United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
DARW

Memorandum

To: All Refuge Managers

From: Assistant Regional Director, Refuges and Wildlife

Subject: Wolf Management Plan

As you know the Alaska Department of Fish and Game is facilitating a public planning effort on wolf management for Alaska. Recently you provided information to Biologist Ted Bailey and Daryle Lons on data and issues relative to wolves on refuges. That material was used to develop a presentation to the planning team in Fairbanks on March 8 by Paul Schmidt. That presentation provided data, regulations and policies relative to this issue. For your information, that presentation is attached along with a selection of the materials the planning effort has produced to date.

The planning process will continue later this month in Anchorage and will conclude in April or May. Thank you for the information you contributed to this effort and a very special thanks to Ted Bailey and Daryle Lons for pulling it together in short order.

John P. Rogers

Attachments

cc: Senior Resident Agent Al Crane
LE
AM
Lons
Bailey

Wolf Management

U.S. Fish and Wildlife Service

Presentation March 8, 1991

I. Introduction

My name is Paul Schmidt and I am the Deputy Assistant Regional Director for the U.S. Fish and Wildlife Service in Anchorage. Thank you for the opportunity to make a formal presentation before the Alaska Wolf Management Planning Team. I am representing the Regional Director Walt Stieglitz as he is unable to be here because of the current meetings of the Federal Subsistence Board. The Service supports the planning approach of this team and welcomes the opportunity to share with this team the Service regulations, policies, and data. As you no doubt recognize, it is important to the success of this team's work and deliberations that the management framework of major land owners and managers be considered. Recognizing these legal and policy guidelines will result in a more successful implementation of a comprehensive plan.

My presentation will cover the legal framework under which we are authorized to manage the 77 million acres of the National Wildlife Refuge System in Alaska, some estimates and trends of wolf populations, our general management goals, current regulations and enforcement, and our thoughts on some important issues before this team.

A. National Wildlife Refuge System

The mission of the National Wildlife Refuge System is to provide, preserve, restore, and manage a national network of lands and waters sufficient in size, diversity, and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available.

There are 16 national wildlife refuges in Alaska. Some were established prior to 1980; however most of the refuges were created or expanded by the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. Most of these refuges were legally established with four major purposes:

1. to conserve fish and wildlife populations and habitats in their natural diversity. Each refuge's number 1 purpose goes on to include mention of species or groups of species. Wolves are specifically mentioned for Arctic, Kenai, and Yukon Flats. Furbearers, which would include wolves, were mentioned for Innoko, Kanuti, Koyukuk, Nowitna, and Tetlin.

2. to fulfill international treaty obligations of the United States with respect to fish and wildlife and their habitats;

3. to provide for the opportunity for continued subsistence uses by local residents (this was included for all refuges except Kenai);

4. to ensure water quality and necessary water quantity within the refuges;

Kenai Refuge also has two other major purposes which are to 1) provide for opportunities for fish and wildlife oriented recreation and 2) to provide for opportunities for scientific research, interpretation, environmental education, and land management training. Tetlin Refuge has a fifth major purpose of providing for opportunities for interpretation and environmental education.

The Refuge System encompasses approximately 20% of the land area in Alaska and the refuges range in size from Izembek Refuge at 320,000 acres to the Yukon Delta and Arctic Refuge which are each about 20 million acres.

* General leaflet on the National Wildlife Refuges in Alaska.

B. Status of Wolf Populations

As you have already heard estimating wolf populations is not

an easy or particularly exacting science. With that in mind I offer you the following summary of the estimated wolf populations on the refuges.

* Status of Wolf Populations

As you can see we have various levels of quality of data; some are based upon a number of years of survey and specific radio telemetry studies and some are not much more than educated guesses. Much of this is in coordination with the Alaska Department of Fish and Game.

Most of the refuge areas for which we have information can be classified as stable or increasing. You recognize this is only a relative kind of measurement.

C. Current Studies

Currently, the Service is conducting studies on seven national wildlife refuges.

* Status of Wolf Studies on Refuges

Some of the studies are intended to give specific wolf population numbers, while others are trying to understand the predator/prey relationships or habitat use among other things.

D. Wolf Harvest

We have some information on the maximum percent of the estimated wolf population that is annually harvested. Given that this is based upon the guesstimates presented earlier, please do not consider these numbers to be anything more than professional judgements. Nonetheless it does give you some idea of the existing situation. I will hand out these estimates. Included in this handout is a criptic display of what each refuge manager considers to be an important wolf related issue on that refuge. Please consider this information to be personal opinions of those managers.

* Estimated Wolf Harvest Intensity and Issues

E. Current Regulations

Here is a summary of the current wolf hunting and trapping seasons, including whether same day land and shoot is allowed in accordance with the State regulations.

* Wolf Hunting and Trapping Seasons and Harvest

F. Management Objectives

With the exception of the Kenai Refuge, no Alaska refuge has

specific population objectives established. As you know this would be a very difficult thing to do, because of the dynamic situation relative to predator/prey relationships. Biological data, professional judgement and policy guidelines will necessarily manage these wildlife populations. The Kenai Refuge established a population objective as a part of the development of the comprehensive conservation planning process, because of the unique situation that exists on the Kenai. Because of its geographic characteristics, available biological data, the vulnerability of the population (being convenient to Anchorage) and the political intensity and public scrutiny of the issue, a population objective for the refuge was set at 90 wolves. This population objective was inturn broken down by subunit on the refuge. At present the objective level is being met successfully.

The other refuges manage with some general goals related to the purposes for which the refuge was established. At this time it might be appropriate to quote from ANILCA. The general purposes of Alaska refuges is:

> "To provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable value to the citizens of Alaska and the Nation; including those species dependent on vast relatively undeveloped areas; to preserve in their natural state

extensive unaltered arctic tundra, boreal forest, and coastal rainforest ecosystems;..."

In accordance with the national policy as articulated in the Refuge Manual:

"Fish and wildlife populations of a particular refuge will be maintained at levels consistent with sound wildlife management principles and in conformance with that refuge's objectives."

The number 1 purpose for all of the Alaska refuges refers to natural diversity. A working definition of natural diversity is:

"The number and relative abundance of indigenous species which would occur without the interference of man."

I will address wolf control later, but it is important to note that based upon this definition very sound biological information would be necessary to justify a wolf control program on a national wildlife refuge.

II. Regulations

A. Proposals to change regulations

At present the Fish and Wildlife Service is not actively pursuing alteration of existing wolf harvest seasons or bag limits. Under the Memorandum of Understanding with the State of Alaska the Service has worked within the framework of the Board of Game process to date. While we intend to continue to work thru that process in the future, new Federal responsibilities for subsistence issues on refuges could result in some modifications.

B. Same day airborne harvest (land and shoot)

Currently, same day airborne harvest is permitted on some portion of 9 of the 16 refuges in Alaska. The legal pursuit of this activity has not been identified as incompatible with the purposes for any refuge in Alaska. This does not mean that the Fish and Wildlife Service is comfortable with this method of harvest. In fact, Special Agent Al Crane articulated some of the concerns we have with this activity in your meeting in January. I know that a number of you have questions as a result of that presentation and I will try to answer those questions in this presentation.

As Agent Crane indicated, land and shoot hunting can be done legally within the framework of the Federal Airborne Hunting Act, however, it is very limited. Let me backup and

explain. Both the Federal and State law control the use of aircraft involved in hunting wildlife. The Federal Airborne Hunting Act prohibits a person from shooting or attempting to shoot animals out of an aircraft or to use an aircraft to harass any bird, fish or other animal. It also prohibits anyone in the aircraft or on the ground from taking wildlife with the aid or use of an aircraft.

In the regulation, the term harass means to "disturb, worry, molest, rally, concentrate, harry, chase, herd, or torment."

State of Alaska regulations under UNLAWFUL METHODS OF TAKING GAME also limit the use of an aircraft.

> "The following methods of taking game are prohibited:
>
> 4) unless otherwise prohibited in this chapter, from a mechanical vehicle...
> 5) with the use of an aircraft, snowmachine, motor-driven boat, or other motorized vehicle for the purpose of driving, herding, or molesting game;
> 7) with the aid of a pit, fire, artificial light, radio communication..."

Many people are unclear about what constitutes legal "same day airborne or land and shoot wolf hunting, and in particular there is confusion about state vs. federal

interpretations of which practices are legal. In the past, many hunters have assumed that landing among a pack of wolves and then quickly jumping out of the aircraft and shooting is legal. Under federal law, this practice is clearly illegal if it results in the wolves running from the aircraft, even if that is not the intended result. Causing wolves to change their direction of travel either while the aircraft is in the air or on the ground, or using a radio to direct airplanes involved in this activity is also illegal.

Federal enforcement agents have and will prosecute people for shooting wolves using an illegal practice with posible forfeiture of aircraft and other penalties. It is our intent to provide this information to the public so that they don't jeopardize an outing by violating state or federal law.

The only clearly legal method of "same day airborne-land and shoot" wolf hunting is to land the aircraft far enough away from wolves so that they are not harassed by the airplane, and then either stalk the wolves on the ground or wait until the wolves approach the aircraft themselves. The hunter must be out of the aircraft before shooting, and may not use radio communications as an aid to finding, stalking, or shooting the wolves. Here is recent news release we sent out in hopes of informing people of the regulations so they know how to conduct this activity legally.

* News Release

Both federal and state officers are empowered to enforce the law. I will not try to represent the state's enforcement policy; but as I am sure you all recognize there may be differences in how each agency approaches this issue and indeed differences in interpretation among officers. Differences do exist. I can only tell you what guidance our enforcement agents work under.

As you know, we have been involved in two Airborne Hunting Act violations concerning wolves. Neither case has been completely settled.

C. Enforcement officers

The Fish and Wildlife Service currently has only 10 full time agents to enforce laws. On many of our national wildlife refuges we have professional biologists, managers, and public use specialists who carry federal law enforcement authority. We have over 40 of these individuals who conduct law enforcement as a colateral duty. Law enforcement is not a primary function of their jobs, but they do have the authority and spend a number of days or weeks in that mode each year.

III. Important Issues for this Team

There are several important issues before this team. Same day airborne hunting and wolf control are perhaps the most sensitive and controversial.

We have serious concerns for land and shoot as a method of take in Alaska. We feel it does the wolf hunting public a disservice in light of the Airborne Hunting Act restrictions. This method provides little opportunity to pursue wolf hunting legally and it temps fate. The activity is clearly offensive to a significant portion of the general public. We are continually questioned about this activity on national wildlife refuges. Many feel it is not a good example of the "fair chase" conservation ethic. For these reasons, we recommend that this management planning team seriously consider eliminating the practice of land and shoot hunting of wolves in Alaska.

I would like to address wolf control now. We view wolf control as a specific management action (other than modification of the sport or subsistence harvest regulations) taken by an agency in order to reduce the wolf population forthe benefit another species - ungulates.

The Alaska Department of Fish and Game was involved in wolf control programs in the late 70s and early 80s. Aerial

gunning of wolves occurred on what is now the Innoko and Nowitna refuge areas before they were designated national wildlife refuges in 1980. Once they were established by Congress, the Fish and Wildlife Service and State agreed to discontinue the control activity.

If state-managed wolf control programs are necessary, the Federal Airborne Hunting Act provides that permits may be issued as an exception to the rule in order to manage wildlife, or protect domesticated animals. These permits my be issued through state managing agencies.

As you know this is a very serious and controversial issue that touches at the hearts of many people. This activity should not be entered into lightly. We must all ask ourselves a number of questions before we embark on this management technique. Some of the questions the Service would have to ask before considering such a program on a national wildlife refuge are:

Does it conform with the Service policy for predator management? (The only current predator control guidelines relate to benefiting breeding waterfowl.)

Is the proposed wolf control compatible with refuge purposes?

Perhaps most importantly: Is the activity biologically sound? The Service will consider the latest scientific thinking about when wolf control may be appropriate.

Has the proposed wolf control program met the National Environmental Policy Act (NEPA) requirements?

As you might imagine the process for establishing a wolf control program on a national wildlife refuge is not simple. I will outline the process we would likely use to establish such a program.

1) The refuge wildlife objectives are clearly defined for both prey and predator in an approved comprehensive conservation plan or equivalent.

2) Wildlife studies document ungulate numbers that are well below the nutrition/climate or carrying capacity level. The latter would require studies of habitat quantity, quality, availability and use in relation to ungulate numbers and their impact on the habitat and a thorough assessment of population "health and vigor" using physiological indicies and parameters measuring reproductive performance.

3) Wildlife studies document that mortality is the major factor in changes in prey numbers.

4) Wildlife studies document that wolf predation is the major cause of the ungulate mortality.

5) A thorough consideration is given in multi-predator systems for the likehood that another predator, particularly brown or black bears, may increase their predation on the ungulate in question and cancel the benefits desired by wolf control.

6) The wolf control program meets Service policies and the National Environmental Policy Act requirements.

Existing Service policies or criteria for predator control programs relate to benefiting breeding waterfowl populations but may guide a wolf control program also:

a) Predator control must be site specific;

b) Habitat quantity and quality must be sufficient to support the desired prey populations.

c) When appropriate, improvement of prey habitat is to be performed before the application of predator management;

d) Operational programs to control predators will be conducted only where prey objectives are a clear priority;

e) Predator control must be based on a thorough analysis of the actual potential problem.

f) Predator control must be capable of being monitored for effectiveness;

g) Again, the approved comprehensive conservation plan must identify prey objectives;

h) A prey management plan addressing both prey and the targeted predator population must be prepared and approved by the Regional Director before predator reduction activities are initiated;

i) Predator control must be coordinated with Research and Development during management planning.

The National Environmental Policy Act (NEPA) compliance would be required for this action. At the very least an environmental assessment would have to be prepared; however

it is more likely the more indepth analysis and review process of an environmental impact statement would be needed. The determination of whether an EIS must be prepared depends on a judgement of the significance and/or controversy associated with the proposed action. This process would include extensive public involvement.

* NEPA Process Flowchart

ALASKAN NATIONAL WILDLIFE REFUGES
STATUS OF WOLF POPULATIONS
FEBRUARY 1991

Refuge	Estimated Wolf Population		Year of Estimate	Method of Estimate	Estimated Population Trend
	Pack	Numbers			
Alaska Maritime	5-6	60	1991	Estimate	Unknown
Arctic	33	267	1990	Estimate	Unknown
Alaska Peninsula and Becharof	Unknown		N/A	N/A	Stable
Innoko	20	260	1990	Estimate	Increasing
Izembek	10	80	1990	Estimate	Decreasing?
Kanuti	7-9	40-50	1990	Telemetry	Unknown
Kenai (Northern Refuge)	13 (4)	82 (47-48)	1980-81 (1990)	Estimate Telemetry	Unknown Stable ?
Kodiak	NO WOLVES PRESENT ON KODIAK NWR				
Koyukuk	7-8	100-150	1990	Telemetry Census	Increasing
Nowitna	9-10	70-100	1990	Telemetry Census	Increasing
Selawik	7	55	1990	Telemetry	Increasing
Tetlin	7	49	1990	Telemetry	Increasing
Togiak	3-5	13-27	1990	Estimate	GMU18 Increasing GMU17 Decreasing
Yukon Delta	6-7	75-100	1990	Estimate	Increasing
Yukon Flats	13-15	92-108	1990	Census	Increasing or stable

ALASKAN NATIONAL WILDLIFE REFUGES
ESTIMATED WOLF HARVEST INTENSITY AND ISSUES
FEBRUARY 1991

Refuge	Average Annual Harvest (Recent)	Maximum Percent of Estimated Wolf Population Harvested Annually	Wolf Issues
Alaska Maritime	Unknown	Unknown	None
Arctic	Unknown	Unknown	History of illegal aerial take
Alaska Peninsula and Becharof	25	Unknown	Census needed
Innoko	35	13%	
Izembek	6	7%	Guides say wolves too abundant
Kanuti	15	37%	High 1989 harvest, hunt violations
Kenai	27	33%	Harvest levels vs wolf population response
Kodiak	NO WOLVES ON KODIAK NWR		
Koyukuk	30	30%	Harvest violations subsistence use conflicts
Nowitna	20	28%	Same as Koyukuk
Selawik	29	53%	Harvest using snowmobiles

ESTIMATED WOLF HARVEST INTENSITY AND ISSUES (continued)
FEBRUARY 1991

Refuge	Average Annual Harvest (Recent)	Maximum Percent of Estimated Wolf Population Harvested Annually	Wolf Issues
Tetlin	4	8%	None
Togiak	0	0	Lack of prey species
Yukon Delta	10	13	None
Yukon Flats	16	17	Moose predation

ALASKAN NATIONAL WILDLIFE REFUGES
STATUS OF WOLF STUDIES ON REFUGES
FEBRUARY 1991

REFUGE: Kanuti NWR

TITLE: Status of the gray wolf and preliminary assessment of the moose-wolf relationship in the Kanuti National Wildlife Refuge, Alaska

OBJECTIVES:
1) Determine numbers, densities, structure, distribution and range of wolves.
2) Estimate survival, dispersal, harvest of winter population.
3) Estimate moose/wolf ratios in winter.

STUDY AREA SIZE: 6,480 KM² WOLVES COLLARED: 9 PACKS COLLARED: 5
STATUS: Continuing; 1991 objective is to collar the remaining packs.

REFUGE: Selawik NWR

TITLE: Wolf and wolverine populations and habitat use in relation to the Western Arctic Herd in northwestern Alaska.

OBJECTIVES:
1) Determine population size.
2) Determine predation rates.
3) Develop economical, repeatable census technique.

STUDY AREA SIZE: 15,000 KM² WOLVES COLLARED: 29 PACKS COLLARED: 10
STATUS: Predation objective completed, interagency effort required to accomplish other objectives; recent rabies outbreak in area.

REFUGE: Yukon Flats NWR

TITLE: Wolf distribution and predation

OBJECTIVES:
1) Determine distribution, size, and seasonal use of pack territories.
2) Estimate kill rates and species composition of prey during winters.

STUDY AREA SIZE: 6,700 KM² WOLVES COLLARED: 3 PACKS COLLARED: 2
STATUS: On hold.

ALASKAN NATIONAL WILDLIFE REFUGES
STATUS OF WOLF STUDIES ON REFUGES
FEBRUARY 1991

REFUGE: Arctic NWR

TITLE: Differential impacts of predators on caribou calving in the 1002 area and potential displacement areas: an assessment of predation risk.

OBJECTIVES:
1) Predator distribution and movement patterns.
2) Relative abundance of predators.
3) Predator impact on caribou.

STUDY AREA SIZE: 6,300 KM² WOLVES COLLARED: 20 PACKS COLLARED: 5
STATUS: Continuing

REFUGE: Tetlin NWR

TITLE: Winter and summer predation rates and movements of wolves in east central Alaska.

OBJECTIVES:
1) Investigate wolf feeding habits in winter and summer.
2) Determine home ranges and activity patterns of collared packs and individuals.

STUDY AREA SIZE: 3,700 KM² WOLVES COLLARED: 4 PACKS COLLARED: 2
STATUS: Report being prepared.

REFUGE: Koyukuk and Nowitna NWR

TITLE: Seasonal movements and home range of wolf packs on the Koyukuk and Nowitna National Wildlife Refuges.

OBJECTIVES:
1) Compare pack ranges, sizes, predation rates in areas of known prey densities.
2) Determine seasonal habitats used and preferences.
3) Develop estimates of wolf-prey ratios.

STUDY AREA SIZE: 11,000 KM² WOLVES COLLARED: 20 PACKS COLLARED: 8
STATUS: Continuing.

ALASKAN NATIONAL WILDLIFE REFUGES
STATUS OF WOLF STUDIES ON REFUGES
FEBRUARY 1991

REFUGE: Kenai NWR

TITLE: Standard Wildlife Inventory for Northern Portion of the Kenai NWR: Wolf numbers and distribution on the northern Kenai National Wildlife Refuge.

OBJECTIVES:
1) Determine pre-season number of wolf packs and numbers of wolves using the most accurate technique available.
2) Maintain 25-35 wolves post-season on northern refuge.
3) Document changes in pack territories in relation to ungulate distribution and successional forest habitats.

STUDY AREA SIZE: 3,310 KM^2 WOLVES COLLARED: 13 PACKS COLLARED: 4
STATUS: Continuing.

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ALASKAN NATIONAL WILDLIFE REFUGES
WOLF HUNTING AND TRAPPING SEASONS AND HARVEST
FEBRUARY 1991

Refuge		Hunting Season Opens	Hunting Season Closes	Trapping Season Opens	Trapping Season Closes	Same Day Hunting
Alaska Maritime		10 Aug	30 Apr			No
Arctic	Unit 25	10 Aug	30 Apr	1 Nov	31 Mar	
	Unit 26	10 Aug	30 Apr	1 Nov	15 Apr	Yes (only 25%)
Alaska Peninsula and Becharof		10 Aug	30 Apr	10 Nov	31 Mar	Yes
Innoko		10 Aug	30 Apr	1 Nov	31 Mar	Yes
Izembek		10 Aug	30 Apr	11 Nov	31 Mar	Yes
Kanuti		10 Aug	30 Apr	10 Nov	28 Feb	Yes
Kenai		10 Aug	30 Apr	10 Nov	28 Feb	No
Kodiak		NO WOLVES				
Koyukuk		10 Aug	30 Apr	1 Nov	31 Mar	Yes
Nowitna		10 Aug	30 Apr	1 Nov	31 Mar	Yes
Selawik		10 Aug	30 Apr	1 Nov	15 Apr	No
Tetlin		10 Aug	30 Apr	1 Oct	30 Apr	Yes
Togiak		10 Aug	30 Apr	11 Nov	31 Mar	Yes
Yukon Delta		10 Aug	30 Apr	10 Nov	31 Mar	No
Yukon Flats		10 Aug	30 Apr	1 Nov	31 Mar	Yes

U.S. FISH & WILDLIFE SERVICE

ALASKA

1011 E. TUDOR RD.
ANCHORAGE, ALASKA
99503

Bruce Batten 786-3487
Dave Purinton 786-3311

U.S. FISH AND WILDLIFE SERVICE ADVISORY ON SAME-DAY-AIRBORNE WOLF HUNTING: *WHAT IS LEGAL, WHAT IS NOT*

Both federal and state laws control the use of aircraft involved in hunting wildlife, and both federal and state officers are empowered to enforce these laws.

Under the existing state hunting regulations, hunters in Alaska may be authorized by state-issued permits to hunt wolves on the **same day** that the hunter has flown in an aircraft.

HOWEVER, the following restrictions on the use of aircraft involved in hunting STILL APPLY:

1. The Federal Airborne Hunting Act (16 USC 742j-1) prohibits anyone from shooting or attempting to shoot animals out of an aircraft or to use an aircraft to **harass** any bird, fish, or other animal. The term "harass" means to "disturb, worry, molest, rally, concentrate, harry, chase, herd, or torment."

2. The law also prohibits anyone in the aircraft or on the ground from taking wildlife with the **aid or use** of an aircraft.

3. State of Alaska regulations, which are adopted as federal law on National Wildlife Refuges and National Parks, also limit the use of an aircraft. Under UNLAWFUL METHODS OF TAKING GAME (5 AAC 92.080), "The following methods of taking game are **prohibited:**

> (4) unless otherwise prohibited in this chapter, *from a mechanical vehicle . . .*;
>
> (5) with the use of an *aircraft . . .* for the purpose of *driving, herding, or molesting game*;"
>
> (7) with the aid of . . . *radio communication.*"

The only clearly legal method of same-day-airborne ("land-and-shoot") wolf hunting is for the hunter to land the aircraft far enough away from the wolves so that they are *not harassed by the airplane*, and then either to

(1) stalk the wolves on the ground, or

(2) wait until the wolves approach the hunter themselves.

Furthermore, the hunter must

(1) be **out of the aircraft prior to shooting**, and

(2) **not** use **radio-communications** as an aid to finding, stalking, or shooting the wolves.

(more)

"In the past, some hunters have *assumed* that landing among a pack of wolves and then jumping out of the aircraft and quickly shooting is legal practice," said R. David Purinton, Assistant Regional Director for Law Enforcement in Alaska. "Under federal law, this practice is clearly *illegal if it results in wolves running from the aircraft--even if that is not the intended result.*"

Causing wolves to change their direction of travel either while the aircraft is in the air or on the ground, or using a radio to *direct* airplanes involved in hunting is also **illegal.**

Federal law enforcement agents have prosecuted hunters for shooting wolves using these practices. Possible penalties for these violations include large fines, jail sentences, forfeiture of aircraft, and loss of hunting or guiding privileges. Purinton warns that federal agents will continue to actively enforce these regulations this season.

"Hunters need to be aware of these laws--that the land-and-shoot and same-day-airborne wolf hunting does *not* mean that no other hunting rules apply," said Purinton. "Just because it's a wolf hunt doesn't mean that the Airborne Hunting Act and state rules about molesting game and radio use are thrown to the wind. It is our intent to make this information clear to hunters so they will not jeopardize an outing by violating state or federal laws."

Purinton points out that under some circumstances exemptions to federal law may be granted.

