.7	67.6	40.0	17.2	19.9	N/A	683
1953	107.4	38.5	56.0	12.4	85.8	89.8	17.4	28.8	N/A	1100
1954	109.0	28.4	35.3	9.9	72.2	78.7	16.4	27.3	N/A	1700
1955	92.0	28.8	45.6	11.6	105.8	54.4	9.5	22.0	N/A	2200
1956	63.6	12.4	24.3	6.6	94.7	26.3	1.3	13.8	37	1099
1957	69.3	16.3	30.7	7.7	78.1	41.6	6.2	19.7	N/A	2295
1958	66.2	11.3	20.5	5.5	59.9	37.6	4.5	18.5	115	3490
1959	N O .	D A T A								
1960	84.1	20.4	32.1	8.3	72.9	56.1	11.5	22.7	56	1367
1961	63.5	20.3	47.1	9.7	88.7	45.9	10.1	21.9	70	2977
1962	64.0	17.7	45.0	10.5	147.1	28.1	5.5	14.6	87	2357
1963	54.5	13.7	33.6	7.0	68.2	40.1	5.7	20.6	123	2061
1964	LATE COUNT--SEX COMPOSITION NOT USABLE									
1965	46.3	12.4	36.6	7.2	93.7	26.5	2.2	15.3	82	5933
1966	40.5	6.4	18.8	3.8	48.3	26.6	2.1	15.9	60	4534
1967	37.7	8.5	29.2	5.1	61.4	27.7	3.0	16.7	68	5338
1968	29.9	4.8	18.9	2.9	29.0	32.8	4.1	20.2	63	3042
1969	26.7	10.0	60.3	6.3	61.4	32.7	5.2	20.4	57	4098
1970	30.0	9.4	38.9	5.7	63.6	29.6	8.6	18.0	51	4549
1971	24.5	7.2	41.4	4.9	61.4	23.4	6.8	15.8	53	5256
1972	17.6	3.6	25.6	2.7	40.7	17.7	2.6	13.0	45	3994
1973	20.0	6.5	48.7	4.8	81.2	16.1	3.7	11.8	45.2	4578
1974	17.2	5.9	52.6	4.1	40.8	29.0	6.7	19.8	42	4297
1975	15.3	4.6	43.5	3.6	62.5	14.8	5.2	11.4	42	3203

Remarks:

Appendix 2. Research Outline submitted to U. S. Fish and Wildlife Service,
Federal Aid in Wildlife Restoration

Not for Publication
or Publication
Reference

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
Smithsonian Institution
U.S. DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
Division of Federal Aid

Site No. _____
Project No. W-17-8
State: Alaska
Job No.: XIVB-14.10(1st yr)
Res. Class.: R

Job Title: Impact of Wolf Predation Upon Ungulate Populations

Name and Title of Principal Investigator: Carl Mellroy, Game Biologist and
Robert O. Stephenson, Game Biologist

Name and Address of Game and Fish Agency: Alaska Department of Fish and Game, Juneau, Alaska

Study Objective - To determine the relationships between wolves (Canis lupus) and the condition and distribution of important prey species and to quantify the impact of wolf predation upon populations of prey species.

Job Objective - To quantitatively assess the impact of wolf predation upon ungulate populations in Unit 13.

Procedures - The essence of this study is to manipulate wolf numbers in the experimental area (Job 14.8R) and to subsequently monitor prey populations to determine their response. Wolves will not be manipulated in the control area but wolf numbers and movements and prey numbers and productivity will be monitored for comparison with the experimental area.

Beginning approximately January 1976, wolf numbers will be reduced in the upper Susitna River experimental area. The objective would be to reduce wolf numbers in the experimental area to ten percent or less of the initial wolf density. Wolf carcasses will be retrieved when possible and analyzed for age, sex, reproductive condition, identification of stomach contents and physiological condition based on hair samples, blood samples and carcass fat. Moose calf survival in the experimental area during November will be compared to moose calf survival in the control area. Caribou, sheep and hare populations will also be monitored in both the control and experimental areas.

This study will extend over a three year period. Results based on a three-year study will be less vulnerable to misinterpretations based on chance, unexpected problems, or some other factor. Wolf numbers would be reduced to low levels in the winters of 1976-77 and 1977-78 in the experimental area. Radio-collared wolves in

Job Duration:	Total Cost:	\$14,500
From: July 1, 1975	Federal Share:	\$10,875
To: June 30, 1976	State Share:	\$ 3,625

the control area would be monitored until the batteries expired. Radios from wolves killed in the experimental area will be placed on live wolves if possible.

Schedule

- January 1976-May 1976

Estimated Man-Days

- Principal Investigators - 60
Associates - 20

Location of Work

- Upper Susitna River basin and the Gulkana-Gakona River basins

Work Assigned to

- Carl McIlroy

Progress Report Due

- July 1, 1976

Final Report Due

- July 1, 1978