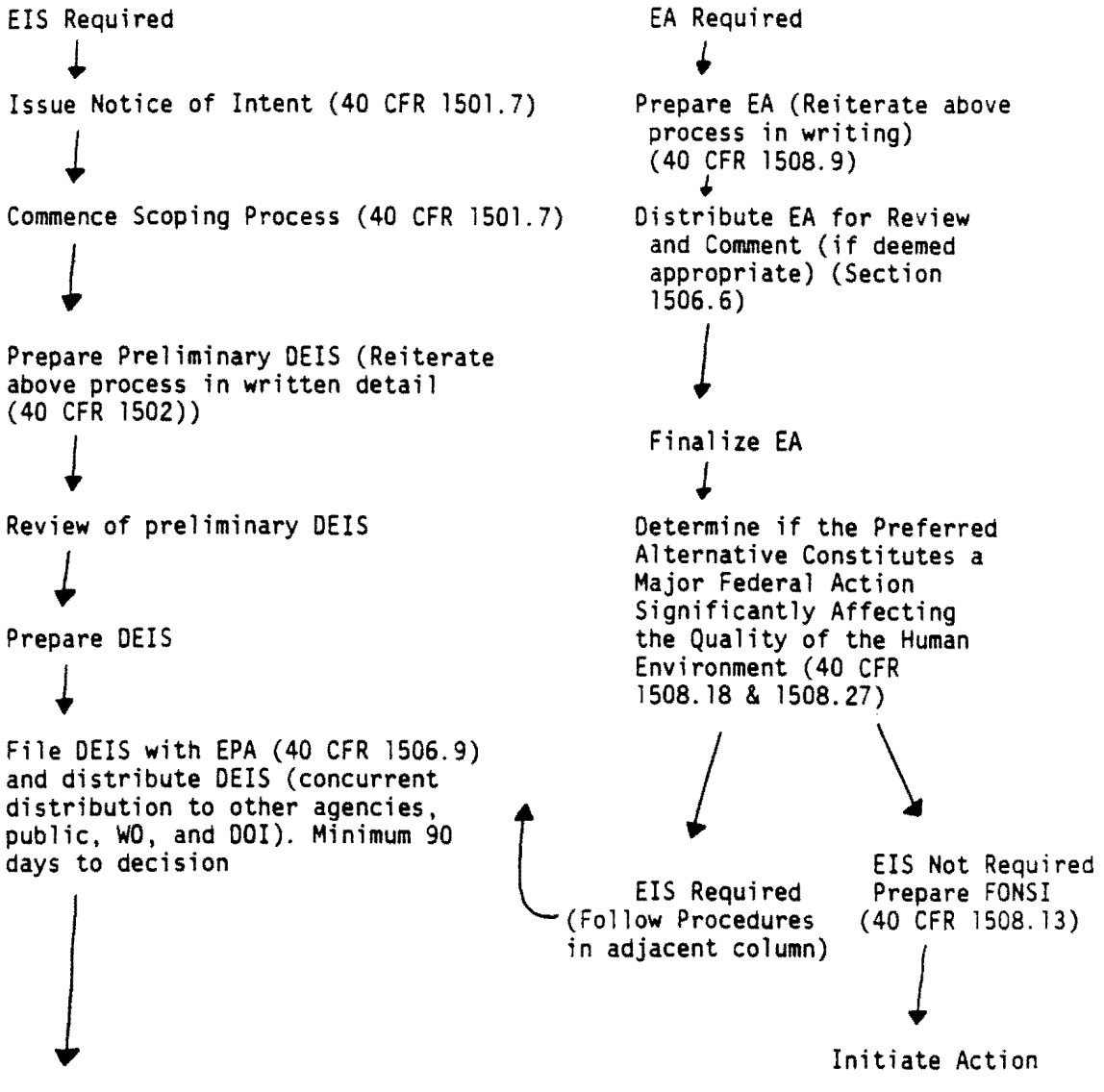
"If state-managed wolf control or wildlife managment programs are necessary, the Federal Airborne Hunting Act provides that permits may be issued as an exception to the rule in order to manage wildlife, or protect domesticated animals or human life," he said. These permits may be issued through state managing agencies (in Alaska, the Alaska Department of Fish and Game).

Further information may be obtained by calling U.S. Fish and Wildlife Service Law Enforcement Offices:

In Fairbanks, Special Agent Al Crane, *456-0255*
In Anchorage, Special Agent Wally Soroka, *271-2828*

-FWS-

FISH AND WILDLIFE SERVICE
NEPA PROCESS FLOWCHART-PHASE 2



Respond to Comments on DEIS (40 CFR 1503.4) and Prepare Preliminary FEIS

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Review of Preliminary FEIS

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Prepare FEIS

↓

File FEIS with EPA (40 CFR 1506.9) and distribute FEIS (concurrent distribution to other agencies, public, WO, and DOI). Minimum 30 days to decision (40 CFR 1506.10)

↓

Make Decision and Prepare Record of Decision (40 CFR 1505.2)

↓

Implement Action 30 Days After Notifying Public

Alaska Department of Fish and Game
Division of Wildlife Conservation

A PROPOSAL TO DEVELOP A WOLF MANAGEMENT PLAN FOR ALASKA

January 24, 1990

INTRODUCTION

Wildlife in Alaska is managed by the Alaska Department of Fish and Game's Division of Wildlife Conservation (Division). The goal of wolf management is to ensure that Alaska always has healthy numbers of wolves and their prey and appropriate habitat for both. Also, the Division and the Board of Game (Board) must provide for both consumptive and nonconsumptive uses of wolves and their prey.

Wolf management has become more and more difficult because some social values have changed over the years and the public has voiced different demands for wolves. Conflicts between people with different interests concerning wolves have become intense, and many discussions of how wolves should be managed in Alaska have resulted in unproductive confrontations.

There are many growing pressures and threats to Alaska's wildlife and their habitats. It is imperative that we resolve this conflict so we can work together successfully to conserve Alaska's wildlife for all users.

Presently someone always loses in confrontations about wolf management. We propose creating a situation in which all sides have something to win. To do so, we propose a three stage effort, each of which would involve the public in a meaningful role.

The first stage involves developing a general agreement about just what the fundamental "problem" of wolf management is. The problem statement will have to be broad enough to include the concerns of most people and interest groups.

The second stage will involve developing a statewide management plan for wolves. The plan will identify and recommend potential solutions to the problem. Identifying acceptable solutions will require both the best technical information from wildlife scientists and managers and sincere efforts by the public to recognize and reconcile their conflicting values and desires.

The third stage involves implementing the plan. Regulations based on the plan will have to be passed by the Board, and the Division will have to develop appropriate management and research programs to fully implement the statewide plan.

STAGE I: PROBLEM ANALYSIS

The Division has developed the following Problem Statement. In this statement we have tried to boil the problem down to the basic elements which are common to all interested parties. We realize that we may not have represented everyone's concerns adequately, so we are asking you to give us your comments.

PROBLEM STATEMENT

People are not getting what they want when it comes to wolf management. Different people have different desires for wolves which cover a broad range of options. Currently, the way wolves are managed in Alaska does not satisfy the range of those desires. Consequently, opposing groups each try to force the state to meet their wishes, which produces a continual series of conflicts regarding wolf management policies, techniques, and the decision-making process.

Although the different interests can compromise to change some of the aspects of this conflict, we recognize that other aspects most likely cannot be changed.

Unchangeable Aspects.

Human uses of wolves and their prey cover a broad spectrum of values from knowing animals are there (existence value) to nutritional dependence. These uses reflect values which are often based on deeply held personal beliefs which are not subject to change or negotiation.

To provide for a broad variety of human uses of wildlife, different management strategies are required. For example, existence values may be satisfied by simply protecting habitat and wildlife from human development. However, providing for consumptive use involves allowing and maintaining harvests of moose or caribou by humans, which may require manipulation of habitats or predator-prey relationships. This is particularly true in less productive northern areas where predation by wolves and bears may limit the potential surplus of prey available to humans.

Human attitudes regarding what is proper in the way wolves and other animals are treated also cover a wide range. These values are based upon people's experience and ethical judgments about treatment of wildlife populations or individual animals.

Changeable Aspects.

In the past, the Division assumed that maintaining moderate to high densities of wildlife (particularly moose and caribou) would satisfy everyone. By following this approach, the Division did not adequately acknowledge the fact that some individuals are opposed to manipulation of wildlife populations. In addition, this approach helped create the perceptions that the Division's wolf management was intended to mainly benefit hunters, and that the Division placed a higher value on prey species than on wolves. These perceptions have alienated many people. Ironically, efforts the Division has made to date to demonstrate our long-standing commitment to balanced management of wolves and prey have caused some rural residents and sportsmen's groups to believe the Division is ignoring their traditional hunting concerns. This feeling has contributed to opposition to license fee increases, jeopardizing the Division's ability to obtain additional funding needed for a wide range of wildlife management and conservation programs.

Some techniques which have been used in wolf management are no longer acceptable to some people. For example, poison, which was once widely used to kill wolves and other predators, is now banned in Alaska. Aerial shooting, as part of a state administered wolf control program, is increasingly unacceptable to some segments of the Alaskan and national public. The tools wildlife managers use and the conditions under which they are applied can be reevaluated or changed.

Poor communication is often a problem among various public interest groups and government agencies. As a result, interest groups have become more polarized, so resolving conflicts has become more and more difficult. Opposing groups often believe that their antagonists have little understanding of their values and have no desire to learn more. These same feelings extend to the Division when it proposes management programs which are unacceptable to various groups.

Decisions are currently made in a "win-lose" confrontational setting. This can be changed to a more constructive "win-win" problem solving atmosphere by involving all groups interested in wolf management in a planning process that will allow each to develop a better understanding of the others' values and contribute to the final product in a meaningful way. People who share a common interest in the future of Alaska's wildlife and have reached a common ground in their understanding of predator-prey ecology and management can work together to ensure the welfare of these species. We believe if people recognize their common interests and work together with the Division and the Board, we can satisfy a broad range of wildlife users, though not necessarily at the same time in every area.

PROBLEM CONSEQUENCES

Enough people are dissatisfied with wolf management policies and practices that groups which share common interests in wildlife have become divided instead of working together. This has been costly to both the resources and to Alaskans.

Because conflicts have not been effectively resolved, different interests have become more polarized. The atmosphere of recent Board meetings has become highly confrontational as various groups have attempted to impose their values on others. Costly law suits, inaccurate information campaigns, long and controversial meetings of the Board, and inefficient use of Division staff time and funds hurt Alaska's wildlife more than they help it.

COST OF NOT FINDING A SOLUTION TO THE PROBLEM

If we do not develop a different approach to resolving the existing conflicts and choosing management strategies, then everyone interested in the long-term welfare of Alaska's wildlife will suffer.

Our decision-making forum has been highly charged and confrontational. If this continues, the public will become more frustrated over not getting what they want. This problem affects all public interest groups and individuals as well as the Division.

People who favor the more extreme types of management (either full protection of wolves, virtually unlimited harvest, or government control programs) may find their influence dramatically affected by changes in elected officials or people appointed to the Board. Guarding their viewpoints and enforcing their desires may require constant lobbying efforts.

People who want more wolves may find their efforts blocked by their opponents even in areas where prey species are abundant. Illegal "vigilante" actions may be taken against wolves in some areas.

People who want more prey or fewer wolves may find their efforts blocked by legal maneuvering or political pressure. Opportunities to hunt or trap wolves and their prey in some areas may decrease or be greatly restricted.

Unless this issue is resolved, the Division and the Board will spend more time and money dealing with the controversy of wolf and prey management at the expense of other important activities. The Division's working relationship with all users will suffer and public support for a variety of programs will be reduced. Conflicts between the Division and other agencies will increase in number and cooperative research and management programs on federal areas may be reduced or damaged.

The most unfavorable consequence is that all concerned parties will be unable to work together in an effective partnership for wildlife conservation in Alaska.

ALASKA WOLF MANAGEMENT PLANNING TEAM

GOALS

To help increase public awareness, understanding, and agreement on wolf conservation and management in Alaska

To help promote communication among the public, interest groups, and the Department of Fish and Game

To advise the Department and the Board of Game on the management and conservation of wolves in Alaska

OBJECTIVES

To review the status and ecology of wolves in Alaska

To review existing policies and procedures for the management and conservation of wolves in Alaska

To recommend goals and objectives for the management and conservation of wolves in Alaska over the next 5 to 10 years

To identify public uses of wolves and their prey which are compatible with these goals and objectives

To identify which uses of wolves are in conflict with each other and recommend ways to reduce or eliminate these conflicts

To expedite the flow of information between the Department and the broad spectrum of public interest groups

To recommend specific management options for ensuring the long-term conservation of wolves in Alaska and for satisfying the greatest variety of public desires for wolf management in the state

ROLE

The role of the Planning Team is to make recommendations to the Department and the Board on how wolves should be managed in Alaska. Recommendations from this team and all interested parties will be used to help develop a statewide strategic management plan. The Department will then submit a proposed plan to the public and the Board for formal review and eventual adoption. It must be recognized that the Department considers these recommendations to be very important and will follow them as closely as possible, but that laws, regulations, and cooperative agreements with other agencies do limit how wolves can be managed. Also, any changes in hunting or trapping regulations must be adopted by the Board of Game.

MEMBERSHIP

Members will be appointed by the Director of the Division of Wildlife Conservation. The group will consist of up to 12 members representing a broad spectrum of interests.

One seat each will be allocated to a representative of the Board of Game and the Division. Team members should represent the following interests: recreational hunting, subsistence hunting, nonconsumptive use, environmental, animal welfare, big game guiding, trapping, tourism, and education. At least one member of the team should be a member of a fish and game advisory committee. The team should have a broad geographic representation within the state and include a national interest (e.g., a state resident who is a member of a national organization).

MEETINGS

During the first year, from four to six meetings will be held in Anchorage. The first meeting will be two to four days in duration and will include a public forum. We plan to contract the services of a professional facilitator to initiate this effort and to conduct a workshop on problem resolution and mediation. Following the initial session, meetings will be one to two days in duration. Teleconferences may be held between meetings. Guidelines for meetings will be developed during the initial meeting. Group consensus will be the preferred approach for resolving conflicts and formulating recommendations.

PUBLIC PARTICIPATION

To attain the broadest representation on the Planning Team, we are contacting all individuals and organizations who may have an interest in the planning process and asking for their recommendations on candidates. Below is a list of organizations we are contacting.

If you know of others (or individuals) we should contact, please inform us. Interested members of the public will be encouraged to share their ideas and concerns with team members and the Department throughout the planning process.

All local Fish and Game Advisory Committees and Regional Councils
Alaska Big Game Handgunners Association
Alaska Big Game Trophy Club
Alaska Bowhunters Association
Alaska Center for the Environment
Alaska Chapter of The Wildlife Society
Alaska Conservation Foundation
Alaska Environmental Lobby
Alaska Federation of Natives
Alaska Frontier Trappers Association
Alaska Outdoor Council
Alaska Professional Hunters Association
Alaska Professional Sportsmen's Association
Alaska Public Lands Information Center
Alaska Sports and Wildlife Club
Alaska State Archers Association
Alaska State Rifle & Pistol Association
Alaska Trappers Association
Alaska Wildlife Alliance
Anchorage Audubon
Anchorage Sportsmen's Association
Arctic Audubon
Clear Sky Sportsmen's Club
Delta Sportsmen's Association
Ducks Unlimited (Alaska Chapter)
Foundation for North American Wild Sheep (Alaska Chapter)
Ft. Wainwright Sportsmen's Association
Glacier Bear Archers
Golden North Archery Association
Greenpeace (Alaska Regional Office)
Interior Wildlife Association of Alaska
International Moose Federation
Izaak Walton League
Juneau Audubon
Kenai Audubon
Kenai Trappers Association
Kodiak Audubon
Kodiak Island Sportsmen's Association
Matanuska Valley Sportsmen
Midnight Sun Hybrid Wolf Association
Lynn Canal Conservation
Narrows Conservation Coalition
National Audubon Society (Alaska Regional Office)
National Wildlife Federation (Alaska Regional Office)
Nature Conservancy (Alaska Regional Office)
North American Wolf Society
Northern Alaska Environmental Center
Peninsula Sportsmen
Petersburg Rod and Gun Club
RuralCap
Safari Club International (Alaska Chapter)
Sierra Club (Alaska Regional Office)
Sitka Conservation Society
Sitka Sportsmen's Association
Southeast Alaska Conservation Council
Southeast Alaska Trappers Association
Taku Conservation Society
Tanana Valley Sportsmen's Association
Territorial Sportsmen
The Wilderness Society (Alaska Regional Office)
Tok Shooters Association
Trustees for Alaska
United States Wolf Hybrid Association (Fairbanks Chapter)
University of Alaska (Wildlife Department)
Valdez Sportsmen's Association
Wolf Song of Alaska
Wrangell Resource Council
Yakutat Resource Conservation Council

Alaska Wolf Management Planning Team

Meeting Summary
November 14-15, 1990

INTRODUCTION

The first meeting of the Alaska Wolf Management Planning Team was held on November 14-15 at the Barratt Inn in Anchorage. Connie Lewis, a professional facilitator associated with the Keystone Center, chaired the meeting. She opened the session by describing her background and role as facilitator of the team. Team members introduced themselves, provided background on their involvement with wolves, and stated their expectation of the team. A list of team members, department staff, agency representatives, and members of the public who attended the meeting is contained in Appendix A.

Team orientation began with John Hechtel, wildlife biologist with the Alaska Department of Fish and Game, Division of Wildlife Conservation (DWC), presenting a historical overview of wolf management in Alaska. John Schoen, conservation biologist, DWC, explained why the planning team was established, how team members were selected, and documents the team is expected to provide. The planning team will make recommendations that the DWC will use to develop a statewide wolf management plan and will make proposals to the Board of Game to change hunting and trapping regulations related to wolves.

CONSENSUS PROCESS

Ms. Lewis described the consensus process. She emphasized that certain rules are necessary to promote an open exchange of ideas. The group agreed to four basic rules:

1. articulate your interests and concerns
2. try to understand other interests, keep an open mind, and listen
3. try to fashion solutions that meet all interests (not just our own)
4. understand that not every recommendation will be your first choice

Ms. Lewis emphasized that members must always be in a frame of mind to strive for consensus, yet maintain their basic values. No one will be expected to compromise those values. The team established ground rules to promote discussion and maintain a professional atmosphere.

Those rules are:

1. all values will be respected and considered to be valid
2. all comments will be depersonalized
3. all disagreements will be discussed on a professional level
4. everyone has equal access to the floor
5. team members will serve not as a formal representative of their respective organizations/agencies, but rather as individuals.

The team realized that reaching consensus may not be possible on some issues. The team has three options in such cases: they can (1) adopt a team position by majority vote, (2) provide minority and majority opinions in the report, or (3) lay out the range of options without reference to the amount of support for each. The team agreed to strive to reach consensus on all issues. If consensus cannot be reached, options will be presented in the report. Votes will not be taken. No decision was reached on listing options as minority or majority viewpoints. Most team members believed that all points of view should be treated equally. A decision on this issue will be made on a case-by-case basis if it becomes obvious that a consensus, through compromise, cannot be reached.

PUBLIC PARTICIPATION

The team recognized the value of public participation in its deliberations, but was concerned that certain types of public participation could be disruptive to the consensus process. The public may attend all meetings but will not be able to participate in the discussion. The team agreed to receive public testimony at two forums - one in Fairbanks and one in Anchorage. Because some interested people will be unable to attend the forums, the team also will accept written comments throughout the process. The team also invite speakers with specific expertise to address topics agreed to by team members.

Information about planning team activities will be made available to the public through:

1. media announcements of the dates, times, and locations of meetings
2. distribution of meeting summaries to interested individuals, organizations, and agencies
3. news releases following each meeting.

The team recognized that contacts with the media must be handled carefully to avoid unnecessary polarization and disruption of the process.

The team, therefore, agreed to the following:

1. the facilitator would act as the point person for media contact
2. calls to team members will be answered with a description of the process, referral to Ms. Lewis and meeting summaries for specific information

Some team members are affiliated or associated with organizations. These members should strive to review meeting summaries with these organizations to obtain feedback and share information. Several members are not associated with any organization or constituency. These members will share information and meeting summaries with interested people as best they can.

Dale Kohlmoos, wildlife biologist, DWC, will compile meeting summaries. The summaries will cover the topics discussed and list all actions and decisions made by the team. The summaries will not attribute statements or positions to individuals. Meetings will not be tape recorded. Technical presentations by invited speakers may be tape recorded.

The product of the process will be a report with recommendations for wolf management. Ms. Lewis described the report as an evolving process, beginning with an outline and using technical information as preamble and appendices. Any points of consensus achieved during discussion will be clearly noted. A staff person will record the consensus as stated by the group.

IDENTIFICATION OF ISSUES

In a brainstorming session, the team developed a list of issues to be addressed by the team. The issues were then grouped into four sections that will provide a framework for the process. The sections include:

1. technical
2. goals/general policy
3. management strategies
4. implementation

Appendix B summarizes issues by section.

To operate within this framework, the team established the following schedule.

1. January 11-12, 1991, Anchorage, Barratt Inn
   Technical Information and Outline of Goals and Policy

2. February 8-9, 1990, Anchorage, Barratt Inn
   Goals and Parameters/Strategy

3. March 8-10, 1991, Fairbanks, North Star Borough Library
   Specific Management Strategy/Public Forum

4. March 21-23, 1991, Anchorage, Barratt Inn;
   Forum at Loussac Library
   Specific Management Strategy/Public Forum

5. April 26-27, 1991, Anchorage, Barratt Inn
   Implementation and Report

After reviewing the issues identified from the brainstorming session, team members generated a list of information needs and resource contacts. The next meeting will focus on biological information. Experienced biologists will be invited to provide information to the team.

Topics to be covered include:

1. basic biology of wolves
2. enforcement of regulations, especially land-and-shoot
3. economic value of wolves
4. predator-prey relationships

Several individuals were suggested as speakers. John Schoen and Dale Kohlmoos were asked to contact these individuals and ask them to speak to the group. A tentative agenda has been developed, but not all speakers have been confirmed. The format is outlined below:

I. Basic biology of wolves, Bob Stephenson, wildlife biologist, DWC

II. Enforcement of regulations
   A. Al Crane, law enforcement officer, United States Fish & Wildlife Service (USFWS)
   B. Joe D'Amico, Fish and Wildlife Protection officer, Alaska Department of Public Safety

III. Economic value of wolves, John Hechtel, wildlife biologist, DWC

IV. Predator-Prey relationships

Five recognized wolf experts have each agreed to submit 3-4 page summaries of predator-prey relationships.
These biologists are:

- Layne Adams, National Park Service
- Warren Ballard, DWC, retired
- Rod Boertje, DWC
- Gordon Haber, private consultant
- Vic VanBallenberghe, US Forest Service

The team recognized that wolf-predator relationships are a controversial subject and expert biologists disagree on many "fine points," but probably agree on 90 percent of the major concepts. To assist the team, these five papers will be summarized by an independent biologist, Terry Bowyer, associate professor of wildlife management, University of Alaska, Fairbanks. Dr. Bowyer will list points of agreement and points of disagreement for the team. Dr. Bowyer's synthesis will be reviewed by Dr. Todd Fuller, assistant professor of wildlife biology, University of Massachusetts.

Each of the five biologists who will prepare a paper was asked to make an oral presentation and be available for questions. Warren Ballard and Layne Adams will not be able to attend the meeting. The three other speakers will each have 30 minutes to summarize their papers for team members. Ample time will be available for questions.

AVAILABILITY OF SCIENTIFIC LITERATURE

The DWC will prepare a list of scientific publications and reports that the team may wish to read. Team members can check if they want to receive the entire paper or the abstract. Any material sent to individual team members by the public should be sent to Ms. Lewis for distribution to the entire team.

Written comments may be sent to Ms. Lewis at: 4764 Mills Dr., Anchorage, AK 99508.

Appendix A. Attendance, November 14-15, 1990 Wolf Planning Team Meeting

Team Members present

Bob Ahgook	(subsistence hunter and trapper, Anaktuvuk Pass)
Scott Bothwell	(sportsman, Fairbanks)
Valerie Brown	(environmental activist, Anchorage)
Ray Collins	(member of the McGrath Fish & Game Advisory Committee and the Interior Regional Council, McGrath)
Peggy Cowan	(education specialist, Juneau)
John Doore	(wolf enthusiast, Anchorage)
Robert Heyano	(hunter and trapper, Dillingham)
Larry Holmes	(member of the Anchorage Fish & Game Advisory Committee, Girdwood)
Chuck McMahan	(hunter, trapper and pilot, Glennallen)
Wayne Regelin	(Deputy Director of Wildlife Conservation, Fairbanks)
Ann Ruggles	(environmentalist, Fairbanks)
Dean Wilson	(fur buyer, Copper Center)

Jack Lentfer, Board of Game
Connie Lewis, Facilitator

Members unable to attend
Dave Cline (National Audubon Society, Anchorage)

Division of Wildlife Conservation Staff
John Hechtel
Dale Kohlmoos
John Schoen

Agency Representative
Paul Schmidt, United States Fish & Wildlife Service

Public
Susan Ruddy
Vic VanBallenberghe

Appendix B. Issues by section

Technical
- Definition of terms
- Wolf population monitoring/technique/data, uses and needs
- Pack dynamics
- Predator/prey relationships
- Predator control programs
- Enforcement capabilities

Goals/General policy
- Long term population goals
- Management goals/area
- Ethics of study/technique
- Assess user groups/needs
- Attitude of the general public

Management strategies
- Method and means/area
- Needs of user groups/area
- Need for predator control/area
- Interagency coordination
- State economic development

Implementation
- Education/responsibilities of all parties
- Public/agency/interagency relations
- Role of politics - biology
- Recognition of decision making body/timing of action
- Enforcement

ALASKA WOLF MANAGEMENT PLANNING TEAM

JANUARY 11 - 12, 1991 MEETING
BARRATT INN, ANCHORAGE

Friday January 11, 1991

9:00	Preliminaries (introductions, review of agenda, approval of last meeting's summary, logistics, etc.)
10:00	Basic wolf biology - presentation (Bob Stephenson) and discussion
12:00	Lunch
1:00	Enforcement - presentation (Al Crane & Joe D'Amico) and discussion
2:30	Predator/prey/human relationships - presentations (Rod Boertje, Gordon Haber, and Vic VanBallenberghe) and discussion
5:30	Adjourn

Saturday January 12, 1991

8:30	Economics - presentation (Fish & Game Dept. staff) and discussion
9:30	Review of available information and identification of what still needs to be obtained - group discussion
11:00	Terminology - group discussion
12:00	Lunch
1:00	Goals and general policy - group discussion
5:00	Adjourn

Connie Lewis
Facilitator
333-9215

Alaska Wolf Management Planning Team

Meeting Summary
January 11-12, 1991

INTRODUCTION

The second meeting of the Alaska Wolf Management Planning Team was held on January 11-12 at the Barratt Inn in Anchorage. The focus was on developing a base of information for the team members. There were presentations by Alaska Department of Fish & Game (ADF&G) biologists and guest speakers on wolf biology, predator/prey relationships, enforcement, and economics. A list of speakers, team members, department staff, and agency representatives who attended the meeting is contained in Appendix A.

BASIC WOLF BIOLOGY

Bob Stephenson, wildlife biologist with ADF&G, Division of Wildlife Conservation (DWC), opened the series of presentations with a discussion on wolf biology. His topics included the history of wolves in Alaska, natural history and biology of wolves, food habits, and the status of wolf populations in Alaska.

History

Wolves entered North America 500,000 years ago. Approximately 20,000 years ago, much of the continent was covered by the Wisconsin ice sheet. During that period, wolves were abundant, but geographically isolated in ice-free areas. Genetic isolation accounts, in part, for the larger wolf inhabiting most of Alaska and northern Canada today. A smaller white wolf, which inhabits the high arctic, also developed during that period, as well as the smaller subspecies that currently inhabits southeast Alaska and the U.S.-Canadian border.

Prior to 10,000 years ago, the fauna and habitat of Alaska was very different. There appears to have been a much greater biomass of prey animals and greater diversity of species, of which most are extinct. The wolf has been very successful in surviving these changes and still has one of the largest ranges of land mammals in the world.

Wolves have adapted to all habitat types found in Alaska. However, their present distribution does not include Admiralty, Baranof, Chichagof, or Kodiak, nor the majority of the Aleutian islands. Wolves never colonized these areas after the ice age. The scarcity of wolves in certain areas of the state (e.g. many coastal areas) is attributed to a combination of factors which include their vulnerability to man in open country, low to non-existent populations of large ungulates, and disease.

Most of Alaska's forests, mountains, and tundra are frequented by wolves. It is common to see wolves at four to six thousand feet elevation. Wolves are long-distance travellers whose welfare ultimately depends on good habitat and prey abundance.

Life History

Wolves breed in late February-March. Most packs have one litter each year, but as many as three have been recorded. Female wolves mature when 22 months old and approximately 85 percent of those go through an estrus cycle each year. On average, 70 percent will become pregnant and give birth to four to seven pups. Generally, survival of the pups is high, though dependent on the experience of adult pack members and food availability.

Most litters are born in mid-May. Immediate needs are food, shelter and protection from predators. The growth of pups is dependent on diet, especially during the first six months. Pups weigh approximately 30 pounds by September, and continue to grow rapidly until mid to late winter.

Adult wolves center their activity around the den through the first half of the summer. Most den sites have a southerly exposure with warm, well drained soil that is easily excavated. Den sites are often used for many years. Availability of den sites does not appear to be a limiting factor in Alaska.

In late July, wolves move to what is called a rendezvous site. This site may be changed periodically. These sites continue to be the center of activity for adults while the pups continue to develop. When pups are big enough, the pack will begin to travel extensively, visiting the edges of their home range. In winter, wolves are known to temporarily abandon their home range and travel up to 100 miles or more in search of prey.

Most wolves in the population are less than five years old. The age curve composition falls rapidly between five and six years, and there are few wolves older than six. Records indicate however, that wolves have lived as many as 15 years.

The size of wolves in Alaska varies. Adult males average 100 pounds and females 10-15 pounds lighter. Also, there is considerable variation in the color of wolves in the state. Seventy percent are gray color, with the majority of those having brown undertones. In general, wolves in Alaska have a high pelt quality.

Most packs in Alaska include six to twelve wolves, but packs of 20 or more are not uncommon. Lower density populations average a smaller pack size. Bigger packs are generally found were moose are a major prey source. Current high density areas are in central Alaska (unit 20A), Kenai Peninsula, and southeast Alaska. High

densities are generally associated with high prey populations and low wolf mortality.

There is an elaborate social structure with separate rank orders among males and females. This is a dynamic feature and not all packs are identical. Studies indicate that wolves are better at problem solving compared to dogs which are better at being trained.

Food habits

Large mammals including moose, caribou, sheep, goat and deer, account for about 90 percent, by weight, of the wolf diet in Alaska. Generally, wolves catch a small proportion of the animals they chase. Most packs rely on two or more prey species and will switch prey depending on availability. Wolves usually kill one prey animal at a time, although it is not uncommon to find more than one animal killed in some cases.

Wolves and bears kill many newborn (0-6 weeks) moose, but calf vulnerability is greatly reduced by mid-summer. Bears and wolves associate at kills and bears commonly drive wolves from their kill.

In addition to large mammals, wolves are known to catch small mammals to supplement their diet. Ground squirrels, hares, and beaver can be caught daily, when they are abundant.

Status in Alaska

Techniques used for wolf population estimates incorporate a number of characteristics of wolves. Pack structure, color composition and distinctive trails in the snow make aerial censusing feasible in most areas. Experienced personnel can accurately estimate numbers of wolves where snow conditions allow aerial tracking.

The range of a pack can be determined after tracking throughout a winter. Using known pack distributions, it is possible to extrapolate a general distribution of the total population in a given area. Radio telemetry facilitates the location of packs. More than 180 packs have been monitored using radio telemetry for periods of two to eight years. Most packs have two or three collared animals. When estimating the number of wolves in large areas, biologists compile data using telemetry, aerial surveys, and pilot/trapper reports. Alaska DWC estimates between 700-900 packs in the state which include from 5900-7900 wolves.

Dispersing wolves (i.e. wolves not affiliated with packs) are numerous, but difficult to count. Yearlings can disperse more than 500 miles. Mortality is higher among dispersing animals than for pack members. Collared wolves have traveled from southcentral Alaska to the eastern Brooks Range, from central Brooks Range into the Yukon and Northwest Territories, from the northeast corner of the state to the Selawik flats, and from the Kenai Peninsula to the Denali and Fairbanks areas. Travel between these areas has taken

from a few days to six months. Occasionally, there are long distance movements of entire packs.

Extensive long-range movements by wolves probably account for general character similarities among wolves in Alaska and northwest Canada. At one time, more than 20 subspecies of wolf were thought to inhabit North America. However, taxonomists now believe that no more than five subspecies are warranted.

There are several sources of natural mortality of wolves. Rabies sometimes has drastic effects on wolves in northern and western regions of the state, while other canine diseases have only minor effects. The social nature of wolves facilitates the spread of disease. Diseases which appear to have minor affects on wolf numbers are canine hepatitis, distemper, and parvo virus. Susceptibility to these diseases is associated, in part, with poor nutritional condition. Approximately 10 percent of the wolves in the state are exposed to distemper. Rates of exposure to hepatitis and parvo are higher. However, mortality from these diseases is apparently quite low.

Uncommon causes of death include food poisoning, incapacitation by porcupine quills, and bone disease. There may be starvation where prey is very scarce. In most situations, wolves are resilient to food scarcity and can fast for several days without long term effects. Physical injury is very common in adult wolves. Broken/healed ribs are found in approximately 26 percent of the adult wolves in Alaska and healed skull injuries are documented in approximately 36 percent of the population. Both injuries are especially common among wolves hunting moose.

A significant mortality factor is other wolves. An example is a dramatically decreasing prey population and a large wolf population. Adult mortality as great as 65 percent has been documented in cases where trespassing between packs is common. This type of mortality is a regular feature in wolf populations and can account for 10-20 percent mortality each year. Mortality from strife within packs most commonly would occur during breeding season and especially among females.

Human influenced mortality accounts for 11-14 percent of the Alaska wolf population. The state's total reported harvest in the last 10 years has averaged 842 wolves.

In conclusion, Mr. Stephenson noted that the statewide wolf population estimate is of limited use in evaluating our success in wolf conservation. Wolf populations should be evaluated area by area, based on the number of wolves relative to available prey resources and previously mentioned limiting factors. Population decreases in one area can be balanced by increases in another, with very little change in the state's total wolf population.

PREDATOR/PREY RELATIONSHIPS

Speakers on the panel were Rod Boertje, wildlife biologist with ADF&G, DWC; Gordon Haber, wildlife scientist, private consultant; and Vic VanBallenberghe, wildlife biologist, U.S. Forest Service (USFS). Brief summaries by each speaker, and two other scientists who were unable to attend the meeting are contained in Appendix B.

ENFORCEMENT

Guest speakers were Al Crane, enforcement officer with the U.S. Fish and Wildlife Service (USFWS); and Phil Gilson, from Alaska Fish and Wildlife Protection (FWP). They focused on the interpretation and enforceability of the Airborne Hunting Act (AHA) 16 U.S.C. 742j-1 and applicable state regulations (50 CFR 19). Both are contained in Appendix C.

Definitions clarified for the group were: "aircraft"-any contrivance used for flight in the air, and "harassment"-to disturb, worry, rally, concentrate, harry, chase, drive, herd or torment. State regulated land and shoot hunting is legal when it is conducted under legislative exception to federal law.

Legislative history shows that Congress did not intend to restrict the use of aircraft as a means of transportation for hunting. Mr. Crane pointed out that the state law does not conflict with this interpretation and that Congress meant the act to cover only intentional harassment of animals. He emphasized the word "knowingly" in the federal law.

In Alaska, there are 87 active enforcement officers. Nine special assignment officers focus on violations involving the use of aircraft. The team questioned whether the current number of field officers could effectively enforce the regulations. The panel suggested that the current level of enforcement has provided a significant level of deterrence.

In conclusion, panel members emphasized that public education, about the laws would be more effective than increasing the number of field officers.

ECONOMICS

John Hechtel, wildlife biologist with ADF&G, DWC, presented an overview of wolf-related economics in Alaska. He pointed out that very few data are available.

Data for determining total economic value of wolf pelts for the state do not exist. Industries associated with trapping are fur dealing, tanneries, taxidermists, furriers, handicraft

manufacturing, cottage industries, and retailers. A study in interior Alaska reported 61 percent of the trappers said the income was important, 25 percent said it was solely recreational, and 12 percent said it was both.

Other non-market values of trapping are essential to communities that are geographically isolated. The value in trade and barter, as a food source, clothing, lifestyle, and culture/tradition are examples.

It is difficult to determine exactly how many people are engaged in trapping. Trapping licenses are sold in combination with hunting and fishing licenses. Three groups don't need trapping licenses: people under 16 years old, over 60 and low-income people who qualify for a $5 license which covers hunting, fishing and trapping. A 1978-79 study conducted in southeast Alaska suggested that 5.1 percent of the total male population and 1.1 percent of the total female population engaged in trapping. The study also indicated a higher percentage of native women engaged in trapping than women from other ethnic groups. A 1978 study done in interior Alaska suggested there were 19,500 people licensed to trap and approximately 28,000 people engaged in trapping. The sale of trapping licenses in Alaska peaked in the mid 1980's and is declining. Revenues to the state from the sale of trapping licenses is about $50,000 annually.

Hunting of wolves, in addition to trapping, provides direct economic benefit through hunting license sales and guide services. The market value of all raw furs from Alaska between 1980 and 1990 is estimated at $2-6 million. The value during that period for raw wolf pelts is estimated at $150,000-$200,000. There are 18 fur dealers in Alaska.

Appendix D contains figures showing numbers of wolves sealed in Alaska, percentages of wolves taken from different game units, estimated raw fur and wolf pelt values, trapping license income and numbers of trapping licenses sold.

Tourism can be another economic benefit from wolves, primarily in services rendered. The abundance of wildlife in Alaska, including wolves, is one of the many reasons why people visit the state. However, it is difficult to quantify the exact economic benefit that is derived from a particular species. Mr. Hechtel noted that tourism is the third-largest industry in Alaska, with about 500,000 visitors per year.

Tourism provides 11 percent of the employment in the state, and 7 percent of the wages and salaries. It represents 1 percent of the state's gross economic output. Some economists predict that by the year 2000, tourism will be the largest contributor in the world to the global economy. There is a 'willingness to pay' to see or hear wolves. In Algonquin Park, Canada, tourists willingly pay to

participate in wolf-howling sessions. Up to 1,500 people can participate per session. The international wolf program in Minnesota charges up to $400 per weekend to take people out on snowshoes or cross country skis to track wolves. Mr. Hechtel noted studies which indicate site-specific wildlife viewing limits the carrying capacity of the area.

The Wolf Action Group in Missoula, Montana, is encouraging a tourism boycott of Alaska because they claim that Alaska has "wiped out" a "large percentage of its wolf population".

INFORMATION REVIEW AND SYNTHESIS

Following the technical presentations, team members identified points that members agreed with and questions that were raised by the presentations. Points of agreement and questions are contained in Appendix E.

KENAI LOUSE INFESTATION

The Kenai louse infestation was not discussed in Stephenson's presentation. Appendix F contains a brief review and update.

ADDITIONAL INFORMATION NEEDS

The team identified additional information that would be helpful in future deliberations:

History of the federal Airborne Hunting Act.

Predator control provisions from other states and provinces.

Total wolf tags for non-resident hunters and numbers of wolves taken by non-residents.

Total acreage for different land use management areas and a review of the relevant policies for management.

Copies of the Mr. Stephenson's wolf density/packs maps.

Additional background from enforcement agencies about land-and-shoot hunting and the number of violations, ideas about enforcement alternatives, and National Park Service data on land-and-shoot hunting violations in Denali Park.

Habitat areas that are critical for subsistence or that are 'hot spots' of controversy. (The group agreed that the best way to approach this might be through discussion within the group - i.e., drawing upon the combined wisdom of all the team members).

Written comments/testimony from hearings on wolf management in the state. (Notebooks containing copies of the comments and testimony will be made available during future team meetings).

Background on the International Union for the Conservation of Nature (IUCN) wolf group. (It was recommended that Dr. Mech, an IUCN representative, be invited to speak to the team).

Rules of fair chase (e.g. from the Boone and Crocket Club).

Summary of the attitude surveys by Stephen R. Kellert.

Alternative management strategies, e.g., habitat enhancement, predator birth control, and diversionary feeding. (It was suggested that John Schoen prepare a presentation for a future team meeting).

Economics of prey species (e.g., value of meat).

Non-resident moose and caribou tags.

1978 Wildlife Society Monograph on Sustainable Use of Wild Living Resources (the section on basic broad principles).

TERMINOLOGY

To facilitate a common understanding of terminology, the following ideas were clarified:

Wolf control-a program to dramatically reduce the wolf population in an area (reference state regulations for the criteria).

Harvest-wolves taken by either hunting or trapping methods.

Same-day-airborne (SDA) hunting-can shoot an animal the same day you travelled in an airplane (other than a commercial flight).

Land-and-shoot-A way to harvest wolves. A subset of SDA hunting. A common vernaculars which is not used in the regulations.

Wolf management/conservation-System management (includes habitat protection, ungulate management, bear management etc.). Distinguished from wolf control and wolf harvest.

WOLF HYBRID ISSUE

The team considered incorporation of the hybrid issue into their schedule, but decided the complexity of the issue would require more time for study than the team could allow. The issue will be stated as needing to be addressed.

Appendix A. Attendance, January 11-12, 1991 Alaska Wolf Management Planning Team Meeting

Team Members present

Bob Ahgook	(subsistence hunter and trapper, Anaktuvuk Pass)
Scott Bothwell	(sportsman, Fairbanks)
Valerie Brown	(environmental activist, Anchorage)
Dave Cline	(National Audubon Society, Anchorage)
Ray Collins	(member of the McGrath Fish & Game Advisory Committee and the Interior Regional Council, McGrath)
Peggy Cowan	(education specialist, Juneau)
John Doore	(wolf enthusiast, Anchorage)
Robert Heyano	(hunter and trapper, Dillingham)
Larry Holmes	(member of the Anchorage Fish & Game Advisory Committee, Girdwood)
Chuck McMahan	(hunter, trapper and pilot, Glennallen)
Wayne Regelin	(Deputy Director of Wildlife Conservation, Fairbanks)
Ann Ruggles	(environmentalist, Fairbanks)
Dean Wilson	(fur buyer, Copper Center)

R. T. "Skip" Wallen , Board of Game
Connie Lewis, Facilitator

Guest Speakers
Rod Boertje, Alaska Dept. of Fish & Game, Div. Wildlife Conservation
Al Crane, United States Fish & Wildlife Protection
Phil Gilson, Alaska Fish & Wildlife Protection
Gordon Haber, private consultant
Vic VanBallenberghe, United States Forest Service

Division of Wildlife Conservation Staff
John Hechtel
Dale Kohlmoos
John Schoen
Chris Smith
Ken Taylor

Agency Representative
Paul Schmidt, United States Fish & Wildlife Service

Public
Bill Barrickman
Dan Dennis
Ralph Feriani
John Frost
George Constantine
Victoria Harman
Sherie Hind

Karen Koenemann
Dave Kretsinger
Michael Lewis
Al Lovaas
Cindy Lowry
Brad Precosky
Katharine Richarson
Fred Samson
Steve Shackelton
Bill Sherwonit
Kristian Sieling
Karen Stevens
Gene Terland
Jon Waterman
Steve Wells

ALASKA WOLF MANAGEMENT PLANNING TEAM

FEBRUARY 8 - 9 1991 DRAFT MEETING AGENDA

(Barratt Inn, Anchorage)

Friday February 8, 1991

9:00	Preliminaries (ground rules, agenda review, approval of last meeting's summary, logistics etc.)
9:20	Speaker Tina Cunning from Alaska Dept. of Fish & Game, discussion on land use management policies including all agencies in Alaska
10:30	Technical information - distribution of materials obtained since last meeting and discussion of potential future speakers
11:00	Goals discussion
12:00	Lunch
1:00	Goals discussion continued
5:00	Adjourn

Saturday February 9, 1991

8:30	Goals discussion
12:00	Lunch
1:00	Public forums - discussion of format and preparation
2:00	Beginning of management options discussion
4:30	Meeting debriefing
5:00	Adjourn

Alaska Wolf Management Planning Team

Meeting Summary
February 8-9, 1991

INTRODUCTION

The third meeting of the Alaska Wolf Management Planning Team was held on February 8-9 at the Barratt Inn in Anchorage. A list of attendees is contained in Appendix A.

COMMENTS ON PREVIOUS MEETING SUMARY

The team indicated that they did not think the summary enforcement section adequately covered the presentation by Mr. Crane and Mr. Gilson. In particular, the summary did not reflect comments that had been made about the degree to which land and shoot hunting might be problematic or illegal. Transcripts of the presentation will be reviewed and the section rewritten.

DISCREPANCIES BETWEEN WOLVES TAKEN AND WOLVES SEALED

Bob Ahgook agreed to respond to a question about the percentage of wolves harvested, but not sealed in North Slope village areas. Based on his experience, Bob estimated 25 percent of the wolves harvested in these areas are not sealed. Many villages do not have access to a license officer, therefore, many residents do not purchase state licenses. Sealing agents work essentially as volunteers and may not always complete the appropriate paperwork. Since Anaktuvuk Pass is the headquarters for a research project in which wolf carcasses are being purchased, it may be possible to do a comparison of wolves taken versus wolves sealed in that area. Some of the hides are sold to fur buyers, but most hides are used in North Slope cottage industries.

In interior Alaska, a higher percentage of furs are commercially sold and therefore, probably sealed. Biologists approximate less than 10 percent of the furs taken statewide are not sealed.

AVAILABILITY OF TAPES AND VIDEOS FROM THE JANUARY MEETING

Audio cassette recordings of the presentations given during the January meeting will be made available for use at the Anchorage and Fairbanks state Fish & Game offices. Those team members who specifically request them will be sent copies. Peggy Cowan, Valerie Brown, and Chuck McMahan indicated they wanted copies.

The video recording of Bob Stephenson's presentation has not been reviewed or copied and is not yet available for distribution.

INFORMATION NEEDS

Several pieces of information were distributed to the team and previously requested information was reviewed:

History of the Airborne Hunting Act (already sent to the team).

Predator control provisions from other states and provinces (Dale has written for information from 15 states and Wayne has contacted the Canadian provinces).

Number of wolf tags purchased by non-resident hunters and numbers of wolves taken by non-residents. (Information distributed to the team. Wayne noted that in 1989-90 non-resident hunters took 54 of 860 wolves taken statewide. He will look up the 1987-88 information for the next meeting.)

Acreage of land managed for different purposes (e.g. closed/open to hunting) and a review of relevant land use management policies. (Acreage statistics were distributed to the team and the respective agencies have been asked to give presentations on management policy at the March 8-10 meeting. Also, a map will be prepared showing areas in Alaska where taking wolves by any means is totally prohibited.)

Copies of Mr. Stephenson's wolf pack distribution map (Dale expects to have copies by the March 8-10 meeting).

Additional background from enforcement departments about enforcement of land and shoot hunting and the AHA--e.g. number of violations with airborne hunting and wolves; ideas about enforcement alternatives; and Park Service data on infringements of prohibitions on land and shoot wolf hunting in Denali Park. Some specific questions that team members will ask to be addressed: 1) Do the agencies perceive a problem with the methods and means of SDA hunting? 2) Is SDA hunting compatible and desirable on the agency lands where it is practiced? 3) Is there data suggesting problems with enforceability of current laws? 4) What is the agencies' perspective on the public attitude concerning SDA hunting? (Agency presentations at the March 8-10 meeting are expected to cover management policy, SDA hunting, and enforcement. Al Crane will be contacted about the possibility of doing a written follow-up to his January presentation.)

Written comments/testimony from hearings on wolf management in the state. (A notebook containing comments and testimony will be available at meetings.)

Background on the International Union for the Conservation of Nature (IUCN) wolf group. (Bob Stephensen has contacted IUCN

representative David Mech, about making a presentation to the team on March 21. Details are pending.)

Rules of 'fair chase' (Boone & Crocket Club rules already sent to the team. The team suggested contacting Safari Club International, Isaac Walton League, and firearm/ammunition manufacturers also.)

Summary of the attitude survey by Stephen R. Kellert (already sent to the team).

Alternative management strategies, e.g. habitat enhancement, birth control for predators, diversionary feeding (Wayne has coordinated a short ADF&G presentation for whenever the team wants it).

Economics of prey species, e.g. value of meat (distributed to the team).

Number of non-resident moose and caribou tags (distributed to the team).

1978 Wildlife Society monograph on Sustainable Use of Wild Living Resources, especially the section on basic broad principles (Wayne will obtain and excerpt copies for the next meeting).

DISCUSSION FRAMEWORK

The team developed the following working report framework to help guide their discussions:

Working Report Framework

1. Introduction

2. Findings-points of fact that everyone on the team agrees with and thinks are important to include.

3. Goals-the ends or final purposes towards which management strategies should be directed. These are very broad statements.

4. Principles/Policies-more specific statements that should serve as guides for developing the management strategies.

5. Management Strategies
   - Objectives-measurable targets
   - Recommended actions

FINDINGS

Drawing upon the "points of agreement" that emerged from the information review and synthesis discussion during the January meeting, the team came to consensus on a set of findings which are contained in Appendix B Working report draft.

It was clarified, that team members have the right at any stage of the discussion up until the end, to change their minds on points of consensus.

GOALS

The facilitator explained to the group that she had typed and categorized the draft goals hand-written by the participants at the close of the previous meeting. The team recognized that many of the points on the typed list were not really "goals", but rather principles or management strategies. The group reviewed and revised the categories:

Draft Goals Categories

Broad conservation goals

Broad use goals

Managing-general concepts

Non consumptive uses

Hunting-ungulates

Hunting and trapping-wolves

Control-wolves

Alternative means (include habitat)

Zoning (include habitat)

Monitoring and research

Education

Funding

Enforcement

Public involvement

Research

Drawing from that typed and recategorized draft goals list, the team then embarked on a discussion of goals for wolf management in Alaska. The consensus goals developed by the team are included in Appendix B Working report draft .

PRINCIPLES

The team then discussed and agreed to a set of principles, also included in Appendix B.

MANAGEMENT STRATEGIES

As the team began its discussion of management strategies, it became apparent that they needed to re-clarify what was meant by the term "wolf control". They realized that in using this term, they were talking about two distinct things:

1. "Wolf predation control"-a program carried out under Alaska statute 5 AAC 92.110, to dramatically reduce the population of wolves [in a given area] for the benefit of ungulates. For example, in a "predator pit" situation.

2. "Wolf population regulation"-a program to maintain wolf populations at a pre-determined level [in a given area] for the benefit of ungulates. Increasing bag limits on wolves has been one means used by ADF&G to accomplish wolf population regulation.

The team concluded by recognizing that a significant focus of their future deliberations will be on possible acceptable criteria and methods and means for wolf hunting and trapping for both sport and subsistence purposes, wolf predation control, and for wolf population regulation.

PUBLIC FORUMS

It was clarified that the objective in holding public forums is to provide an additional avenue, other than written comment, for the public to offer input to the team. The first public forum will be in Fairbanks at the Wedgewood Manor on Friday, March 8 from 1:30 p.m.-5:00 p.m. and Saturday, March 9 from 8:30 a.m.-12:00 noon.

The second forum will be in Anchorage during the afternoon and evening of Thursday, March 21 at the Barratt Inn, specific times will be determined later. Connie Lewis will moderate the sessions.

Based on the numbers of speakers anticipated (50-150), the team decided to allocate a maximum of three minutes per individual speaker and five minutes for organization representatives. There will be a speaker sign-up sheet at the door. The time limit rule and information about the team's purpose will be posted. Copies of

meeting summaries will also be posted. There will be a sign up sheet for people who would like to obtain copies of the summaries.

PRESENTATIONS AT UPCOMING MEETINGS

The U. S. Department of Interior, Bureau of Land Management, National Park Service and Fish & Wildlife Service; and U. S. Department of Agriculture, Forest Service, have been asked to send a representative to speak to the team on the morning of March 8. Wayne is coordinating those presentations. Dr. Mech (IUCN) and Al Manville (Defenders of Wildlife) have been asked to provide brief presentations Thursday morning, March 21.

Appendix A. Attendance February 8-9, 1991 Alaska Wolf Management Planning Team Meeting

Team Members present

Bob Ahgook	(subsistence hunter and trapper, Anaktuvuk Pass)
Scott Bothwell	(sportsman, Fairbanks)
Valerie Brown	(environmental activist, Anchorage)
Dave Cline	(National Audubon Society, Anchorage)
Ray Collins	(member of the McGrath Fish & Game Advisory Committee and the Interior Regional Council, McGrath)
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Larry Holmes	(member of the Anchorage Fish & Game Advisory Committee, Girdwood)
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Wayne Regelin	(Deputy Director of Wildlife Conservation, Fairbanks)
Ann Ruggles	(environmentalist, Fairbanks)
Dean Wilson	(fur buyer, Copper Center)

Jack Lentfer, Board of Game
Connie Lewis, Facilitator

Division of Wildlife Conservation Staff
Dave Anderson
John Hechtel
Dale Kohlmoos
John Schoen
Chris Smith

Agency Representative
Paul Schmidt, United States Fish & Wildlife Service

Public
Katharine Richardson
Mike Lewis

Appendix B. Working report draft, February 10, 1991.

(Note: Use of the term "working" Report Draft means that it is a work in progress and will continue to evolve over time. This draft is not the final consensus of the team. Note: the comments in brackets and the "bin" at the end are intended as reminders of points that still need to be addressed.)

CHAPTER I. INTRODUCTION

To include:

Problem/need for the team.

Statement of intent of the process - i.e., to draft recommendations for wolf management policy.

Description of the team process.

Statement about how conflicts between various uses waste time that could be better spent on common interests such as habitat.

Team terminology.

CHAPTER II. FINDINGS

1. Wolves are valuable because of their intrinsic value and for their multiple values to society:

   Consumptive and non-consumptive use.

   They are a symbol of wilderness to many people and of worldwide significance.

   The role of the wolf in nature as a key member of natural food chains.

   Their contribution to rural economies.

   The special social/cultural relationship of people in rural Alaska to wolves.

2. Wolves exist as part of a complex ecological system and successful wolf conservation requires integrated protection and preservation of habitat and prey species. [Systems don't stop at political boundaries].

3. The wolf population in Alaska is not endangered. The density varies greatly throughout the State. The statewide population

of wolves is currently about 6000, but the population will vary over time due to factors beyond human control.

4. Wolf population can sustain harvest, but there is a variation in sustainable harvest.

5. [work on] Alaska is fortunate to have one of the largest wolf populations in the world and currently has extensive habitats and prey. Therefore, we have a special responsibility to ensure that wolves and their habitat are conserved. or/ Alaska is one of the few areas in the world that still has extensive habitat for wolves. We have an obligation to maintain this habitat and the wolf and prey populations it supports.

6. Wolves can affect prey populations and in some situations, can keep prey populations at low levels. Human intervention can speed recovery of the prey population in some cases.

7. Wolves are potentially vulnerable to a growing human population, habitat fragmentation, disease, development, reduction in prey species, and over harvest.

8. Wolves and their prey are of vital importance to the economy and nutritional needs of people in many areas of rural Alaska. Healthy ungulate populations are necessary for rural Alaska.

CHAPTER III. GOALS AND PRINCIPLES

A. GOALS

1) Ensure the long-term conservation of wolves throughout Alaska.

2) Provide for consumptive and non-consumptive uses and values of wolves and their prey, consistent with the principles of wildlife conservation and with due consideration to public review and comment.

3) Help increase public awareness, understanding and agreement on wolf conservation and management in Alaska.

B. PRINCIPLES

1) Minimize conflict between uses and user groups. Attempt to select management tools that are most effective but least controversial.

2) Adopt a statewide wolf management plan that recognizes differences in management goals across/within various land jurisdictions and management areas.

3) In those areas where populations of wolves and prey are manipulated, pursue management strategies to prevent prey species populations from declining into the "predator pit".

4) Wolf management should consider wolves, and manage wolves, as part of the total ecosystem, including, but not limited to, prey and predator game species. Because of the interconnectedness of prey and predator species, it is in the best interest of all concerned to do a good job of managing all systems.

5) The immediate and cumulative effects of habitat loss and fragmentation should be addressed in the management of wolves and their prey.

6) Provide protection for the genetic diversity of wolf populations. We should be more concerned with the genetic diversity of isolated wolf populations (e.g. southeast Alaska) than with populations that disperse widely and freely.

7) Develop a program that will allow the managers flexibility to take necessary emergency action consistent with approved management policies, procedures and objectives.

8) The regulations to implement wolf harvesting methods should be understandable, enforceable and consistent.

9) A wolf management program should include both public information and education programs.

10) Wolf management should provide meaningful opportunities for non-consumptive user groups to participate and share in the resource.

11) An adequate level of funding for wildlife management in the State should be ensured.

12) There is a need for ongoing research and monitoring.

13) Assure that law enforcement is adequate to prevent damage to the resource.

CHAPTER IV. MANAGEMENT STRATEGIES

APPENDICES

GLOSSARY

-predator pit

BIN (points to come back to)

Provide maximum opportunity for different consumptive user groups to participate and share in the harvestable portion of the resource as determined by ADF&G.

A. Hunters
    1. Subsistence hunters
    2. Land based hunters
    3. Land & shoot hunters
B. Trappers
    1. Subsistence trappers
    2. Recreational trappers

In areas where wolf populations are at unnaturally low levels, management should encourage the recovery of wolf numbers [dealt with in discussion of specific scenarios under management recommendations].

Species management policies - may have some useful language.

Add concept that our estimating ability (i.e. our ability to estimate wolf populations) changes over time.

Add concept of coordination with Canada.

Idea of interagency plan into recommendations

LIST OF POSSIBLE METHODS AND MEANS

(Note: there is no discrimination between legal and illegal)

Trapping
- snares
- leg-hold traps
- shooting
- SDA

Hunting/Sport
- calling/howling
- land and shoot
- SDA
- aerial
- ground shooting

Hunting/Subsistence
- calling/howling
- land and shoot
- SDA
- ground shooting

Control
- poisoning
- denning
- bait
- aerial shooting
- land and shoot
- SDA
- trapping
- hunting
- relocation
- birth control
- diversionary feeding
- radio collar
- injection

ALASKA WOLF MANAGEMENT PLANNING TEAM

March 8-9, 1991 Meeting Agenda
Wedgewood Manor, Fairbanks

Friday March 8, 1991

8:30	Preliminaries (agenda and ground rules review, approval of last meeting summary)
9:00	Agency presentations and follow-up discussion
11:00	Discussion of forum details
11:30	Lunch and forum preparations
1:30	Forum
5:00	Adjourn

Saturday March 9, 1991

8:30	Forum
12:00	Lunch
1:00	Forum debriefing
1:30	Management strategies discussion
5:00	Adjourn

Sunday March 10, 1991

9:00	Management strategies discussion continued
12:00	Lunch
1:00	Management strategies discussion continued
4:30	Meeting debriefing
5:00	Adjourn

Technical Information on Wolf Ecology and Relationships among Wolves, their Prey, and Humans: an Overview

Presented To:

Alaska Wolf Management Planning Team

By

R. Terry Bowyer
Associate Professor of Wildlife Ecology
Institute of Arctic Biology, and
Department of Biology and Wildlife
University of Alaska Fairbanks
Fairbanks, Alaska 99775-0180

8 January 1991

The purpose of this synopsis is to identify areas of agreement among reports from five individuals that compose the Wolf Technical Group on the management of wolves and their prey in an ecosystem in which hunting, predation, food supply and winter weather all may effect populations. Additionally, I have noted those areas where disagreement occurred and attempted to sort these varying notions, and provide professional guidance for the management team. Specifically, I have delineated areas where I believe ideas are not established in the peer-reviewed literature, or where information from local areas or conditions has been extrapolated too broadly.

A brief digression to explain the importance of peer-reviewed literature is essential. Peer review is an imperfect system, but it helps scientists discriminate between unfounded speculation and ideas that should become part of the knowledge of science. This does not mean that every article published in a refereed journal is correct, but that established scientists in that field believed it contributed significantly to our knowledge. Consequently, notions that are not supported by data or do not add substantially to scientific thought are less likely to find their way in to the refereed literature; such publications represent a measure of confidence that is placed in ideas. Most reviews by the Technical Group do not cite the scientific literature; instead they summarize literature from scientific sources. Wherever I do not believe there is published support for an idea, I have indicated this. Further, I have asked that Tod Fuller also review and critique my overview for its scientific merit. I take full responsibility, however, for this synopsis.

Before I begin synthesizing the views of the Wolf Technical Group, I believe some additional information is necessary to place their perspectives in a proper framework.

To understand the ecology and management of wolves, it is first necessary to grasp the dynamics of their prey. Moose, caribou, and deer are the primary prey of wolves in Alaska. Although wolves occasionally kill Dall's sheep, mountain goats, and even beaver, these prey are comparatively unimportant because the habitats they live in make them less accessible to wolves. Likewise, consumption of rodents, hares, birds and plant parts normally play a small role in the population dynamics of wolves.

In the absence of hunting, predation, and severe weather, ungulates (hooved mammals) are regulated by their food supply. This has been demonstrated repeatedly for many different species, including those ungulates preyed upon by wolves. Not all plants, however, are suitable food for ungulates--these herbivores select different plant species and plant parts throughout the year in trying to meet their nutritional needs. The availability of these foods, in combination with other features of suitable habitat, set the carrying capacity (K) for a particular area. Competition among animals of the same species for food is what regulates their populations in the absence of, or in combination with, other factors (i.e., hunting, predation, and severe weather).

When ungulate populations are at or near K, forage availability is reduced and animals obtain a relatively poor diet (because of increased competition); they are in poor physical condition, and consequently have low rates of reproduction. Conversely, populations backed well away from K have ample food, a high-quality diet, are in excellent physical condition, and exhibit high rates of reproduction. Note that this relationship between ungulates and their food supply is not based solely on number of animals or their density (animals/unit area), but on the ability of habitat to support them (K), which may vary from area to area and through time.

Because individuals at K still attempt to reproduce, more young are born than can be added successfully (recruited) to the population. In simple terms, this means that if

one young dies, it "makes room" for another young to be recruited. Thus, mortality of young near K is compensatory (one source of mortality can substitute for another). A different way to view compensatory mortality is, for instance, that a young killed by a predator would have died later anyway as a result of starvation. Mortality in populations backed well away from K, however, is additive. One source of mortality does not substitute for another, because most attempts at reproduction would be successful in the absence of the source of mortality. These young would have been recruited if not for their death (e.g., predation). In this instance, deaths due to one cause are added to those from another.

Given this basic understanding of ungulate population dynamics, I now will proceed with the overview. Because all members of the Technical Group did not address the same topics and space is limited, I have selected those areas I believe to be most relevant.

Role of Severe Weather in Regulating Ungulate Populations.

Adams, Ballard, Boertje, and Van Ballenberghe concur that winter weather has reduced ungulate populations in Alaska; Haber believes that the importance of winter weather is overstated. Ballard noted that the duration and depth of snow were critical factors (snow covers winter foods and make locomotion difficult and energetically expensive). His notion that low temperatures also are important, however, is questionable. Moose and caribou probably do not exit their thermal neutral zones (the temperature at which they must expend additional energy to stay warm) during most winters.

Although exceptionally severe winters are capable of killing ungulates irrespective of their physical condition, populations nearer K are more likely to be affected by severe weather than those farther from K because the physical condition of the animals entering winter affects their likelihood of surviving to the following spring. Van Ballenberghe points out that more moose starved in the winter of 1989-90 where their populations were higher, or food supply lower due to plant succession. Adams, Ballard, Boertje, and Van Ballenberghe agreed that deep snow also makes ungulates more vulnerable to predation. Declines in ungulate populations coincided with severe winters in the mid 1960's and early 1970's (Boertje, Adams, Van Ballenberghe), but sorting the effects of weather, food supply, hunting, and predation to find a "primary cause" is speculative at best. The important point is the concensus that weather, food, predation, and hunting all had some affect.

Wolf Regulation of Ungulates.

All members of the Technical Group agree that under some circumstances wolves can regulate populations of their prey for at least short periods of time. Wolf predation tends to be focused on old, young, and infirm individuals; nonetheless, prime individuals sometimes are killed (Adams, Ballard, Van Ballenberghe). Surplus killing may occur under conditions in which prey are especially vulnerable, but this is not thought to be common or overly important in regulating prey populations (Van Ballenberghe).

On Isle Royale, a simple moose-wolf system with no hunting, moose have "escaped" predation by wolves and populations of both predator and prey have fluctuated (Boertje, Van Ballenberghe). Haber notes that Isle Royale follows a different "limit cycle" than the Alaskan "multiple equilibria" system. Although this may be the case, Isle Royale still provides important insights into the dynamics of wolves and their prey, but these outcomes should be interpreted cautiously for a multiple-predatory, multiple-prey ecosystem. In any event, changes in prey density are likely to affect predation (Haber).

All members of the technical group agree that a combination of wolf and bear predation (especially brown bear) have the ability to hold moose populations at low levels--this is known as a "predator pit." How moose are driven into the pit, however, is less certain. Wolf and bear predation coupled with severe weather appears sufficient to produce a predator pit; low moose densities are known to occur in areas with little harvest by humans (Boertje, Van Ballenberghe). Haber believes that harvest by humans, in addition to other factors, is necessary to produce a predator pit. This opinion apparently is based on modeling outcomes rather than empirical evidence. Van Ballenberghe believes that the ratio of prey biomass per wolf may be useful in determining when wolves may regulate their prey--Haber does not. In any event, once an ungulate population is in a decline, wolves may exert an even stronger affect because there is a time-lag before the wolf population also declines (Adams, Ballard, Van Ballenberghe); indeed, wolf numbers may remain higher than expected if they respond by "switching" to alternate prey (Ballard). Bears are thought to be less affected than wolves by changes in ungulate numbers because of their broad, omnivorous food habits (Adams, Ballard, Boertje). How moose "escape" from predator pits also is open to question. Boertje cites archaeological evidence that moose were at low levels prior to European settlement, and by inference, that the predator pit may be the "normal" condition. Evidence on moose density even over the past one-half Century, let alone into prehistoric times, however, is not convincing. Most indepth studies of predator-prey dynamics in Alaska come from a time in which harsh winters were common. Hence, our understanding of these systems has been conditioned by the occurrence of severe weather, and this may be too limited in scope. Perhaps changes in alternate prey may allow moose to escape the predator pit (Boertje, Van Ballenberghe).

Caribou also may be held at low levels by predation, but recent increases indicate that combined wolf and bear predation, relative harsh weather, and current levels of harvest failed to prevent this increase, perhaps because of their migratory behavior (Adams, Boertje, Van Ballenberghe, Haber). Caribou apparently are not regulated by predation to the extent that moose have been. Wolves have held black-tailed deer on islands in Southeast Alaska to low levels (Boertje), but the relevance of this to mainland populations is less clear.

Regulation of Wolf Numbers

In the absence of harvest, wolves are controlled by the availability and vulnerability of prey (Adams, Van Ballenberghe) and to a lesser extent by their social system (Haber, Van Ballenberghe). Published tests showing that wolf social systems regulate their populations are scant, but more research is needed. Per capita biomass of available ungulate prey is thought to affect survivorship of pups, an important factor in the growth of wolf populations. Indeed, wolves have high rates of reproduction, and in some areas can withstand comparatively heavy harvests by humans (Adams, Boertje, Ballard, Van Ballenberghe). Nonetheless, legal and illegal killing of wolves by people has kept wolf populations low along the northern and northwestern coasts of Alaska (Van Ballenberghe). Extremely heavy harvests by humans are capable of regulating wolf populations in most areas. Haber is convinced that any harvesting of wolves may lead to a "social breakdown" that may prevent their rapid recovery – evidence for this is nil.

Management Options

All members of the technical group agree that multiple factors must be considered in managing wolves, and that simple systems are much easier to manage than multiple-prey, multiple-predator systems that occur in Alaska. Haber noted the need for managing large ecological units based on wolf social organization, and Adams pointed out the desirability for long-term studies and scientific experiments to improve our knowledge of predator-prey systems.

All members also noted that management is most controversial in situations where humans also use ungulates preyed upon by wolves, and Ballard makes the point that many current management problems resulted from past mistakes. Haber suggested that only wide-sale reductions in both wolves and bears can bring about marked increases in moose numbers, but Boertje and Van Ballenberghe give examples where a reduction in wolves was thought to increase moose populations. Adams, Boertje and Ballard caution that reducing bear numbers may be hazardous because bears have a much lower reproductive rate than wolves, and consequently bear populations may take longer to recover from such reductions.

Ballard notes that habitat manipulations also may enhance moose numbers. This would be most effective where populations were near K, but might bring about less of a response where moose are in predator pits (under such circumstances moose already exhibit high reproductive rates that would not be increased substantially by providing more food).

All members agree that reducing predator numbers can lead to more ungulates for human use. Further, they concur that even without predator control, some harvest of moose is possible. Controlling wolves, however, will not always lead to large increases in predator numbers, either because the ungulate population was near K or because bears were helping to regulate prey abundance. Also, for populations near K, it is possible that ungulates may be harvested without controlling wolves and still be stable. The question, then, is how much control (none to heavy), what type of control (trapping, hunting, etc) and where to apply the control. Boertje and Ballard note that initial predator control may allow subsequent increases in moose populations (escape from the predator pit) that will provide both an increased moose harvest and equivalent numbers of wolves. Van Ballenberghe offers an example of such an increase. An important point is that wolf management need not be identical for all of Alaska. Van Ballenberghe noted that the effects of humans upon wolves, ungulates, and their habitats often controls the "balance of nature". This "balance of nature," however, may include population fluctuations and multiple points of equilibria. Simply "preserving" a system may not restore the balance of nature, because past human activities may be responsible for current levels of predators and prey. Information on population densities of both predators and prey, their food supplies, affects of winter weather, and harvest by humans, and other factors are necessary to manage wolves in Alaska. Deciding what numbers of wolves, bears, and ungulates should be present on a particular area is not solely a biological problem -- society also must make decisions about what is wanted; a variety of options are available that include wolves and their prey

Finally, if wolves are to be harvested, the means of doing so are important. Land and shoot, and hunting from snowmobiles are thought to help control wolves in some areas (Haber, Van Ballenberghe). Adverse public reaction (both in Alaska and the lower United States) to such control measures, however, may have more of an effect on how wolves are managed in the future than sound biological information. Thus, an understanding of wolf and ungulate ecology must be integrated with the broader needs and desires of the society in which we live.

SUMMARY OF WOLF-PREY-HUMAN RELATIONSHIPS IN ALASKA

LAYNE G. ADAMS; National Park Service - Alaska Region; 2525 Gambell Street, Room 107; Anchorage, AK 99503-2892

Populations of wolves, bears, moose and caribou in Alaska have been on a "rollercoaster ride" over the last 50 years. Wolves were heavily exploited during much of the 1940s - 60s. In addition to types of harvest occurring today, aerial hunting of wolves was allowed and wolves were killed for bounty. Federal predator control agents killed wolves by year-round trapping and poisoning, and winter aerial hunting. Federal wolf control also inadvertently reduced bear populations. Decreases in the abundance of these large predators resulted in increased abundance of moose and caribou, which were able to support a high hunter kill.

By the late 1960s, Federal predator control had ended and wolf bounties were abolished nearly statewide. Undoubtedly, predator populations increased to take advantage of the abundant large prey. Increasing predator populations, high human harvests, a couple of bad winters, and possibly declining availability of food on moose and caribou ranges, all coincided in the early 1970s to bring moose and caribou populations crashing down in many areas. This series of events set the stage for the wolf management controversies that continue today and are the impetus for the present wolf management planning effort.

During the same time that wolf management controversies were developing in Alaska, wildlife management was "growing up". Wildlife management is a relatively young discipline that got its start in the 1930s. Up until the last decade or so, wildlife management was truly an art. Wildlife biologists had limited field "data" on animal abundance, species interrelationships, and human harvest. They applied what they could of general ecological principles, theories, and hypotheses (many were untested and a few were dead wrong) to pick a course they hoped would maintain reasonable wild populations and provide for sustained human harvest. The chances of being "right" were not very great, particularly in the vast and complex environment of Alaska. It is amazing to look back and realize that research into wolf/prey relationships did not really get started until the late 1950s. It wasn't until the late 1960s that wildlife professionals and the public alike were beginning to realize the complexity of predator/prey systems and the important role of predators. The importance of bears as predators of ungulates did not come to light until the late 1970s - early 1980s!

Since the mid-1970s, wildlife management has become more of a science and a little less of an art. The advent of radio-collars, the increasing use of aircraft in wildlife research, the results of a few long-term studies, and rigorous scientific analyses and comparisons of increasing numbers of studies have greatly improved understanding of population dynamics and interrelationships of wolves, bears, and their large prey, as well as the influences of human harvest. Still, the species' interactions are highly variable and factors that affect them can be subtle. Even today, many of the tools regularly used in wildlife biology are "blunt" and can only provide general answers to our research/management questions. In many cases, the opinions of knowledgeable, local wildlife managers, hunters, and trappers are still relied on to assess wildlife population status and trends, just like 20

years ago. Alaska is big and diverse and we will never have the manpower or money to gather, analyze and digest all the information that could be used to help with wildlife management decisions.

Areas of the state where wolf management is the most controversial have two or three large predators (wolves, brown/grizzly bears, and black bears) and either primarily moose as prey or several prey species (moose, caribou, and Dall sheep). These multi-predator and multi-predator/multi-prey systems are obviously more complex than systems with one predator and one large prey species. For example, a second prey species can either increase predation on the initial prey species (e.g. British Columbia, where moose have expanded into caribou range, supporting a higher density of wolves to the detriment of caribou populations) or reduce predation (e.g. Ontario, Minnesota, and elsewhere where white-tailed deer are primary prey for wolves and moose are buffered from wolf predation). Also, bears and wolves vary in their importance as predators on ungulates with age of the prey, season of the year, density of prey, and density of the predators. The effects of these predators on their prey can be additive to each other, replacements for each other or anything in between.

Where does hunting fit into all this? Hunting is the major driving force in most wolf management controversies in Alaska. Management is not much of an issue in areas where human harvest is nil or close to it. Hunting can add additional complexity since harvest of prey adds man as another predator to the system, affecting prey populations and potentially competing with the wild predators. Harvest of predators can directly affect their abundance and adjust the interrelationships they have with large prey species.

So wildlife professionals are faced with managing complex, interacting wildlife populations to ensure their long-term health while attempting to satisfy the diverse and often opposing needs/demands of the public. They are expected to complete this imposing task with limited area-specific information, little money or help, and only a handful of studies conducted in a wide array of places for guidance. To say the least, it is an overwhelming job!

I believe there are a few consistent "threads" that run through many of the predator/prey studies that wildlife biologists can use as a basis for their management:

1) Without heavy harvests, wolf abundance is related to the abundance of available ungulate prey. When prey are abundant, wolves will be abundant, and not many wolves will be found when ungulate populations are low. "Available ungulate prey" is made up of two components: 1) gross density of prey or pounds of meat on the hoof per acre, and 2) the relative availability or vulnerability of that prey to the wolves. The first is easy to measure, but vulnerability is not. Conceptually, vulnerability is a combination of factors that influence the likelihood of a given animal being preyed upon. Some of the factors that can be involved are:

A) Age: Young and old animals are more vulnerable to predation than prime age animals,

B) Health: Animals that are sick or injured are more likely to be preyed upon than animals in good health,

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D) Animal density: When a prey population reaches or exceeds "carrying capacity", individuals will be in poorer nutritional condition, on average, than a population at a lower density,

E) Snow conditions: Deep snows increase the vulnerability of prey species because individuals are in poorer nutritional condition and snow impedes their ability to escape from wolves.

2) When prey populations are declining because of severe winters or overgrazing, wolves can increase the rate of decline and lower the levels at which the populations bottom out. Wolves and their prey are not perfectly synchronized. As a prey population begins to decline, the preponderance of animals in poor condition actually increases the amount of vulnerable prey available to wolves. Therefore, wolf numbers can stay high, resulting in a high rate of predation on the remaining prey population. In wolf/single prey systems, wolf numbers usually crash within a few years of when the prey bottom out. The response of wolves is not as clear in multiple prey systems.

3) In places where wolves and bears occur together, predation can maintain moose populations at low levels, but apparently this does not apply to caribou. Several examples of predator-limited moose populations are available from studies conducted across North America. These low population levels may be the "natural" or unmanaged norm for these areas. It is not clear whether moose populations can "escape" from this limitation by predators on their own, but in some of Interior Alaska nearly two decades of low moose abundance have gone by, with no indications of change in the near future. On the other hand, several caribou herds in the state are increasing even though they are faced with both bear and wolf predation. Where moose and caribou overlap, increasing caribou herds may divert predation pressure from these low-density moose populations and give them the opportunity to increase.

4) Wolves are normally highly productive and can sustain high harvest and will rebound quickly if fewer wolves are harvested. In areas with reasonable prey abundance, an estimated 25 - 40% of the wolves can be harvested annually without decreasing the population. Where wolves have been reduced dramatically, as in wolf control programs, they returned to their original population size within two or three years once the harvest was reduced.

5) Bears can be important predators on moose and caribou, and they present a couple of management dilemmas. Several studies in the last 10 years have shown the importance of both grizzly and black bears as predators on moose and caribou, particularly on young calves. Bears also prey on adults of both species. Since bears can make use of a wide range of foods, their abundance is probably not strongly tied to the abundance of the ungulates they prey on, unlike wolves. Therefore, when prey populations are low, bears can have a big effect on them. Manipulating bear populations is touchy because bears are long-lived and have low reproductive rates. A little error in applying bear management plans can result in long-term effects different than desired.

6) Winter severity can play a big role in predator/prey relationships. Deep snows directly increase vulnerability of ungulates to wolf predation in two ways: 1) by impeding their ability to move and therefore avoid or escape from wolves, and 2) increasing the energy they have to expend while reducing the availability of their food, resulting in poorer nutritional condition. Calves are particularly affected since they are shorter and have less fat to draw on

over the winter. A severe winter also can have a lingering effect on the ungulates. Immediately following a severe winter, fewer calves may be born and those may be smaller and less likely to survive. Cows that make it through the winter, particularly with calves at heel, may have a hard time getting back into good enough condition to breed in the fall, resulting in reduced calf production a year after the bad winter. It is easy to see that two or more bad winters in a row can create big problems for an ungulate population. Wolves, on the other hand, can thrive in bad winters because of the additional vulnerable prey.

These factors, although not a complete list, touch on many of the important factors that must be used to guide management of Alaska's large mammals. A good understanding of wildlife species and their interrelationships is necessary when planning for, or the public demands, intensive management; otherwise management must be conservative.

Improving management of Alaska's wildlife will require additional understanding of these species and their interactions. Much of what is known about wolves, bears, their prey, and how they all interact comes from two types of studies:

1) Long-term (5 - 30+ years) observations of these species freely interacting. The importance of long-term studies cannot be overestimated. Long-term studies provide insights into the effects of factors that man has little control of, such as severe winters and changes in prey density, on predator/prey relationships. Short studies can provide useful "snapshots" to consider, but long-term studies give views of the "big picture".

2) Close monitoring of experimental treatments (wolf control, grizzly bear translocations, sex/age specific harvest regulations, supplemental feeding, etc.) and the subsequent responses by the affected species. Much can be gained by conducting normal management of wildlife within an experimental framework. Much of what is known about wolf/prey relationships in Alaska resulted from such an approach to a few wolf control efforts. In order to get the most out of "experimental management", management actions, or "treatments", must be clearly defined and applied so that evaluation is possible. Affected species must be monitored before, during and after the treatment, and "control" areas with similar populations that are not affected by the management action of interest must also be studied. Unfortunately, treatments are often applied haphazardly. For example, several management actions are implemented at once confounding evaluation of observed changes. Treatments are not applied long enough or intensive enough to be evaluated. Also, insufficient monitoring, before, during, and/or after the treatment, results in little chance to learn something. Future management efforts must avoid these pitfalls.

Wolf management, like all management of wildlife in Alaska, will always be controversial. Whatever routes are taken, decisions must be based on the best available information, and management must be designed to add to understanding the wildlife systems we are responsible for.

WOLVES AND MAN IN ALASKA: SOME THOUGHTS AND COMMENTS

by: Warren B. Ballard, Wildlife Biologist

Wolves and their prey have coexisted for thousands of years. The relationships between wolves, bears and ungulates have been characterized by long periods of stability and then long periods of prey scarcity. These natural systems have never resulted in extinction of predators or their prey. Single predator-prey systems involving only wolves and one or two species of ungulate prey are simpler and easier to monitor and understand than systems also involving two or three species of predators such as grizzly bears and black bears.

Wolves depend primarily on ungulate prey for reproduction and survival even though other prey such as birds, rodents, hares, etc. may at times supplement their diet. Wolves which rely on prey other than ungulates usually have low rates of reproduction and/or survival and exist at low densities. This dependence on ungulate prey has brought wolves into competition with humans for the same ungulate prey upon which they depend.

When prey populations such as moose and caribou are at relatively high densities, they are capable of supporting large populations of predators and regulated uses by humans. Often there is no competition, particularly if both moose and caribou are present at relatively high densities. A good example of this is in GMU 13 in recent years. Serious conflicts between humans and wolves and other predators occur when prey populations decline to low levels.

Major declines in ungulate populations are usually the result of several factors but in Alaska severe winters are the major one. Both moose and caribou populations are subject to the forces of winter weather. Deep snow and extreme low temperatures can take a heavy toll on ungulate populations. Deep snow covers up food resources which would have otherwise been available during average years. Deep snow also restricts movements of most ungulates, requiring greater amounts of energy to acquire needed food resources. In Alaska, moose condition is normally in a slowly declining state during winter. Moose feed on browse (woody plants) which either maintains their condition or slows the rate of decline in condition. Caribou on the other hand, depending on sex and age, may gain weight during average winters. Severe winters accelerate the rate of decline in physical condition and many ungulates may die. The number that might starve varies with winter severity in terms of snow depth, snow hardness, temperature, and length of winter. Obviously during years when winters extend into late April and May, the proportion of the ungulate population which may starve increases. Besides direct starvation, predation may accelerate the effects of severe winters.

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Wolves depend primarily on ungulate prey for reproduction and survival even though other prey such as birds, rodents, hares, etc. may at times supplement their diet. Wolves which rely on prey other than ungulates usually have low rates of reproduction and/or survival and exist at low densities. This dependence on ungulate prey has brought wolves into competition with humans for the same ungulate prey upon which they depend.

When prey populations such as moose and caribou are at relatively high densities, they are capable of supporting large populations of predators and regulated uses by humans. Often there is no competition, particularly if both moose and caribou are present at relatively high densities. A good example of this is in GMU 13 in recent years. Serious conflicts between humans and wolves and other predators occur when prey populations decline to low levels.

Major declines in ungulate populations are usually the result of several factors but in Alaska severe winters are the major one. Both moose and caribou populations are subject to the forces of winter weather. Deep snow and extreme low temperatures can take a heavy toll on ungulate populations. Deep snow covers up food resources which would have otherwise been available during average years. Deep snow also restricts movements of most ungulates, requiring greater amounts of energy to acquire needed food resources. In Alaska, moose condition is normally in a slowly declining state during winter. Moose feed on browse (woody plants) which either maintains their condition or slows the rate of decline in condition. Caribou on the other hand, depending on sex and age, may gain weight during average winters. Severe winters accelerate the rate of decline in physical condition and many ungulates may die. The number that might starve varies with winter severity in terms of snow depth, snow hardness, temperature, and length of winter. Obviously during years when winters extend into late April and May, the proportion of the ungulate population which may starve increases. Besides direct starvation, predation may accelerate the effects of severe winters.

During severe winters, ungulates are particularly vulnerable to predation from wolves. Ungulates which previously could escape predation or successfully defend themselves become weakened from starvation and/or their movements are restricted from deep snow. During such situations, wolves can have a major impact on an ungulate population. As a rule-of-thumb, wolves kill the young and old individuals in a population. However, during a severe winter, all sex and age classes can become vulnerable to wolf predation. Thus, even fit, healthy individuals may be subjected to wolf predation. Under these conditions, wolves have been observed killing many more individuals than they can possibly use during a several day period. Although it was not thought to be a common hunting method by wolves, recent studies on Canadian caribou herds indicate that excess or surplus killing on calving grounds may be a significant form of mortality. Such types of behavior have been observed in Alaska on caribou and Dall sheep during deep snow conditions.

During the past 50 years when many ungulate populations declined, human harvest also contributed to the declines. High densities of ungulates supported large numbers of predators. They also supported relatively liberal hunting seasons and bag limits. After several severe winters with high populations of predators, however, hunting seasons and bag limits remained liberal when they should have been quickly and severely restricted. Severe winters alone would have caused population declines, but the declines were accelerated by predation and hunting mortality. Therefore, the combination of winter severity, predation from both wolves and bears, and human harvests caused severe population declines. During and after an ungulate population crash, the effects of predation become more pronounced.

When an ungulate population crashes or is severely reduced, the length of time before the population will recover is dependent on whether production and survival of young is greater than total mortality. Before the decline, the ungulate population was able to support greater mortality than afterwards. For the population to quickly recover, total mortality must be severely reduced. Often a series of severe winters seem to be followed by a series of mild winters during which mortality due to starvation or vulnerability to predation should be minimal. Human harvests are greatly restricted, usually to bull-only hunting; in some cases human harvest should probably be eliminated all together. But what about mortality from predation?

The popular belief has been that predator numbers quickly respond to the reduced prey population by declining nearly as rapidly. At this point, the prey population will begin regrowth with the predator population following behind. In some cases that type of situation may occur, particularly in small mammal and insect populations. But increasing evidence suggests that in large carnivore-ungulate systems, predator populations may remain at relatively high levels for decades and may prevent the prey population from increasing. This is particularly true for a

long-lived species like wolves (which may live for 13 or more years). Wolves are capable of a several fold difference in food consumption rates ranging from about 2 to 16 lbs of flesh per wolf per day. At the lower consumption rates, pup production and survival is low, but a wolf population can remain at relatively high or moderate numbers for long periods by either reducing consumption or switching to other prey. In such cases, wolves may maintain ungulate populations at low levels for long periods of time until prey numbers gradually build up to where they can escape the constraints of predation.

Long periods of ungulate scarcity have historically occurred in Alaska. During these times, human uses were low because there were relatively few people in Alaska. In the future, human uses may have to be curtailed or greatly restricted. Ungulate population lows may span decades, and humans may not want to wait that long to use the resource. If humans desire a greater share of the ungulate resources, they may want to speed up an ungulate population's recovery by reducing numbers of wolves or other predators. Whether humans should or should not do this is among the moral, ethical, and biological concerns which society must consider.

Wolves are not the only predator of large ungulate species, and in fact, it is relatively rare when they are the only species. Within relatively recent years, black bears and grizzly bears have been documented to be significant predators of moose, caribou, elk, and probably deer populations. In all cases where new-born ungulates have been radio collared, predation by bears has been the largest mortality factor. Mortality due to predation in most Alaskan ungulate populations is greatest at birth through 6 weeks of age. This is the period of time when bears are usually the greatest cause of ungulate mortality.

The rate of bear predation on both moose and caribou does not appear to be closely related to the numbers of ungulates per unit area. This poses severe problems for wildlife managers because it suggests that, even at low population levels, bears may continue to be an important source of mortality. Grizzly bears may also be an important predator of adult ungulates, while black bears rarely prey on adult ungulates. When an ungulate population crashes or is reduced to low levels, it could be held at low levels by predation from bears and/or wolves.

Bears are omnivorous, which means they can subsist on both plants and animals. Because of this, it is likely that declines or crashes in ungulate populations may have little or no impact on bear population levels. However, in at least one case it was found that black bears were more productive in areas where there were greater numbers of moose calves. In terms of ungulate management, this means that bear population levels may be much less sensitive to changes in ungulate numbers than wolf populations, but wolves are also relatively slow to respond.

Given these conditions, it would appear that if humans wish to speed up recovery of an ungulate population, the numbers of all predator species should be temporarily reduced, assuming mortality from predation is the problem.

Biologists have demonstrated that lowering bear population levels by 60%, can greatly increase survival of newborn ungulates at least for a 1 year period. Whether such increases can occur over several years is not known. An attempt to improve moose calf survival by increasing hunter harvests of bears did not improve moose calf survival. However, lack of improvement may have been due to an already high moose population and/or an increasing wolf population. More importantly, bears have relatively low rates of reproduction, which means it may take decades for them to recover following population reductions. Such is not the case with wolves.

Wolves have very high rates of reproduction. For example, a pair of wolves can produce and raise a litter of 6 pups in one season. A grizzly bear may raise 1-2 cubs once every 3 to 5 years. Wolves can easily sustain hunter harvests of about 30% annually while bears can sustain about 6%. In one area where wolves were reduced by at least 50% over a 3-year period, the wolf population recovered to within 81% of precontrol levels within 1 year. Wolves can double their population size in 1 year in some situations.

If it is determined to lower predator numbers, efforts should first be directed at reducing wolves rather than bears because of their higher rates of reproduction. Perhaps equally important, biologists are better able to monitor the size and distribution of wolf populations than bear populations. In many cases, reducing mortality on a depressed ungulate population due to wolf predation may be sufficient to allow the ungulate population to increase in spite of heavy predation by bears. Such predator control actions should not be needed for more than a 3-5 year period. Once an ungulate population escapes the constraints of predation, predator control actions should no longer be needed unless the prey population is overexploited by humans or another combination of severe winters causes a large population decline.

Thus far this discussion has centered on predators and prey but has not discussed how habitat and particularly vegetation might modify predator-prey relationships. Biologists have studied ungulate-vegetative relationships for years, and although much has been learned, determining the actual number of ungulates that can be sustained indefinitely is poorly understood. High quality and abundant forage obviously will support more ungulates than low quality or quantity forage. Ungulates surviving on high quality forage have higher birth rates than those on lesser quality ranges. Ungulate populations with higher rates of productivity are better able to cope and escape the constraints of predation than populations of average or poor productivity. Equally important, ungulate populations will achieve greater

densities on high quality ranges than on low quality ranges. High ungulate populations can withstand heavier levels of exploitation by both predators and humans than low density ungulate populations. Therefore, a desirable predator-prey management program should include maintenance and improvement of ungulate habitat.

All things being equal, an ungulate population subjected to predation will always produce a lower surplus for human harvest than an ungulate population subjected to no predation. Thus, in terms of meat production alone, having no predators would be the most efficient scenario for humans. To do that would require extermination of wolves and bears, similar to cattle ranches in the lower 48 states, which no responsible individual concerned about wildlife would favor. A reasonable approach might be to balance human's desires for maintaining ungulate populations and uses with maintaining viable and sustainable populations of wolves and bears. Our dilemma is whether to interfere with the natural predator-prey system so reasonable uses of ungulates by humans can occur, or whether natural systems should be allowed to function without human use. Should humans wait several decades for ungulates to recover, or temporarily intervene to quickly increase ungulate populations when they are depressed?

Wolves are highly valued by humans for a number of reasons. Some regard wolves as a symbol of wilderness, while others value them for their pelts, and others as valuable components of the ecosystem. As the human population expands, the habitats necessary to support wolves, other predators, and wild ungulate populations is dwindling. Society needs to ensure that wolves have space and habitats set aside where predator-prey relationships can function naturally. We also must decide under what circumstances and where to intervene.

Within the past 20 years, several wolf control experiments have been conducted. Some have produced the desired results while others have not. We now have a better idea of when wolf control procedures should be implemented from a biological perspective. But other questions need to be considered, such as: should we control wolf numbers, and if not, how should we manage wolf populations? Should we liberalize public harvests to control wolf numbers rather than by government agencies? How do we determine what society wants? These and other questions need to be discussed and reasonable guidelines established.

In conclusion, I regret that I am unable to personally meet with you. I am completing requirements for a Ph.D. at the University of Arizona, and financial restraints prevented my attending this meeting. If you have questions or need of further information, please contact me. I wish you the best in your deliberations. My mailing address is: School of Renewable Natural Resources, 325 Biological Sciences East Bldg., Univ. of Arizona, Tucson, Arizona 85721. Telephone messages can be left at 602-621-3845.

Wolf-Prey-Human Relationships in Alaska

by

Rod Boertje, Alaska Department of Fish and Game

for the

Alaska Wolf Management Planning Team

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Following is a brief discussion of 3 subjects:

I. how factors other than predation affect ungulate populations in Alaska,

II. what was learned from government wolf reductions in 5 Alaska and Yukon study sites, and

III. a summary of predator-prey-human relationships in Alaska and Yukon.

I include discussions of Yukon studies because Alaska and Yukon have similar wolf-bear-moose-caribou systems and lack the alternate prey of most systems farther south.

I. Most of Alaska's moose, caribou, and deer populations increased dramatically during the 1950's and 1960's because of federal predator control, including poisoning, which terminated in 1960[1,2]. A variety of factors caused these ungulate populations to return to low levels during the late 1960's and early 1970's.

Deep snow during 1965-66 and 1970-71 precipitated declines in high-density moose populations in Subunit 20A and Unit 13 and deer in Southeast Alaska[1,3,4]. Deep snow causes death from malnutrition and by increasing vulnerability to predators. These declines were noteworthy because predators remained at their former levels or increased following these winters, despite less prey (termed predator lag). Biologists now understand that declines in predator numbers commonly lag behind declines in prey numbers. Predator lag sharply increased the impact of predation on ungulates. Consequently, predators rapidly drove many ungulate populations to very low levels (termed the predator pit). Periodic deep snows can be expected to occasionally limit most Alaskan moose populations where predators are maintained or limited at low levels by harvest.

Overharvest contributed to declines in Alaska moose and caribou populations during the late 1960's and early 1970's[1,2]. During this period, biologists tended to disregard the effects of predation. They mistakenly assumed from studies in predator-free areas that high harvest rates would be compensated by increased recruitment; their logic was that fewer ungulates meant more food per ungulate. However, overharvest increased the impacts of predation. Today

ungulates are harvested more conservatively (for example, cow moose hunts are relatively rare), and survey techniques are much improved. Wolf predation is now widely recognized for its ability to accelerate ungulate declines to low levels, particularly after overharvest and/or deep snow initiate declines in prey populations.

Today, biologists recognize that the annual yield of ungulate populations must be liberally shared with predators[1,2]. Currently in Subunit 20E, where moose:predator ratios are low, predators annually kill 31% of the postcalving moose population, humans kill 1.5%, 6% die from other causes, and the population is growing at about 4%. Humans can safely kill larger percentages of moose populations (e.g., 10%), where predator populations are limited by harvest.

Malnutrition in the absence of deep snow is apparently a minor factor affecting ungulate population dynamics on the Alaska mainland[2]. For example, moose and caribou studies in Denali National Park predicted densities could rise several-fold before malnutrition would limit numbers[5,6]. Where predators have been reduced by humans and moose have attained high densities (e.g., lower Susitna and Unit 13), the major factor initiating declines has usually been deep snow, not overbrowsing per se. Exceptions occurred in the 1980's in Subunit 15A where moose browse is limited largely to paper birch. Alaska's moose and caribou densities are generally much lower than densities in predator-free, food-limited areas.

Diseases appear to have little effect on moose, deer, and most caribou populations in Alaska[7,8]. However, low proportions of northern caribou populations show serological evidence of brucellosis, which can cause abortions. Brucellosis may become an important source of mortality during high densities of the arctic herds.

II. Studies of predator reductions provide the most accurate assessment of whether predation, alone, is limiting growth of an ungulate population.

Moose and caribou rapidly increased following wolf reductions in Subunit 20A (1976-81), while no such changes occurred in adjacent, untreated areas, including Denali National Park. This clearly indicated that wolves had been the primary factor limiting growth of ungulate populations in Subunit 20A during 1975-76[1]. Apparently other factors, such as bear predation, harvest, or nutrition, were minor factors, because none of these changed significantly. A 3-fold increase in moose numbers and a 5-fold increase in caribou numbers has occurred in this area since initiating wolf reductions in 1976, despite average harvests of 370+ bull moose and 507+ caribou annually during 1983-88[9,10]. In adjacent Denali National Park, ungulates occur at relatively low densities (190 moose and 500 caribou/1,000 km^2 versus 776 moose and 900 caribou/1,000 km^2 in Subunit 20A). These irruptions following wolf reductions indicate that wolves were killing ungulates that otherwise would live to reproduce, i.e., wolves were killing more than sick and weak prey. For example, annual caribou calf mortality declined from 93% to 44% when wolves were reduced, and adult moose mortality declined from 20% to 6%[1].

Results from the wolf reduction in the Finlayson area in eastern Yukon (1982-88) was similar to the Subunit 20A experiment[11]. These studies concluded that maintaining moose and caribou populations at moderate to high

densities is clearly preferable to allowing these populations to decline to low levels before taking recovery measures. Together, these studies showed that, where grizzly predation is light or moderate and prey:wolf ratios are low (e.g., <20 moose:wolf), annual reductions in fall wolf numbers of 38-86% for 4 to 5 years can dramatically increase ungulate numbers.

In contrast, studies in Unit 13, Subunit 20E, and southwest Yukon showed that grizzly predation was the primary factor limiting moose population growth[2,12,13]. For example, grizzlies killed much larger percentages of radio-collared moose calves than wolves in these studies. Wolf food habits and kill rates in these areas were similar to those in Subunit 20A and Finlayson, but wolf predation was secondary to grizzly predation. Measurable increases in moose populations in these areas were not observed following annual wolf reductions of 42-88% of fall numbers for 2 to 4 years. In retrospect, no increase would have been likely in Unit 13 because wolves were scarce relative to prey (i.e., high prey:wolf ratios compared with the Subunit 20A experiment). Wolves in Unit 13 were limited by harvest, not food, prior to wolf reductions.

Large reductions in grizzly bear numbers were not attempted because (1) bear populations have very low recovery rates compared with wolves (lower reproductive and immigration rates), and (2) measuring effects of bear management is extremely costly. In contrast, wolf populations commonly increase 25-40% during summer in areas where harvest is limiting growth[2]. Also, wolf populations have more than doubled during 3 consecutive summers following winter harvests of 84% in the Finlayson area[11]. Immigration was undoubtedly important in the Finlayson area.

III. Summaries of moose-, caribou-, and deer-wolf-bear relationships follow:

Moose - A review of wolf-bear-moose-human relationships[2] indicate that:

(1) Where wolves, grizzly bears, and moose were lightly harvested, densities averaged 153 moose/1,000 km^2, 9 wolves/1,000 km^2, and bears were common. Humans harvested 0-18 moose/1,000 km^2 in these systems on a sustained basis.

(2) Where wolf and bear populations were limited by human harvest, densities averaged 647 moose/1,000 km^2, 6 wolves/1,000 km^2, and bears were common. Humans harvested 20-130 moose/1,000 km^2 in these systems on a sustained basis.

(3) Without predator management, moose and wolves will eventually occur at low densities throughout most of Alaska. These low densities will support little human use and will set the stage for alternative land uses to usurp wildlife habitat. Large expanses of wildlife habitat are required to conserve wolf-bear-moose systems. In single-predator systems (e.g., the Seward Peninsula and Isle Royale) and multi-prey systems (moose-elk-deer), moose can attain moderate densities without predator management. However, virtually all of Alaska and Yukon have both predators, and caribou are a poor alternate prey because of their migratory habit.

Data supporting the generalities above come from: (1) 36 study sites in Alaska and the Yukon, each >2,000 km^2 (770 mi^2)[2] (Fig. 1); (2) implications from other North American studies[2]; and (3) archaeological evidence which

indicates moose were rare in Alaska prior to settlement and the periodic reduction of predators[14].

Caribou - Natural levels of wolf and bear predation can also maintain caribou at chronically low densities[15]. In Denali National Park, for example, caribou have been at historic low levels (1,200-3,000) for 20 years with no harvest since 1977 and harvests averaging <50 caribou annually during 1967-75. In contrast, the Denali Herd numbered about 25,000 from 1900 to 1941.

However, for several reasons, most notably their migratory habits, caribou can periodically overcome the strong limiting effects of predation without high harvests of predators. For example, recent increases in the Mulchatna Herd occurred without high wolf harvests. Nevertheless, most of the recent notable increases in caribou herds (Delta, Nelchina, Western Arctic, and Fortymile) appear to be linked in part to harvest-limited wolf populations[1,2,16,17].

Black-tailed Deer - Like moose, Alaska's deer are often greatly limited by predation[4,18]. For example, deer populations on islands with wolves and black bears have remained at low densities or recovered only slightly since the severe winters of the 1960's and early 1970's. In contrast, deer numbers on islands with brown bears but no wolves rebounded quickly. Also, during predator control in the 1950's, deer populations fluctuated fairly synchronously on islands with and without wolves[4].

In conclusion, data strongly indicate that lightly harvested wolf and bear populations limited only by food can and do maintain moose, caribou, and deer at chronic low densities in Alaska. This occurs today in parts of Alaska and most of the adjacent Yukon (Fig. 1). However, humans are currently harvesting predators at moderate to high rates in most of Alaska. These predator populations are largely harvest-limited, not food-limited, and ungulate prey in these areas occur at moderate to high densities.

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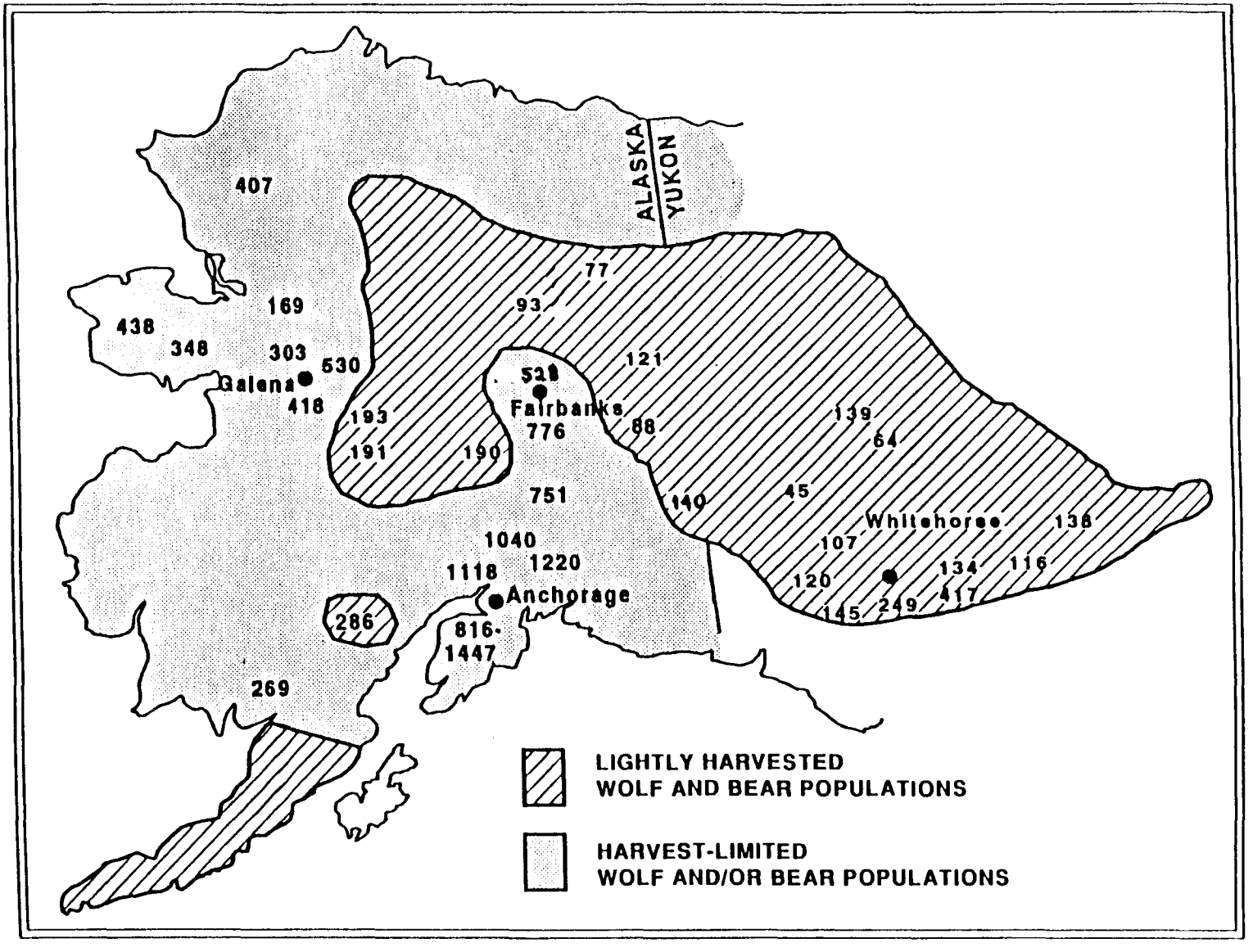


Fig. 1. Moose densities (number of moose/1,000 km^2) within regions with lightly harvested predator populations and regions where wolf and/or bear populations are harvest-limited. Moose surveys were conducted from 1965-88 using stratified random sampling in areas >2,000 km^2.

Exploitation of Wolf-Ungulate Systems in Alaska - A Summary

Gordon C. Haber
December 1990
(For the Alaska Wolf Management Planning Team,
Alaska Department of Fish and Game, Anchorage)

Under natural conditions, wolves, brown bears, and ungulates interact at several different scales as "systems," with specific patterns of change within particular areas. An important step toward ensuring sustainable harvests of ungulate populations (e.g., moose, caribou, and sheep) while avoiding controversial predator control measures is to first ensure the integrity of the harvested systems. Research and management programs typically proceed from the opposite assumption - i.e., that there is no need to worry about system integrity, or that what is being harvested is little more than an assortment of animals scattered more-or-less randomly across the countryside.

When viewed in certain ways (via their "attractors" in "phase space"), the seemingly unending variety of biological, physical, behavioral, and other systems that we observe directly in the natural and man-made worlds - including all wolf/bear-ungulate systems - can be reduced to five general patterns of behavior that have been widely recognized and described by mathematicians, physicists, and other scientists for almost a century now. One of these five patterns - referred to as "multiple equilibria," "multiple stable states," or "multiple point attractors," in which the system remains relatively stable near a single equilibrium but then may shift to one or more other stable states, appears to characterize the way wolves, bears, and ungulates interact and respond to human exploitation over most of the arctic and subarctic. [Note that this does not include the well known Isle Royale wolf-moose system, which appears to follow a different ("limit cycle") pattern]. In Alaska, wolf packs involved in the multiple equilibria pattern of system behavior usually live in fixed territories within slow-changing habitats, where moose and often sheep are the major year-round prey and migratory caribou are available to varying extents seasonally. Each established wolf pack territory bounds a separate system, although larger scale systems can be identified on the basis of entire territorial mosaics and interacting caribou herds, as will be explained later. Under natural conditions, the moose population within each territory will continue to fluctuate for long periods at relatively high densities near a stable equilibrium, despite wolf and bear predation and occasional severe winters. An abundance of sheep or caribou, higher quality habitat, and other variables will lighten the predation impact and allow the moose population to fluctuate at a somewhat higher (and wider) range of densities. In most cases it is also possible to sustain an annual human harvest of 4-7 percent. Predation by wolves in this normal range of densities is highly selective and compensatory, in large measure removing older, debilitated, or young moose (with inferior mothers) that would otherwise die fairly soon from other causes.

But there is a threshold moose density - an unstable equilibrium - below which total annual predation in combination with other natural losses from the population increasingly exceeds total annual

births, and the population begins a rapid decrease to another stable equilibrium within a much lower range of densities, where few if any moose can be harvested on a sustained basis. This is the infamous "predator pit." Within this low range of densities, and during the accelerating decline to it, predation exerts a disproportionately much heavier ("depensatory") impact and becomes largely additive - it removes many prime animals from the population, especially calves that would otherwise mature to reproductive age. Heavy human harvesting - i.e., in excess of 6-7 percent of the population per year - and occasional natural disasters are much more likely than predation or severe winters to *trigger* such a decline, though the natural predators would accelerate the decline and typically continue to suppress the population long after the initial problem ended.

Within the normal (upper) range of densities, the moose population can fluctuate widely - declining by 60-70 percent in some cases - and still return to the high equilibrium fairly quickly without predator control. It is important to distinguish between declines within this range of densities and declines that cross the critical threshold (middle unstable equilibrium) into the predator pit range of densities. Only in the latter cases is remedial predator control likely to become necessary, assuming that hunters are unwilling or unable to wait up to 20-30 years for natural remedies to operate. For a maximum sustainable harvest, the moose population must actually be reduced to about two-thirds of its natural (unhunted) density. Predator reduction might as much as double this normal maximum sustainable harvest (in habitats characteristic of interior Alaska), although this is almost certainly an overly optimistic prediction. Due to complicating social variables in the wolf population and typically high spring and fall levels of bear predation (as well as possible wolf-bear competitive release), the predator removal - of both wolves and bears - would have to be near-complete and maintained indefinitely. A partial wolf removal could not be maintained easily, nor would it generate a proportionate prey increase; under certain conditions it could even create more hunting units and lead to *heavier* predation. In terms of the potential for success, it is one thing to remove predators temporarily to allow a depressed population (i.e., in the predator pit) to recover to normal densities, but quite another to try to remove predators from a prey population already at normal levels, in the hope of sustaining an even larger population and harvest.

A region of suitable habitat is parceled into a mosaic of wolf territories ranging in size from about 200-1,500 square miles each (in Alaska). The multiple equilibria pattern described above would characterize the way most of the resident wolf packs interact with their year-round ungulate prey. Hostile probing and related behavior between packs maintains enough dynamic tension among the territories so that the entire mosaic basically acts as a self-regulating system. Territories can change size for various reasons but particularly in response to sustained, major changes in prey availability, following an inverse (hyperbolic) relationship common to many territorial species. This means that a serious moose decline (into the predator pit) across the mosaic should lead eventually to fewer and (on average) larger territories, resulting in less predation pressure, a moose population recovery, and ultimately a return to more territories and heavier predation. It might be possible to shorten this natural 20-30-year recovery sequence by at least two-thirds, via a carefully targeted removal of 20-30 percent of the packs in the mosaic; this would be done only once, and all

other packs of the mosaic would be left untouched. This selective approach, which would merely speed up a natural response, provides a possible alternative to the more intensive multi-year broadcast removal approaches that have heretofore prevailed in control programs.

It would be crucial not to remove too many packs in the selective approach, because energetic costs alone would limit the extent to which surviving packs could expand their territories and fill the resulting vacancy(s). Creating just enough of a vacancy for them to fill should reduce the number of hunting units and allow a fairly rapid moose recovery. Creating too large of a control vacancy would allow recolonization by the substantial flow of dispersing wolves to be expected from this and other regions. A fine line separates these opposite outcomes, which means the removals would have to be done with surgical-like precision and only after extremely careful identification and selection of the target packs. A prerequisite for the selective removal approach is that the territorial mosaic must be relatively stable when control is applied. This will usually also require that the resident wolf packs have had an opportunity to establish stable social structures. Heavy exploitation of any kind, including for fur and sport, needs to be terminated far enough in advance for stability to return before control is applied. Ironically, this implies that the management response to a serious moose decline could be much faster, and thus would be more likely to succeed, where the wolf population has been protected.

A key bottom line is that such declines, and thus control of any kind, can be largely avoided in the first place. There is no evidence that wolf control has produced any sustained major gains for ungulate hunters, except perhaps in regions where *all* of the large predators have been virtually eliminated and the habitat has been heavily manipulated (e.g., Scandinavia; Newfoundland; most of the lower 48). Recent wolf control programs in Alaska and Canada have allowed ungulate populations merely to recover to pre-decline levels (e.g., Unit 20A, Alaska) or were applied with no demonstrable ungulate increases in cases where misleading ungulate data suggested serious problems where there were likely none (e.g., northern British Columbia; Nowitna region, Alaska). In other cases, wolf control has not led to recovery of depressed ungulate populations, primarily because of heavy bear predation (e.g., Unit 20E, Alaska; southwestern Yukon Territory, Canada).

In Unit 20A, Alaska, the total number of moose harvested from 1970-1984 could have been 14-44 percent higher, without wolf control, had the harvest been held to an annual rate of 6-7 percent. Annual harvests were probably as high as 19 percent (or more) in the early 1970s, and not surprisingly the moose population declined severely, to the point where it was necessary to resort to six years of wolf control and sharply curtailed (1-2%) harvests. There is little evidence to support frequent claims that the severe winters of 1970-71 and 1971-72 played a major role in triggering this decline. [Indeed, there is much evidence to the contrary, yet biologists and others continue to underestimate the resiliency to severe winters of wolf/bear-ungulate systems throughout the North]. 20A wolf control ended in 1982. The wolf population recovered to pre-control levels by 1983 and remained at about the same size through at least 1988, without much hunting and trapping pressure to hold it down. The 20A moose population approximately doubled during the same

period (1982-1984 to 1988), and can again sustain a 6-7 percent harvest. 20A caribou numbers have similarly increased. The 20A story provides an example of multiple equilibria system behavior, and of the high cost of an avoidable descent into the predator pit.

A systems approach for managing moose harvests in subarctic wolf/bear-ungulate systems at minimum requires:

--- delineation of harvest areas so they coincide closely with resident wolf pack territories, or at least with the outer bounds of territorial mosaics;

--- a good moose census within each of these areas, annually if possible, either via direct counting or a sampling procedure, supplemented - but not replaced - with sex/age data; and, as soon as possible, census and sex/age data for associated resident ungulate prey (e.g., sheep);

--- good monitoring of the harvest in each area, this information to be used with the census data to ensure that the annual rate does not exceed 6-7 percent in most cases;

--- continuing baseline research in areas such as Denali National Park and a few other unexploited or lightly exploited systems, ongoing experimental probing and manipulations in the exploited systems, and appropriate simulations, to determine how to better adjust moose harvest rates for differences/changes in regional caribou abundance, the status of other ungulates, bear predation impacts, habitat factors, and for other uncertainties;

--- an end to widespread, arbitrary exploitation of wolves (including for fur and sport) where moose are harvested, to minimize variability in predation impacts and so that wolf pack territories and their mosaics can remain stable enough to be used to delineate systems and basic management units on a long term basis.

Some of these requirements will be expensive, especially the moose censuses. However, the *net* increase over present expenditures will likely be much less than assumed or even disappear when the many hidden costs associated with major management failures are included.

Recruitment indices (e.g., calf:cow ratios) and trend indices (e.g., number of moose seen per hour along aerial transect surveys) are unreliable and can be extremely misleading as predictors of ungulate population change; they do not suffice as a substitute for actual censusing. Much the same is true for wolf:ungulate ratios: they do not provide a reliable way to anticipate a predation problem or a serious ungulate decline, among other reasons because a wolf pack's rate of kill does not continue to increase proportionately (linearly) with the number of wolves present above a pack size of about 7-9. Regional kill rates vary more as a function of the number of packs than the total number of wolves, contrary to a basic assumption in the use of wolf:ungulate ratios. Moreover, many of the juveniles and young adults present in a wolf population as of early-mid winter typically die or disperse by the end of the winter, and therefore do not contribute to predation to the extent that ratios derived from early-mid winter surveys are likely to suggest. A ratio of one wolf per 20-30 moose or higher is generally considered to portend a serious moose decline. However, there are so many documented exceptions to this "rule of thumb" (in Denali National Park, for example) that it is virtually useless for management purposes. A related assumption is that correlated predator increases and prey

decreases imply cause and effect. But again, there are many exceptions, and, more basically, relying on correlations to determine cause and effect is risky in any reasoning process (one could probably find correlations between prey numbers and periodic changes in other variables, in addition to predator numbers).

Biologists should not rely heavily on observed wolf pack kill rates or (assumed) per wolf food requirements to estimate predation impacts and ungulate harvesting potentials. First, predation does not operate in a vacuum - it must be evaluated jointly with all of the major birth, death, and other variables affecting the ungulate population. Second, a typical sample of kill rates represents only one sequence of events and changes among numerous possibilities in a stochastic world. Stochastic simulation can be used to generate many variations from a broader range of field data, to provide better assurance that conclusions are derived from an average set of (system) circumstances rather than an extreme.

Caribou occupy roughly the same high position of user importance in Alaska as do moose. However, to understand the factors that determine caribou abundance and to appreciate the influence of seasonal and longer term caribou variations on wolf-moose-human interactions requires an entirely different spatial and temporal perspective than is necessary in discussing moose. Simply put, whereas for moose it suffices to examine populations defined by individual wolf pack territories or territorial mosaics over a period of years, the analogous caribou population that needs to be considered in essence covers most of Alaska and the adjacent Yukon Territory and fluctuates from region to region over periods spanning decades. Individual caribou herds should not be the focus of management attention, as they are at present. Viewed over past intervals of at least 50-100 years, it can be seen that the major Alaska-Yukon caribou herds interacted via periodic regional shifts in abundance. The basic behavior of this large scale system and appropriate harvesting policies (which are quite different than should be applied for moose) are summarized in Appendix I, to which the reader should now refer.

It is important to distinguish between the pre-1960s pattern of asynchronous shifting that dominated among caribou herds and the more-or-less synchronous condition at small to moderate herd sizes that has prevailed since then. The recent synchrony can be attributed primarily to heavy harvesting of the Western Arctic and Nelchina herds in the 1960s and early 1970s, which prevented both herds (especially the Western Arctic) from reaching the natural peaks that would have generated subsequent dispersals to and buildups in other regions. Restoration of the asynchronous (pre-1960s) pattern would provide for larger statewide harvests under more natural conditions. By allowing individual herds to fluctuate widely at that point, it would be possible to at least double the sustainable annual statewide caribou harvest. The wide swings in herd size probably amount to a form of multiple equilibria behavior, except in this case there are *regular* shifts between high and low equilibria and the herd remains only briefly at the former (hence it "peaks"). Wolves appear to exert relatively little overall influence on each herd during its rise to and decline from a natural peak. But their impact changes dramatically during the herd's natural prolonged low, where they (and bears) typically become the major, depensatory, controlling agent and create another predator pit. Unlike the case for moose,

however, seldom if ever would it be appropriate to view this low as a problem when herds are allowed to fluctuate asynchronously. If remedial wolf control becomes necessary for a caribou decline under other circumstances, it is unlikely that the selective pack removal approach described earlier for moose would suffice. Broadcast control would probably be required, as it was in the case of the avoidable *premature* decline of the Western Arctic Herd in the 1960s and 1970s. [Legal action stopped a formal state control program in its early stages, but local residents and others did intense control in place of this, to the point where wolves remained scarce over much of northwestern Alaska even after the herd recovered].

From a systems perspective, remedial wolf control generally amounts to an admission of a management failure. Control does not represent good biology in such cases - only a lesser of evils toward restoring a system to its previous condition, so that it can soon again support normal levels of both human and natural predation. *Routine* hunting and trapping of wolves, including for fur and sport, raises additional biological questions, especially when the exploitation becomes as heavy as "land and shoot" (aerial) and snowmachine hunting allow. It is commonly argued that such exploitation is acceptable even without an ungulate decline, because the wolves often rebound quickly to their former numbers. But this emphasis on numerical status misses the point on important biological issues of quality and function. While other considerations might justify some routine exploitation of wolf populations, the alleged biological justification is specious.

Wolves and a handful of other species (e.g., African wild hunting dogs, some human societies, perhaps killer whales) sit at the very pinnacle of vertebrate social development, in terms of the sophistication and degree of cooperation that prevails between the sexes and among all adult age classes of their societies. In this regard, they surpass most human societies, chimps, gorillas, lions, elephants, and other species normally considered to be highly social. It is simply impossible to harvest individuals more-or-less at random without seriously disrupting if not altogether shredding this basic feature of the species' biology. Under natural conditions, the primary unit of wolf society, i.e., a "pack," is typically a highly inbred extended family or 2-3 closely related families. One can get some idea of the difficulty of exploiting this kind of group in any intelligent way by considering the sociobiological impacts that would follow from doing likewise to the roughly analogous, albeit much less isolated, units of human society.

Wolf social behavior is remarkably adaptable, but the adaptations are primarily for cooperative hunting, not defense against sustained, heavy predation. It is no surprise that in many cases wolves have held their own *numerically* despite heavy exploitation for the past 40-50 years or more, but this does not suffice as a demonstration that the species can survive such exploitation indefinitely, as is often claimed. A few decades or even a few centuries of heavy exploitation amount to an eyeblink compared to the far longer period of time over which wolves have developed solely in response to the opposite pressures. The relationship between total population size and the integrity of component social systems appears to be quite subtle and nonlinear. For example, a social breakdown can lead in the short term to more matings among

subordinates and thus *higher* total numbers. Nevertheless, it would be foolish to ignore the possibility that after some further lag there will finally come a sudden and dramatic collapse in total numbers as well. Moreover, it is questionable as to whether a normally ultra-social species in fact "survives" if its social organization is kept shredded via heavy annual exploitation. Four-legged, fur-covered canids might continue to run about the countryside for awhile, but should they still be called "wolves" at that point, given such a drastic change in their most fundamental behavior? [Apart from these impacts, it should be remembered (per earlier sections) that routine exploitation of wolves can lead to greater difficulties in managing a system for an ungulate harvest, and, ironically, in applying remedial control if needed].

Species such as moose, caribou, and sheep are at or near the other extreme of social development. Clearly they *are* adapted for exploitation, based on their much different way of subsisting and close association with many superior predators throughout their long evolutionary histories. We should feel little biological reservation about harvesting them regularly, for subsistence, sport/trophy, or control purposes, although it is important to remember the limits discussed earlier. Between the cooperative hunter and ungulate/herbivore prey extremes there is a gradient of sociality that should probably dictate a range of intermediate degrees of exploitation.

It is often assumed that wolf numbers will continue to increase unless there is substantial, ongoing control by humans, using methods such as land and shoot aerial hunting. Long term research in Denali National Park and in other areas indicates quite the contrary. Despite a high reproductive potential, the Denali packs normally do not exceed a total late winter size of 20-30 wolves; 10-15 is more common. Pack sizes are controlled primarily by varying rates of dispersal and death of juveniles and young adults during the winter, in response to varying economic (food) and social conditions and ultimately long term prey availability. Established packs defend traditional territories, and between packs there is extreme hostility, leading to primitive forms of "warfare" and considerable interpack killing. This important feature of wolf behavior helps (in a secondary way) to limit numbers as well as to ensure efficient use of the prey resources across a large region. It is also intimately linked with the unusual ability of packmates to inbreed successfully and with their extreme forms of altruism and other cooperative behavior.

Appendices (attached):

I. Haber, G.C. 1990. "Caribou hunts should parallel herds' natural cycles." Anchorage Daily News, September 8, 1990, p. B-9.

II. Introduction and summary sections from two recent reports by G. Haber, examining major wildlife management/wolf control controversies in Alaska and northern British Columbia. These controversies share key features in common and help to illustrate various points mentioned here.

FORUM

Caribou hunts should parallel herds' natural cycles

By GORDON C. HABER

COMPASS
POINTS OF VIEW FROM OUR COMMUNITY

Largely overlooked in the subsistence preference controversy is a key biological point: There will always be harvesting limits, but we can do a better job toward ensuring naturally large wildlife populations to avoid preference allocations in the first place. More "systems" thinking is needed in Alaska's wildlife management programs, and nowhere is the potential gain so great as it is for caribou management.

It is usually assumed that each major caribou herd is a more or less isolated management problem — that each should be held at some relatively stable size below the point where range damage might occur. This ignores an important feature of caribou biology that could be exploited for larger statewide harvests.

Historical and archeological evidence indicates that the major caribou herds of Alaska and the Yukon interact enough with each other via range expansions and shifts to be regarded as a single, 600,000-700,000-square-mile system. Under natural conditions, individual herds fluctuate widely with recurring high peaks and prolonged lows. Range "damage" can be expected at the peaks, but this, too, is perfectly natural for caribou and by itself provides no biological reason for alarm.

In earlier decades and centuries, a herd peaked and probably damaged its range, whereupon some of the caribou typically remained (thus we see more or less traditional use of certain calving areas and migration routes, despite the other changes), but most shifted to other ranges — sometimes hundreds of miles away. This generated new peaks, probably more range damage, another round of dispersals to other regions, and so on, with a predominantly asynchronous pattern of peaks and lows among regions. Predation alone (by wolves and bears) was enough to suppress each of the remnant herds that remained behind, which allowed range conditions to recover, eventually to support another caribou buildup.

It was largely because there were such dramatic swings in caribou abundance from region to region that many Natives followed a nomadic lifestyle, especially in northern regions. For most, there was simply no possibility of hunting caribou "traditionally" in this area or that, at least not without decades of relative scarcity between successive buildups.

The Western Arctic, Porcupine, and Fortymile herds have almost certainly fluctuated more dramatically than any of the others, with peaks likely on the order of 600,000-800,000 caribou each. Massive dispersals from these herds at or near their natural peaks has probably long driven the pattern of peaks and lows in the smaller central and southern herds. Some of the smallest herds in Alaska — for example, the McComb, Mentasta, and Kenai herds, likely originated via dispersals from the larger herds at or near their peaks.

The Western Arctic and Porcupine herds have now increased to sizes of at least 325,000 and 180,000, respectively — following growth curves I predicted in a 1977 publication, based on the systems thinking summarized here. Range expansions are underway, but neither herd is yet near the natural peak that will generate extensive dispersals to other regions.

At that time, much larger numbers of caribou than at present will again appear in the Fortymile, Denali-Nelchina, and northern Kuskokwim Mountains regions, for intervals of up to 20-40 years each. This could begin happening by the end of the decade, if annual harvests for the Western Arctic herd are held to 5 percent or less and predation does not increase sharply. Current increases in the Mulchatna and Porcupine herds could speed up this sequence in various ways.

Enough of the herds are presently increasing so it would probably be unwise and unnecessary to promote rapid growth in the Fortymile, Nelchina and Denali herds at this time. Doing this could easily lead to a more or less synchronous peaking of all the major herds — followed by synchronous crashes. Thus, for now, we should continue harvesting the latter three herds heavily enough to keep them stable or even at smaller sizes. From this standpoint, it is a good idea to harvest at least 4,000 caribou from the Nelchina herd this year, to reduce it below its present size of 40,000.

After the natural pattern of statewide shifting among herds is restored, a "rotating pulse harvest" would be the most appropriate long-term management policy. Harvesting emphasis would rotate around the state, focusing on the herds that were currently increasing and decreasing from peaks. Each of these (including the Nelchina herd) would be harvested as follows: Annual harvest rates would increase to a maximum of about 10 percent at one-half peak size as the herd increased, then decrease to little or no harvest at the peak (near which major dispersals should be underway to other regions), then increase back to 10 percent as the herd decreased to one-half peak size, and then eventually decrease to little or no harvest during the herd's prolonged low.

By applying these corrective and long-term management policies, we could once again end up with well over 1 million caribou statewide, and generate average annual harvests of at least 50,000-70,000. And, instead of trying to farm individual herds in a highly artificial way — with the variety of hidden dangers that this implies, we would be adapting our exploitation so as to allow the overall system to behave naturally.

The primary trade-off would be that caribou harvesters would have to periodically shift to different hunting grounds. But then this is what caribou harvesters did in Alaska for at least 8,000-10,000 years prior to the mid-1900s, without the airplanes and other advanced technology that would assist us as modern nomads.

□ Gordon Haber, Ph.D. has conducted wildlife research in Alaska for 25 years.

TECHNICAL INFORMATION ON WOLF ECOLOGY AND WOLF/PREY RELATIONSHIPS

A Brief Summary of Selected Topics Presented to the

Alaska Wolf Management Planning Team

by

Victor Van Ballenberghe
U.S. Forest Service
201 East 9th Avenue
Suite 206
Anchorage, AK 99501

January 11, 1991

The following questions and statements represent a brief summary of biological information on wolf ecology and wolf/prey relationships distilled from numerous scientific studies conducted in North America during the past 50 years. I have selected topics that I feel represent some of the key biological issues that impact wolf management. By necessity, this discussion is brief and worded so that those with little technical background can assimilate the information. I have tried to accurately summarize and interpret a large volume of data while adhering to constraints of brevity and simplicity. If more detail is requested, I'd be happy to oblige.

1. Can wolves kill any animal they choose?

Numerous studies across North America on virtually every species of wolf prey from the smallest (deer) to the largest (bison) have shown that wolves generally kill only certain kinds of animals. These include young, old, and infirm animals. Generally, animals in their prime (for example, moose aged 1-6) escape predation. However, during deep snow conditions that favor wolves, prime-age animals may fall prey, but these conditions are uncommon.

These findings have been misinterpreted by some to mean that wolves only kill "sick" animals or that because they generally kill the young, old, and infirm, wolves can't impact prey populations. Biologists have never claimed wolves kill only the sick and have stressed that predation on the young may impact prey populations.

Studies have also shown that prey animals often escape predation by a variety of methods. An early study of moose and wolves at Isle Royale, Michigan, indicated that during winter only 8% of moose encountered by wolves were killed. The rest outran the wolves or stood their ground and the wolves left. During summer, moose often escape by entering water where wolves aren't effective. Certain prey, including goats and sheep, inhabit terrain where they are often protected. All prey species have evolved numerous anti-predator adaptations.

2. Do wolves kill in excess of their needs?

Studies have shown that wolves generally consume the animals they kill, often returning to kills over a prolonged period. They also commonly scavenge animals that die or are killed by other predators or humans. On occasion, wolves starve because they cannot find or kill enough prey, or their reproduction is reduced due to food shortage.

During deep snow conditions that occur rarely, wolves may kill more than they consume. They may also kill more young than they consume when young are very abundant, for example in large herds of caribou. However, this "surplus" killing has generally not been shown to have significant effects on prey populations.

3. At what rate do wolves kill prey?

Research has shown that kill rates vary greatly depending on snow depth, prey size, prey abundance, pack size, and many other factors. Wolves rarely kill only one species for extended periods; most packs in Alaska have access to

several species. During summer, beaver, fish, berries, and numerous small mammals and birds may supplement the diet.

During winter, for wolves that kill only moose, an average-sized pack (6-10) may eat one moose per 4-5 days, but this can vary from about 2-10 days per moose per pack. Some of these animals may be scavenged. Summer data are less reliable and difficult to compare to winter because nutritional needs vary as does prey size (many calves are killed) and composition. However, several studies suggest that summer kill rates are lower than during winter.

For smaller prey, kill rates are necessarily higher. In Minnesota where wolves kill mainly white-tailed deer (and also beaver and moose) annual kill rates per wolf have been estimated at 15-19 deer, including summer fawns.

4. What factors control wolf populations?

In Alaska (and elsewhere) wolf populations are mainly controlled by hunting and trapping, prey abundance, and social interactions among the wolves. Virtually every pack in Alaska is subject to hunting and trapping, legal and illegal, but the impact of this varies. Some packs are exploited lightly because of their inaccessibility; others are kept at low numbers by hunters and trappers. Some packs have been eliminated by humans.

Generally, wolves on the northern and northwestern arctic coasts are rare and kept at low density by people. Wolves in southcentral Alaska are heavily exploited but in much of the interior they are not.

Wolves generally declined during the late 1970's and early 1980's, apparently in response to declines of moose and caribou that began in the mid-1960's. As moose and caribou increased in some areas (including the Nelchina basin) wolves were prevented from increasing by hunting and trapping.

5. What impact has land-and-shoot (LAS) wolf hunting had on wolf numbers?

The impact of LAS has varied from place to place. In some areas that are heavily timbered with few lakes or rivers, LAS has been ineffective in reducing wolf numbers. In other areas (including the Nelchina basin) wolves have been kept low by this practice. Large areas of southcentral including GMU's 9, 16, 11, and 13 are ideally suited to LAS as are northern areas in and near the Brooks Range. It is clear that where the terrain allows hunters to be efficient, LAS has kept wolf numbers lower than they would have been with hunting and trapping by other methods.

6. Will wolves increase indefinitely if they are not "controlled?"

Because hunting and trapping are generally effective controlling factors, wolves will increase if exploitation stops. However, wolf populations will not increase without limit in the absence of exploitation. For example, after the wolf control in GMU-20A stopped, moose numbers more than tripled but wolves increased only to about their pre-control numbers.

7. What roles did hunting, weather, food supplies, and predation play in the moose and caribou declines of the 1960's and 1970's?

Moose and caribou populations in many areas of Alaska increased during the 1950's and early 1960's and declined into the 1970's. Research suggests that for moose, food supplies declined as populations increased. Deep-snow winters aggravated reduced food conditions and started the moose population declines. Hunting regulation changes did not respond in time and hunting further accelerated the declines as it also did for caribou, especially the Nelchina and Western Arctic herds. For some moose populations (GMU-20A), wolves did not start the declines, but acted after they were well underway to drive moose to lower levels than they probably would have reached in the absence of wolves.

8. Is habitat (food) currently limiting moose and caribou populations in Alaska?

Probably so in portions of southcentral including the lower Susitna valley where large numbers of moose starved in 1989-90 and the Kenai peninsula where plant succession has reduced habitat quality since the mid-1970's. Caribou herds, including the Western Arctic and Nelchina herds, are also thought to be approaching the carrying capacity of their ranges.

Probably not in portions of the interior where moose densities are low and food seems abundant.

Maybe in other areas where few data are available on food quantity and quality in relation to moose and caribou numbers. It is difficult to quantify these relationships over vast areas.

9. What about bear predation?

Studies have shown that both black and brown bears (especially the latter) can be efficient predators on young moose calves. In some areas (for example, the Nelchina basin) brown bears were a more significant source of calf mortality than wolves. Bears may also kill adults, especially in spring and fall when they are more vulnerable.

10. a) Can wolves (and bears) keep prey at low densities for long periods?
    b) Can prey increase from low densities if wolves (and bears) are not reduced by people?

There is evidence that wolves and bears acting together can keep moose at low densities for long periods in places where people have little or no impact on predator numbers. For caribou, it appears that this is not the case; caribou can periodically increase if alternate prey for wolves is scarce and they too fall to low densities. Moose also follow this pattern if bears are absent. At Isle Royale national park where bears are absent and people do not exploit either wolves or moose, moose have increased periodically and reached high densities without any form of wolf control.

11. Do we need to "control" wolves in order to harvest prey?

Biologists do not dispute the idea that moose populations will produce a higher yield for people if wolves are few or absent. However, people can still hunt and shoot moose if wolves are present as demonstrated in Alaska for many years. As indicated in question number 4 (above), hunting and trapping impacts wolf populations in many areas and may keep wolf densities low. Moose

abundance may be high in these areas, as it generally is now in southcentral Alaska, and hunting by people may produce high yields. In other areas where wolves and bears reach higher densities it may still be possible for people to hunt, but they may be restricted to bulls only. Moose harvests in many areas of Alaska have increased in recent years without wolf control programs.

12. Does reducing wolf density result in more moose and caribou?

Clearly, wolf control in GMU-20A during 1975-79 resulted in an increase of moose on the Tanana flats. This is probably the best known example of a successful wolf control program in Alaska. However, control programs in other areas where wolf:moose ratios were higher or where bears were the problem had less success. As discussed above, deep snow, reduced food, hunting, or bear predation may be more important than wolf predation in controlling moose numbers. If so, wolf control is not likely to yield benefits.

13. What is the importance of predator:prey ratios?

One of the primary factors in determining the impact of predation on prey numbers is the ratio of predators to prey. If predators are few in relation to prey, predation may have little controlling effect on prey numbers. However, controlling effects may be extreme if there are many predators in relation to prey. For wolves and moose, ratios of less than 1:30 may often result in moose population declines if wolves have little alternate prey. If bears are abundant, they may elevate this ratio considerably. When wolf:moose ratios are 1:60 or higher, predation likely has little impact on moose numbers.

14. Do wolf populations rapidly rebound from control programs?

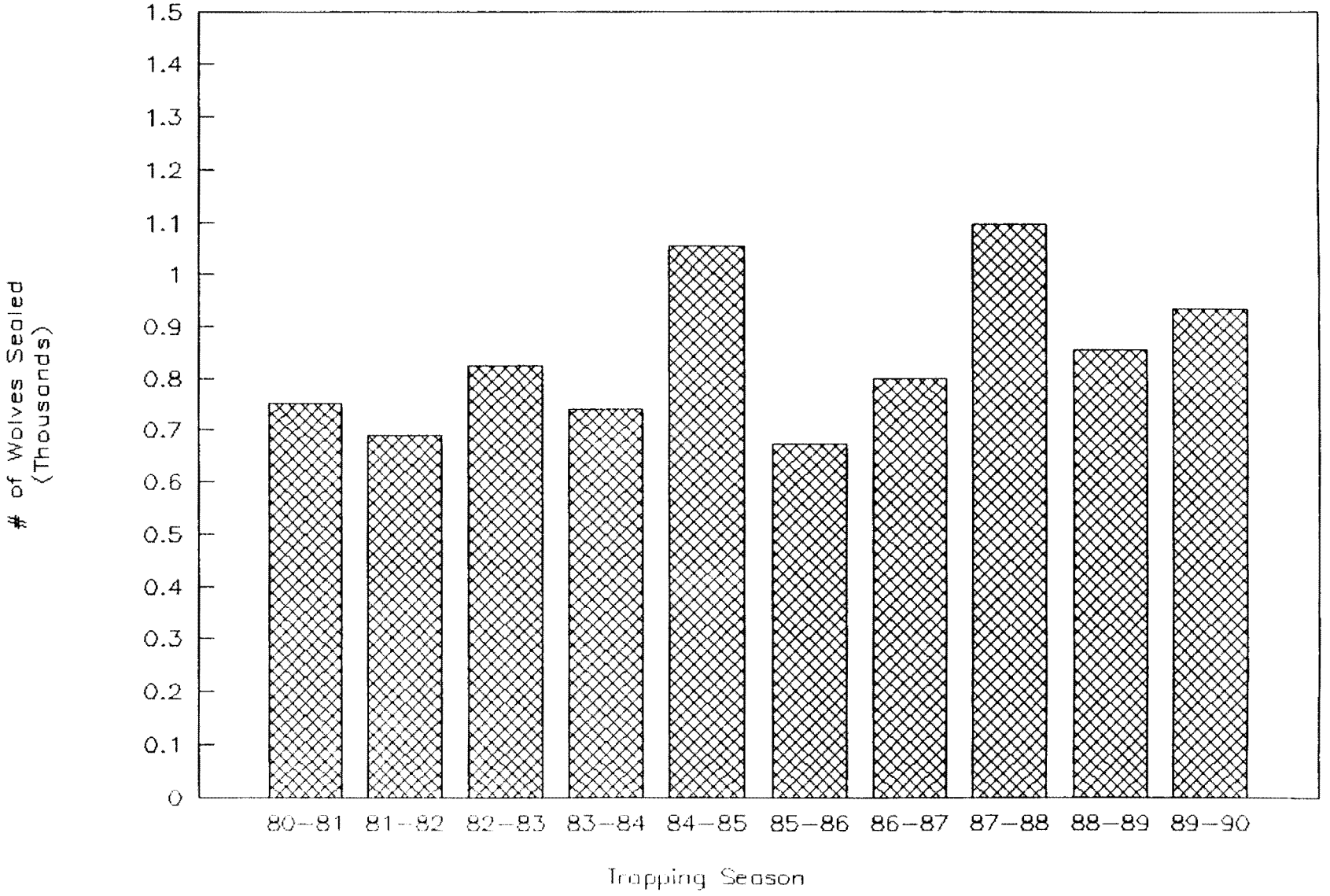
Wolves have a high reproductive rate and may disperse long distances to fill "voids". Studies in Alaska have shown that populations may increase rapidly following control programs and pre-control numbers may be reached in 3-4 years. However, wolves in some areas (including the north slope) have not recovered after being reduced to low densities because hunting and trapping removes them as they recolonize.

15. Is the "balance of nature" a valid concept?

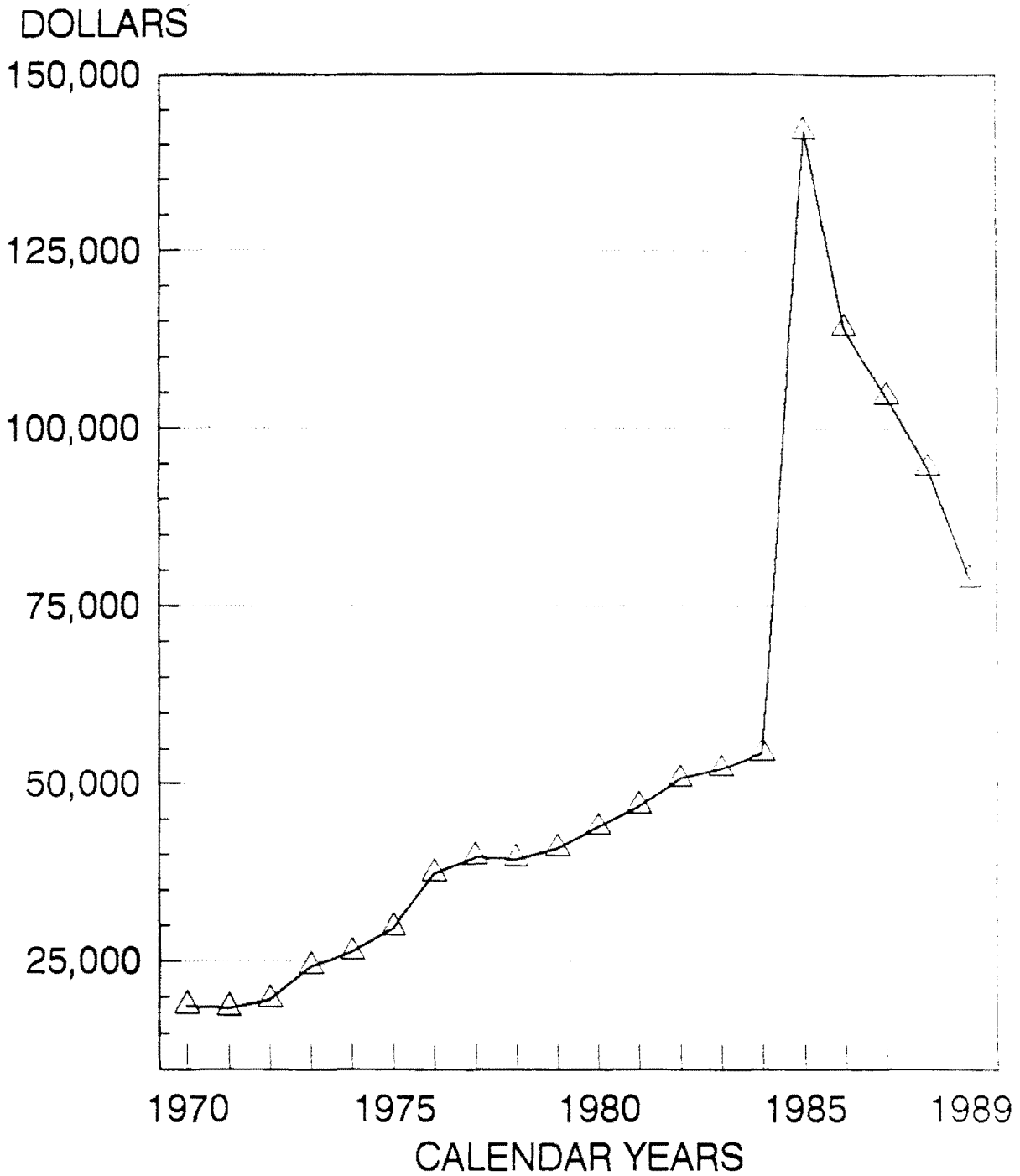
Different definitions of the balance of nature concept have emerged in recent years. If this concept means that wolves and prey exist for long periods at high and stable numbers, then the results of recent studies suggest this is simplistic. Numbers often fluctuate up as well as down and local extinction of prey is possible. However, if the concept means that wolves and prey coexist over time in large areas, clearly this is the case. Wolves and their prey co-evolved over thousands of years with little interference from humans. Wolves are efficient predators that at certain times under certain conditions may exert powerful controlling effects on prey populations. But, for their part, prey animals have evolved the ability to survive and reproduce. The effects of humans on both wolves and prey and their habitat in the modern world are often the primary factors determining the "balances" that now result.

Alaska Wolf Harvest

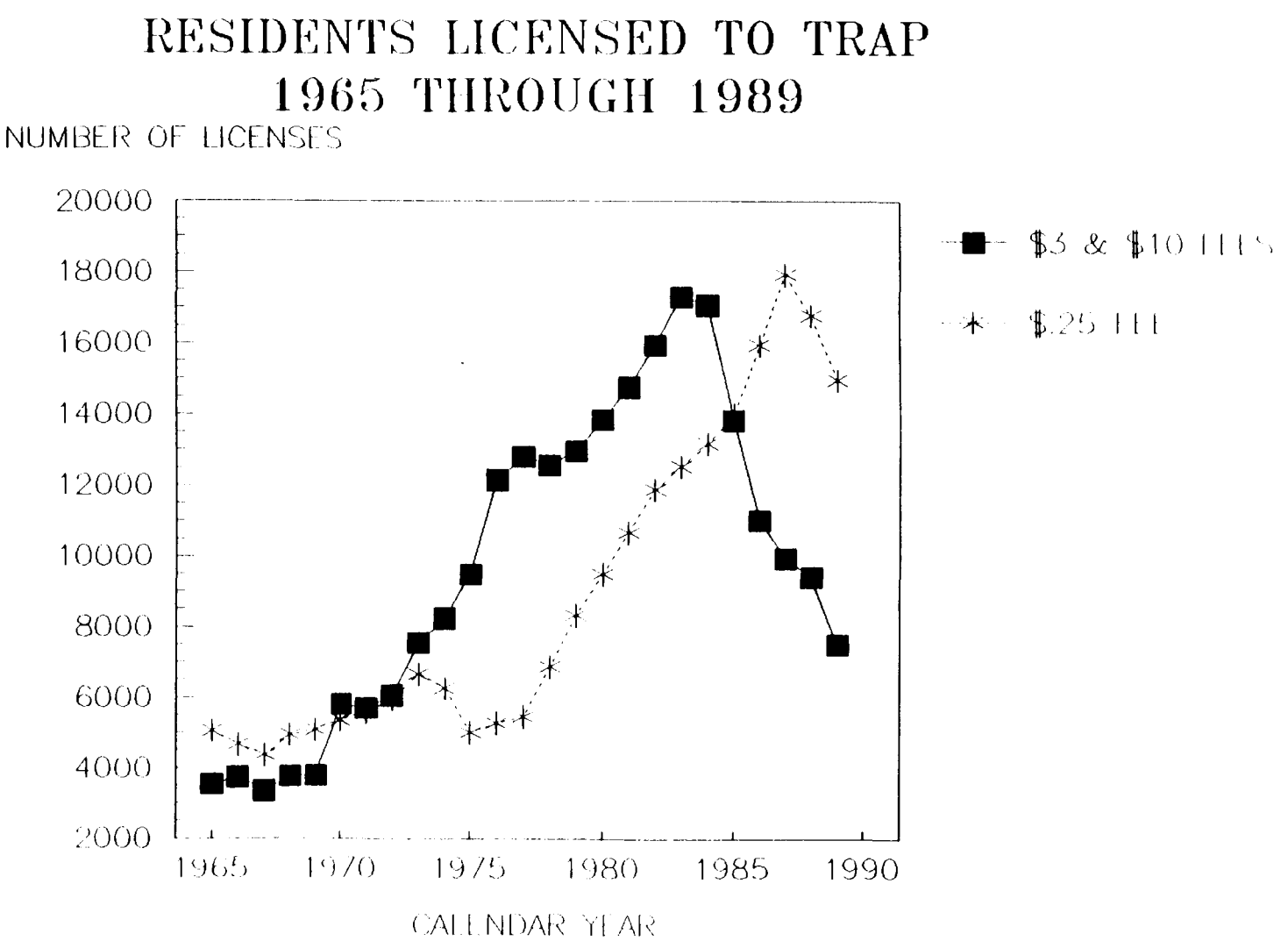
1980–81 thru 1989–90 Seasons



TRAPPING LICENSE INCOME

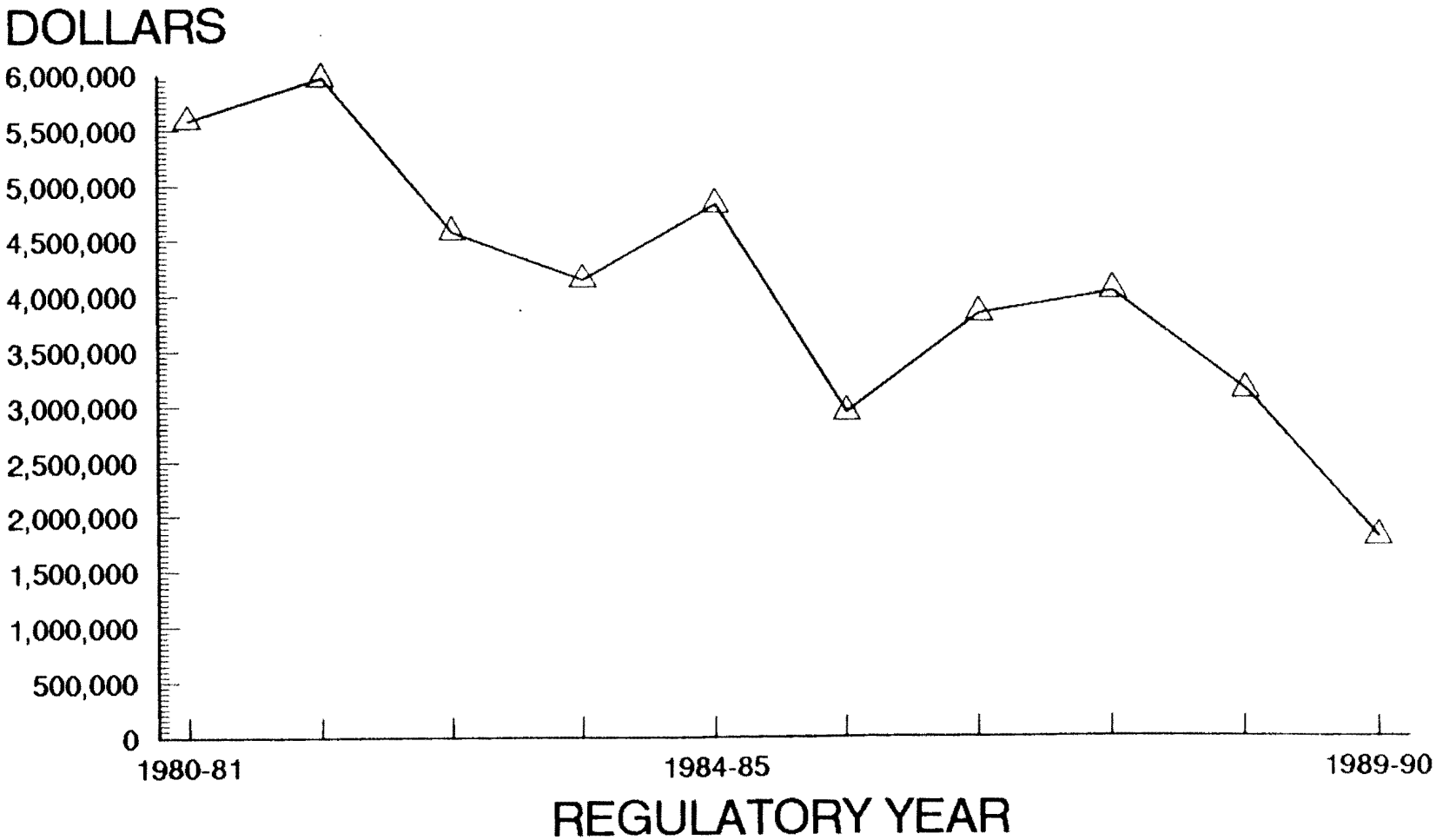


RESIDENTS LICENSED TO TRAP
1965 THROUGH 1989



ESTIMATED RAW FUR VALUES

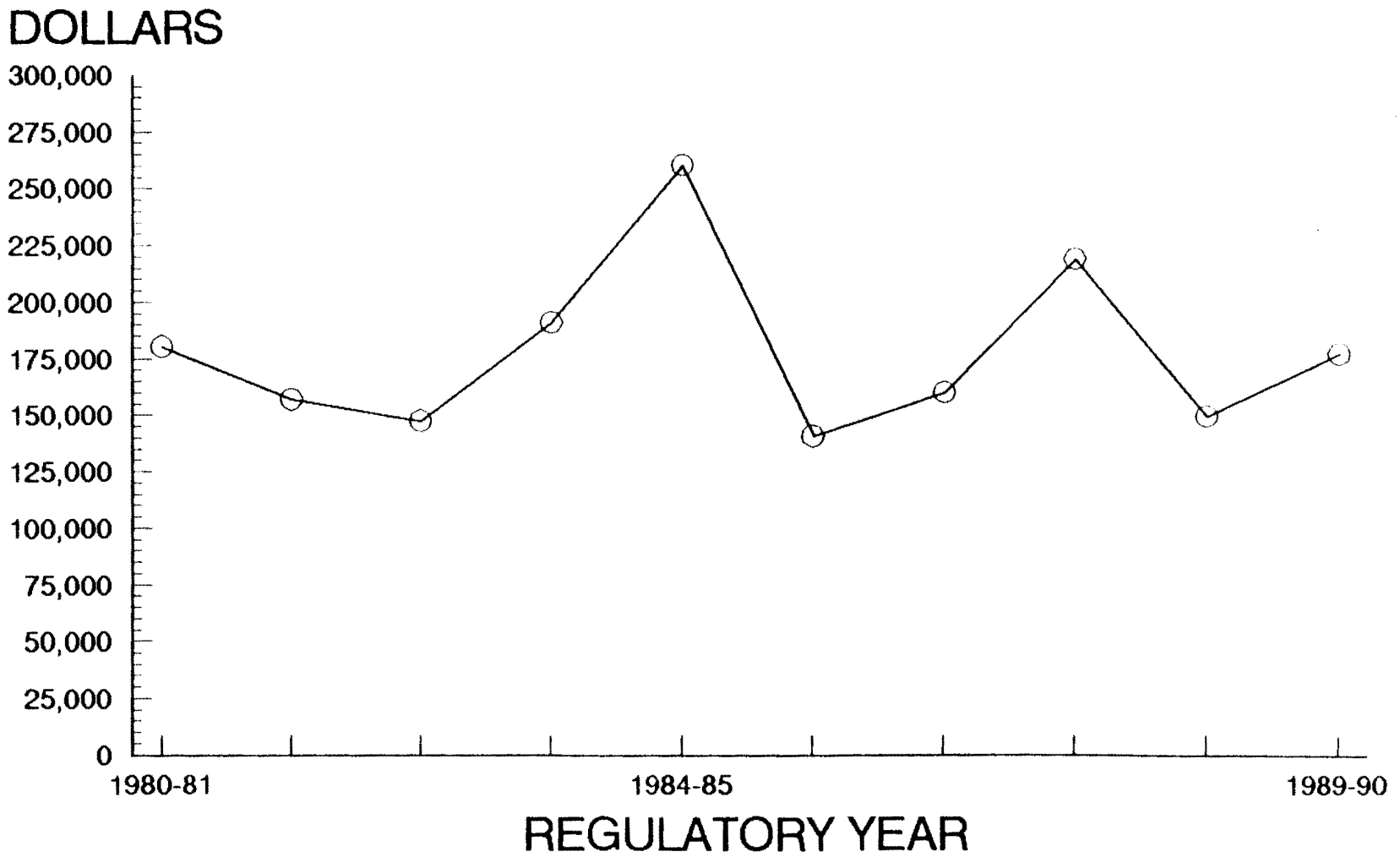
1980-81 TO 1989-90



ESTIMATED VALUE FOR ALL FURS

WOLF ESTIMATED RAW PELT VALUE

1980-81 TO 1989-90



Appendix E. Information Review and Synthesis.

Unanimous agreement
Need for long term systems approach.

Inconsistency in the interpretation of land & shoot.

Hunting wolves as big game an important issue.

Disparity in view of wolves between professional biologists and public.

Turn over in wolf population is high.

Light harvest is likely to be compensatory mortality of young.

Man can intervene in decreasing population density situations, but it is not often necessary.

Must avoid predator pit.

Multiple (wolf) litters are fairly common (up to 29 percent).

The final decision is political and ethical lacking direction from biologists.

Long term solution may not be in the best interest of the species (resource).

ADF&G may need habitat/range management to regulate human use of all resources (need to look at the big picture).

ADF&G needs to do a better job educating the public.

Ever changing process, need flexibility and cooperation in management.

Extreme difference in wolf status throughout the state.

Public demand/require more sophisticated management by the agencies.

Require more public support for management agencies.

Alaska is the best place in the world for wolves. Still have the opportunity to provide for their future and all involved.

Multiple predator systems are complex.

Wolf take strategy are different for sport/hunting and control.

It is easier for man to take wolves in flat country.

Without control, decreasing prey populations will remain low, must intervene to promote a prey population increase.

Wolf populations can sustain harvest, but there is variation in a sustainable harvest.

Need to look at IUCN model.

Healthy ungulate populations are necessary for rural Alaska.

Need more public education on requirements under the AHA.

Management policy will vary under different land jurisdiction.

Some agreement

Wolves/prey are self regulating. Wolf control can be a solution were prey have already been reduced.

Wolf populations are stable and doing well.

To provide prey for human take at the current level, need to manage (harvest) predator to maintain current levels.

Wolves can sustain approximately a 30 percent harvest.

Wolves are not a biological problem, maybe an enforcement problem.

Can't adequately enforce airborne hunting of any type.

The human population is increasing, lots of habitat being lost, need more sharing of limited wolf resources required in the future.

Wolf populations do rebound and hit carrying capacity.

Bears have a low reproductive rate.

Hunting and trapping records are needed for wildlife that is not currently sealed or tagged.

Questions

Should we be making environmental decisions?

Where do we have the most data on predators and prey?

Are there wolf populations in Alaska that are not studied?

Do you practice control on individual wolves or packs?

How do the agencies differ in interpreting the federal law?- especially harassment.

Is there a difference between theory and research?

Do we need wolf control?

Can prey populations increase without wolf control?

Is there value in the integrity of the social structure of the pack?

Can bear control be an option?

What level of information is needed to dictate necessary wolf control?

If a wolf population has a negative affect, how do you control it?

UNION INTERNATIONALE POUR LA CONSERVATION DE LA NATURE ET DE SES RESSOURCES
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

Commission du service de sauvegarde – Survival Service Commission

WOLF SPECIALIST GROUP

Mailing address:

North Central Forest Expt. Station
1992 Folwell Ave.
St. Paul, MN 55108
U. S. A.

19 March 1984

WOLF GROUP STATEMENT ON WOLF CONTROL

The Wolf Specialist Group is part of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature and Natural Resources (IUCN). The Group advises IUCN on matters pertaining to wolf conservation and provides guidelines for wolf management to which member nations and their local subdivisions can look for advice on how professional conservationists with an international perspective consider various wolf management strategies. The Group contains members from the following countries: Canada, Finland, Greece, India, Israel, Italy, Norway, Poland, Portugal, the Soviet Union, Spain, Sweden, and the U.S.

During the last few years, game departments in Alaska and western Canada have instituted wolf-control programs to help increase the numbers of wolf prey, especially caribou and moose. A thorough, scientific investigation in Alaska strongly indicated that at least under certain circumstances such wolf control could substantially increase prey numbers.

Because of the widespread publicity given government wolf-control programs, numerous conservation and protectionist organizations have requested that the Wolf Specialist Group review the program plans and the data on which they are based.

A "Manifesto on Wolf Conservation" was drafted by the Group under the direction of its first chairman, Dr. Douglas H. Pimlott, in 1973 and revised in 1982. This Manifesto recognized that wolves may sometimes have to be controlled and stated that such control should be (1) temporary, (2) based on strict scientific determination of its need, (3) "selective, specific to the problem, highly discriminatory, and with minimal adverse effects of the ecosystem."

The Wolf Specialist Group cannot review or critique specific management plans for each governmental unit, not only because the Group does not have the necessary resources but also because such a task is not the function of the Group. The Group can only set broad principles for wolf conservation, and within these general principles, elaborated within the "Manifesto", there is room for considerable diversity in wolf management. This is as it must be, because the Group (1) must consider the extreme differences in wolf status and ecology throughout the northern hemisphere and (2) accepts the definition of conservation as

being the wise use of a natural resource. So long as a given wolf population is not endangered, it is not within the purview of the Group to involve itself in wolf management decisions.Nevertheless because of the magnitude of popular concern over current wolf-control programs, the Group feels that it has a responsibility to comment generally on those programs.

The Group recognizes that there are circumstances under which wolves may substantially reduce their prey populations and that in such circumstances wolf control would help prey populations recover faster. We believe, however, that control programs should be restricted to the minimal area and period necessary to accomplish the goal and that the control should be carried out after sufficient scientifically collected data are gathered indicating the need.The Group also recognizes that it is not always possible, feasible, necessary, or desirable to wait until a completely definitive study is conducted in each instance before control is instituted. As increasing amounts of data are collected from various regions, it is scientifically valid to generalize and draw inferences from previous studies and apply them to current situations so long as the limitations of such an approach are recognized.

The Wolf Specialist Group also believes that a balance should be struck in managing ecosystems that include the wolf. Governmental units should recognize that not only are large numbers of people interested in harvesting big game animals that happen to be prey of the wolf, but that in addition an increasing number of citizens are also interested in wolf protection. Because of this and because it is only logical, the Group believes that when prey populations are so low that wolf control must be initiated, human harvest of the prey should also be prohibited whenever possible in the same area and period as the wolf control is practiced. Even male prey animals, which usually do not contribute substantially per individual to the increase in a herd directly, should not be taken by humans. This is because human removal of males reduces the number of potential wolf prey, thus forcing wolves to prey increasingly on females.

After prey populations recover, their careful management should allow both humans and wolves to partake in their harvest in reasonable numbers. Game departments, therefore, should monitor prey populations accurately enough and often enough to regulate human and/or wolf harvest in such a way as to minimize the need for wolf control. In this way, the Group believes, the interests of prey, predator, hunter, and protectionist can best be balanced.

L. David Mech
Chairman

BULLETIN IUCN
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES
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Manifesto on Wolf Conservation

This Manifesto comprising a Declaration of Principles for Wolf Conservation and recommended Guidelines for Wolf Conservation was adopted by the IUCN/SSC Wolf Specialist Group at its meeting in Stockholm, Sweden, on 5-7 September 1973, and has been endorsed by the Survival Service Commission and the Executive Board.

The Stockholm meeting was attended by official delegates and observers from 12 countries having important wolf populations. It was the first international meeting on the conservation of the wolf.

Declaration of Principles for Wolf Conservation

1. Wolves, like all other wildlife, have a right to exist in a wild state. This right is in no way related to their known value to mankind. Instead, it derives from the right of all living creatures to co-exist with man as part of natural ecosystems.

2. The wolf pack is a highly developed and unique social organisation. The wolf is one of the most adaptable and important mammalian predators. It has one of the widest natural geographical distributions of any mammal. It has been, and in some cases still is, the most important predator of big-game animals in the northern hemisphere. In this role, it has undoubtedly played an important part in the evolution of such species and, in particular, of those characteristics which have made many of them desirable game animals.

3. It is recognized that wolf populations have differentiated into sub-species which are genetically adapted to particular environments. It is of first importance that these local populations be maintained in their natural environments in a wild state. Maintenance of genetic purity of locally adapted races is a responsibility of agencies which plan to reintroduce wolves into the wild as well as zoological gardens that may provide a source for such reintroductions.

4. Throughout recorded history man has regarded the wolf as undesirable and has sought to exterminate it. In more than half of the countries of the world where the wolf existed, man has either succeeded, or is on the verge of succeeding, in exterminating the wolf.

5. This harsh judgement on the wolf has been based, first, on fear of the wolf as a predator of man and, second, on hatred because of its predation on domestic livestock and on large wild animals. Historical perspectives suggest that to a considerable extent the first fear has been based on myth rather than on fact. It is now evident that the wolf can no longer be considered a serious threat to man. It is true, however, that the wolf has been, and in some cases still is, a predator of some consequence on domestic livestock and wildlife.

6. The response of man, as reflected by the actions of individuals and governments, has been to try to exterminate the wolf. This is an unfortunate situation because the possibility now exists for the development of management programmes which would mitigate serious problems, while at the same time permitting the wolf to live in many areas of the world where its presence would be acceptable.

7. Where wolf control measures are necessary, they should be imposed under strict scientific management, and the methods used must be selective, highly discriminatory, of limited time duration and have minimum side-effects on other animals in the ecosystem.

8. The effect of major alterations of the environment through economic development may have serious consequences for the survival of wolves and their prey species in areas where wolves now exist. Recognition of the importance and status of wolves should be taken into account by legislation and in planning for the future of any region.

9. Scientific knowledge of the role of the wolf in ecosystems is inadequate in most countries in which the wolf still exists. Management should be established only on a firm scientific basis, having regard for international, national and regional situations. However, existing knowledge is at least adequate to develop preliminary programmes to conserve and manage the wolf throughout its range.

10. The maintenance of wolves in some areas may require that society at large bear the cost, e.g. by giving compensation for the loss of domestic stock; conversely there are areas having high agricultural value where it is not desirable to maintain wolves and where their introduction would not be feasible.

11. In some areas there has been a marked change in public attitudes towards the wolf. This change in attitudes has influenced governments to revise and even to eliminate archaic laws. There is a continuing need to inform the public about the place of the wolf in nature.

12. Socio-economic, ecological and political factors must be considered and resolved prior to reintroduction of the wolf into biologically suitable areas from which it has been extirpated.

Guidelines on Wolf Conservation

The following guidelines are recommended for action on wolf conservation.

A. General

1. Where wolves are endangered regionally, nationally or internationally, full protection should be accorded to the surviving population. (Such endangered status is signalled by inclusion in the Red Data Book or by a declaration of the Government concerned.)

2. Each country should define areas suitable for the existence of wolves and enact suitable legislation to perpetuate existing wolf populations or to facilitate reintroduction. These areas would include zones in which wolves would be given full legal protection, e.g. as in national parks, reserves or special conservation areas, and additionally zones within which wolf populations would be regulated according to ecological principles to minimize conflicts with other forms of land use.

3. Sound ecological conditions for wolves should be restored in such areas through the rebuilding of suitable habitats and the re-introduction of large herbivores.

4. In specifically designated wolf conservation areas, extensive economic development likely to be detrimental to the wolf and its habitat should be excluded.

5. In wolf management programmes, poisons, bounty systems and sport hunting using mechanized vehicles should be prohibited.
6. Consideration should be given to the payment of compensation for damage caused by wolves.
7. Legislation should be enacted in every country to require the registration of each wolf killed.

B. Education

A dynamic educational campaign should be promoted to obtain the support of all sectors of the population through a better understanding of the values of wolves and the significance of their rational management. In particular the following actions are advocated:
(a) Press and broadcast campaigns;
(b) Publication and wide distribution of information and educational material; and
(c) Promotion of exhibitions, demonstrations, and relevant extension techniques.

C. Tourism

Where appropriate, general public interest in wolf conservation should be stimulated by promoting wolf-related tourist activities. (Canada already has such activities in some of its national and provincial parks.)

D. Research

Research on wolves should be intensified, with particular reference to:
(a) Surveys on status and distribution of wolf populations;
(b) Studies of feeding habits, including especially interactions of wolves with game animals and livestock;
(c) Investigations into social structure, population dynamics, general behaviour and ecology of wolves;
(d) Taxonomic work, including studies of possible hybridization with other canids;
(e) Research into the methods of reintroduction of wolves and/or their natural prey; and
(f) Studies into human attitudes about wolves and on economic effects of wolves.

E. International Cooperation

A programme of international cooperation should be planned to include:
(a) Periodical official meetings of the countries concerned for the joint planning of programmes, study of legislation, and exchanging of experiences;
(b) A rapid exchange of publications and other research information including new techniques and equipment;
(c) Loaning or exchanging of personnel between countries to help carry out reserach activities; and
(d) Joint conservation programmes in frontier areas where wolves are endangered.

Accepted changes in the Manifesto on Wolf Conservation
and Guidelines on Wolf Conservation

Item 7 of the Manifesto:

It is recognized that occasionally there may be a scientifically established need to reduce non-endangered wolf populations; further it may become scientifically established that in certain endangered wolf populations specific individuals must be removed by appropriate conservation authorities for the benefit of the wolf population. Conflict with man sometimes occurs from undue economic competition or from imbalanced predator-prey ratios adversely affecting prey species and/or the wolf itself. In such cases, temporary reduction of wolf populations may become necessary, but reduction measures should be imposed under strict scientific management. The methods must be selective, specific to the problem, highly discriminatory, and have minimal adverse side effects on the ecosystem. Alternative ecosystem management, including alteration of human activities and attitudes and non-lethal methods of wolf management, should be fully considered before lethal wolf reduction is employed. The goal of wolf management programs must be to restore and maintain a healthy balance in all components of the ecosystem. Wolf reduction should never result in the permanent extirpation of the species from any portion of its natural range.

Item 11 of the Manifesto:

In some areas there has been a marked change in public attitudes towards the wolf. This change in attitudes has influenced governments to revise and even to eliminate archaic laws. It is recognized that education to establish a realistic picture of the wolf and its role in nature is most essential to wolf survival. Education programs, however, must be factual and accurate.

Item B of Guidelines:

B. Education

A dynamic educational campaign should be promoted to obtain the support of all sectors of the population through a better understanding of the values of wolves and the significance of their rational management. Public information should be coordinated and should be implemented with the help of professionals. Specific tools and approaches should be designed for different cultural and social settings.

5. In wolf management programmes, poisons, bounty systems and sport hunting using mechanized vehicles should be prohibited.
6. Consideration should be given to the payment of compensation for damage caused by wolves.
7. Legislation should be enacted in every country to require the registration of each wolf killed.

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L. David Mech
Chairman

CRANE

Starts out reading the federal law (AHA). Then reads, "The term aircraft means..."

"The term harassment can be interpreted in the strict sense that the mere flying over could worry, molest or annoy an animal. If a person flies over say a wilderness area, unaware that an animal is on the ground and he annoys the animal, in the strict sense, one might argue that he could be held responsible. But I think that with the legislative history and also with the way that we interpret the act, that would be ridiculous. Considering the historical use of the aircraft in Alaska, an interpretation like that would create total chaos and it would mean a total prohibition of the use of an airplane for transportation for going out to hunt. Obviously, that's not what the USFWS means and as you can see that's not what congress meant. The purpose and the legislative history of the AHA tends to indicate that Congress meant the act to cover only advertent or specifically intended harassment of animals. If a person flies a helicopter over a wilderness area unaware that an animal is annoyed by the flight and with no intent to so annoy by the flight. It can be said that the person is harassing the animal from the common sense of the meaning. On the other hand, if a person flies a helicopter knowing that an animal is annoyed thereby and intending the annoyance and any responsible/reasonable person would deem the behavior harassment. With this then someone would argue that just to fly over to take pictures and maybe check-out an animal so that you could land and make a camp and conduct a hunt the next day or whatever and that you did not intend to scare them and you inadvertently did scare them that it wouldn't mean that it was in violation of the AHA. That is not necessarily so. With this advertent flight where animals were driven chased, or harassed because an individual specifically put the aircraft into a position to do something connected to the animal and they responded by running away or they jumped over a cliff or they responded in that it was obvious to the pilot or to any reasonable person, that they were somehow annoyed or disturbed then it would be considered harassment. The state in itself, the act of Congress, is basically quite clear in making three separate categories of conduct. (AHA) #1, #2 without 'knowingly'. Strict liability is in effect, meaning that 'you did it.' Considering the historical use of aircraft in AK and the questions at hand on the effect of the AHA on the state's L&S program, one must conclude that any intended action by a pilot that moves animals to a desired location must be considered harassment, in the terms of what the regulation defines in the federal act as harassment.

Whenever a person moves an animal to a desired location whether its circling above or whether it's down, driving them closely on a wolf trail either to get them off the trail or to put them on a trail, on the same trail back to an area where because they couldn't move very fast the aircraft could land on them or land on a lake or some area to get closer to do what he wants to do.

Everyone knows that shooting from the air is illegal, under the present statutes and present regulations unless there is a permit. All the other things discussed may not be so well known. In this sense then, probably 95 percent of all aerial land and shoot wolf hunting would be considered or construed as illegal, under the federal law (AHA). This interpretation then is not in conflict with the states rules. In 50 CFR 19 92.080 5) the states rule says the following... That is not in conflict with the federal rule and it is not in conflict with the ethic of "fair-chase." I think that that is what the drafters of both the regulations had in mind is basically "fair-chase" and not running an animal down. Legislative history points out that congress did not intend to restrict the use of aircraft as a means of transportation for hunting. Provided that no hunting nor harassment takes place from the airplane while airborne. While hunting with the use of the aircraft or from the aircraft while airborne. It is not specifically appropriate to apply the statute in the situation where operators of aircraft unwittingly interfere with wild animals. Intent has something to do with it. Intent to place animals where one wants them or to be connected to them by watching them and wanting to be near them. Then it is necessary, but officers do not have to prove an individuals intent to harass them if harassment took place as a result of the action of the aircraft. While the pilot was intending to look at them, even if he didn't intend to harass them, if he brought himself into the situation where he was watching them and his airplane harassed them, made a bunch of sheep jump over a cliff, or whatever it did, then he would be considered harassing them. And this gets into a more technical than maybe we want to be in, but that's the realm in which the court sometimes gets and defense or prosecuting attorneys get because they're trying do decide whether just because the airplane flew by and had a look at these animals and we were going to hunt these animals the next day and ten sheep ran off a cliff. We can't say those people had intended to harass them because all they wanted to do was look at them. But indeed when the airplane chased those sheep over the cliff those sheep were harassed. The point is that when an airplane is used to disturb, worry... or torment, then the pilot or the aircraft has violated the airborne hunting act. When an airplane is used to disturb, worry,... then the pilot or the aircraft has violated the AHA. What does this all mean? Like I said before, 95 percent of all land and shoot actually would be illegal under the AHA. An example of illegal activity would be circling if you knew that what your activity would change the direction or would change whatever a wolf was doing or whatever an animal was doing on the ground. That would be the strict sense. Not always would they be able to make a case on that, but certainly when low flying and changing the direction of way wolves on a trail to move them from treed areas out onto a lake on their back-tracks on trail or specifically possibly or moving them off their beaten trail into deep snow they couldn't move very fast so the airplane lands on them would be considered, under the AHA, illegal. It would be harassment. Everyone knows that it is illegal to shoot from the air. There have been numerous prosecutions on that. There are aerial hunters that have been permitted to shoot from the

air. That's the exception in the rule. I talked to a trapper, an aerial trapper and I have been out in the country for a few years flying and watching wolves and know what a little bit about how they react. I'm not the expert in this room because I know there are people in this room that surely have more experience in this room than I do. I do respect this individual that I spoke to and he did tell me something that I have a little bit of experience on and I believe is possible. He tells me that there are ways to legally use the states land and shoot program and I believe that's true. The AHA does not prohibit wolf hunting and does not intend according to legislative history, to prohibit the use of an airplane to hunt or to transport individuals to the field. Its intention from what I can gather and from what I read is to promote fair-chase and not to harass.

The USFWS is not out to stop the program as it is at this point used by the state. The US attorney in Fairbanks made a statement to me and I think he puts it plainly and it's probably the way that it should be interpreted in the act that the rule as it is for most wildlife resource laws provides an exception to everything. There's a prohibition and there's an exception. The exception is that indeed there needs to be a program, a control program, then the control program needs to follow the rules as promulgated. And those rules are that permits may be issued and that there is a control a strict control and that people may go against what the rule is, as long as it is controlled and permitted correctly. Even though it sounds like the AHA prohibits all this, it has an exception to allow certain things for control. Personally and I believe on behalf of USFWS that what we'd like to promote is respect for the law. We have difficulty in certain areas of the state with the law and we'd like to promote respect for the law and not disregard for the law by promoting something that is on the edge of or makes it appear to the public that its not legal/illegal. That the public gets sort of straightened out so that they don't feel some ambiguity. That is, the law says that you can't do this but it also says there's an exception then we need to go to that exception and be sure that its followed in that sense.

GLOSSARY

of terms used in game management

Area-kill: The annual kill per unit area.

Breeding (or reproduction) potential: The maximun or unimpeded increase rate of a species in an "ideal" environment.

Carrying capacity: The maximum density of wild game which a particular range is capable of carrying.

Conservation: (concept promoted by T. Roosevelt) It recognized all these "outdoor" resources as one integral whole. It recognized their "conservation through wise use" as a public responsibility, and their private ownership as a public trust. It recognized science as a tool for discharging that responsibility.

Covert: A geographic unit of game cover.

Density: The number of head of game per acre or other unit area carried by a game range. Syn.--stand.

Escape covert: A covert serving as refuge from predator attack, by reason of density or mechanical protection.

Factor: One of the forces reducing the numbers (decimating factors) or retarding the increase rate (welfare factors) of game.

Index: A condition which can be measured, and which varies as some other condition which cannot be measured. The former is used as an index to the latter.

Influence: An environmental variable which influences a factor.

Interspersion: The degree to which environmental types are intermingled or interspersed on a game range.

Irruption: A large, sudden, non-periodic increase in density, often accompanied by an extension into higherto unoccupied range.

Kill: The number of head killed per year from a unit of population.

Kill-ratio: The proportion or per cent of the game population which can be killed yearly without diminishing subsequent crops. The ration of the yield to the population.

Leak: A loss in productivity caused by some factor.

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Dasmann, Raymond F. 1964. Wildlife Biology. John Wiley & Sons, New York

Carrying capacity: Food, water, cover, special needs, and their interspersion are the factors that normally determine where a wildlife species' breeding potential will be balanced by mortality, for that land unit.

...carrying capacity is rarely constant for long periods.

Critical limiting factor: The overall population level of that species will be determined by that essential factor in least supply.

Teague, Richard D. and Eugene Decker. 1979. The Wildlife Society, Wash. D.C.

Sustained yield: Is the number or biomass of animals that can be removed from a population over a long period of time while assuring persistence of the resource.

Schemnitz, Sanford D. 1980. Wildlife Management Techniques Manual. The Wildlife Society, Wash. D.C.

Conservation: The act or practice of conserving; protection from loss, waste, etc.; preservation.

Webster's NewWorld Dictionary. 1980.

Fair Chase

The concept of Fair Chase, of avoiding available but unfair advantage that would deprive the animal of using its normal escape mechanisms, took its early written form in the 1893 Boone and Crockett Club publication, *American Big Game Hunting.* In it, Theodore Roosevelt set forth that, "The term 'Fair Chase' shall not be held to include killing bear, wolf, or cougar in traps, nor 'fire hunting' nor 'crusting' moose, elk or deer in deep snow, nor killing game from a boat while it is swimming in the water, nor killing deer by any other method than fair stalking or still hunting." The foresight contained in this statement is striking when one remembers that these practices were not unlawful in the 1890's. This was a distinct step toward formation of higher standards of sportsmanship afield.

Rapid advances in the field of transportation in the 1940's and 1950's forced a further definition of the Fair Chase concept in a written form adopted in 1963. That statement, printed on the back of the score charts, reads: "Spotting or herding land game from the air, followed by landing in its vicinity for pursuit, shall be deemed UNFAIR CHASE and unsportsmanlike. Herding or pursuing ANY game from motor-powered vehicles shall likewise be deemed Unfair Chase and unsportsmanlike." Hunters entering trophies eligible for Competition were required to sign a statement specifying that the above methods were not used in taking the trophy scored on the chart. Pickups and unknown origin trophies were excluded from this requirement, for obvious reasons.

This basic statement was again revised in January 1968, to include the use of electronic communications for attracting, locating or observing game, or guiding the hunter to such game, as unfair chase, and such conditions were organized into three statements that precede the certification statement of the hunter. The hunter's statement was also expanded to include acknowledgement that all local game laws or regulations were followed in the hunt. Beginning on January 1, 1975, the hunter's signature of the Fair Chase Statement was required to be witnessed by a Notary Public. This is further verification of the serious intent of the Fair Chase requirements for entries.

A fourth statement of unfair chase conditions was approved for implementation as a requirement for the 17th Awards entry period (1977–1979). This additional statement specifies as unfair chase, "Hunting game confined by artificial barriers, including escape-proof fencing, or hunting game transplanted solely for the purpose of commercial shooting".

Thus, the Fair Chase Statement required for hunter-taken entries in the 17th Awards and later entry periods has four statements of unfair chase conditions that specifically disqualify trophies for possible awards and publication. Violation of the intent or substance of the Fair Chase concept may also disqualify trophies. Such cases are considered on an individual basis by the Records Committee, and its decision is final in such matters. The current Fair Chase Statement is reproduced in the score chart section of this book.

FAIR CHASE STATEMENT FOR ALL HUNTER-TAKEN TROPHIES

To make use of the following methods shall be deemed as UNFAIR CHASE and unsportmanlike, and any trophy obtained by use of such means is disqualified from entry for Awards.

I. Spotting or herding game from the air, followed by landing in its vicinity for pursuit;
II. Herding or pursuing game with motor-powered vehicles;
III. Use of electronic communications for attracting, locating or observing game, or guiding the hunter to such game;
IV. Hunting game confined by artificial barriers, including escape-proof fencing; or hunting game transplanted solely for the purpose of commercial shooting.

I certify that the trophy scored on this chart was not taken in UNFAIR CHASE as defined above by the Boone and Crockett Club. I further certify that it was taken in full compliance with local game laws of the state, province, or territory.

Date_____ Signature of Hunter_____

(Have signature notarized by a Notary Public)

COPY FOR YOUR INFORMATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
DARW

TAKE PRIDE IN AMERICA

NOV 2 6 1990

To: All Refuge Managers
Region 7

From: Acting Regional Director
Region 7

Subject: Alaska Wolf Management Plan

As you are probably aware, the Alaska Department of Fish and Game is embarking on the development of a wolf management plan for the State of Alaska. This effort (endorsed by the Board of Game) has begun with the establishment of an "Alaska Wolf Management Planning Team" made up of private citizens (interested citizens and those representing organizations) and the Deputy Director for the Division of Wildlife Conservation (Division). The team is to develop recommendations for the Division to consider. The team met on November 14 and 15 to develop operating procedures and to agree on the goals and objectives. The minutes of that meeting will be provided to you once we have them. Deputy Assistant Regional Director Schmidt will interface with that team to provide answers to questions, provide counsel as necessary, and keep the Fish and Wildlife Service apprised of the team's progress. We hope the end result of this effort will be a comprehensive plan that can be adopted by the Board of Game and meets the legal mandates and policy requirements within the Fish and Wildlife Service.

Attached are some handouts for your information.

Attachments

cc: AM

Alaska Department of Fish and Game
Division of Wildlife Conservation

A PROPOSAL TO DEVELOP A WOLF MANAGEMENT PLAN FOR ALASKA

January 24, 1990

INTRODUCTION

Wildlife in Alaska is managed by the Alaska Department of Fish and Game's Division of Wildlife Conservation (Division). The goal of wolf management is to ensure that Alaska always has healthy numbers of wolves and their prey and appropriate habitat for both. Also, the Division and the Board of Game (Board) must provide for both consumptive and nonconsumptive uses of wolves and their prey.

Wolf management has become more and more difficult because some social values have changed over the years and the public has voiced different demands for wolves. Conflicts between people with different interests concerning wolves have become intense, and many discussions of how wolves should be managed in Alaska have resulted in unproductive confrontations.

There are many growing pressures and threats to Alaska's wildlife and their habitats. It is imperative that we resolve this conflict so we can work together successfully to conserve Alaska's wildlife for all users.

Presently someone always loses in confrontations about wolf management. We propose creating a situation in which all sides have something to win. To do so, we propose a three stage effort, each of which would involve the public in a meaningful role.

The first stage involves developing a general agreement about just what the fundamental "problem" of wolf management is. The problem statement will have to be broad enough to include the concerns of most people and interest groups.

The second stage will involve developing a statewide management plan for wolves. The plan will identify and recommend potential solutions to the problem. Identifying acceptable solutions will require both the best technical information from wildlife scientists and managers and sincere efforts by the public to recognize and reconcile their conflicting values and desires.

The third stage involves implementing the plan. Regulations based on the plan will have to be passed by the Board, and the Division will have to develop appropriate management and research programs to fully implement the statewide plan.

STAGE I: PROBLEM ANALYSIS

The Division has developed the following Problem Statement. In this statement we have tried to boil the problem down to the basic elements which are common to all interested parties. We realize that we may not have represented everyone's concerns adequately, so we are asking you to give us your comments.

PROBLEM STATEMENT

People are not getting what they want when it comes to wolf management. Different people have different desires for wolves which cover a broad range of options. Currently, the way wolves are managed in Alaska does not satisfy the range of those desires. Consequently, opposing groups each try to force the state to meet their wishes, which produces a continual series of conflicts regarding wolf management policies, techniques, and the decision-making process.

Although the different interests can compromise to change some of the aspects of this conflict, we recognize that other aspects most likely cannot be changed.

Unchangeable Aspects.

Human uses of wolves and their prey cover a broad spectrum of values from knowing animals are there (existence value) to nutritional dependence. These uses reflect values which are often based on deeply held personal beliefs which are not subject to change or negotiation.

To provide for a broad variety of human uses of wildlife, different management strategies are required. For example, existence values may be satisfied by simply protecting habitat and wildlife from human development. However, providing for consumptive use involves allowing and maintaining harvests of moose or caribou by humans, which may require manipulation of habitats or predator-prey relationships. This is particularly true in less productive northern areas where predation by wolves and bears may limit the potential surplus of prey available to humans.

Human attitudes regarding what is proper in the way wolves and other animals are treated also cover a wide range. These values are based upon people's experience and ethical judgments about treatment of wildlife populations or individual animals.

Changeable Aspects.

In the past, the Division assumed that maintaining moderate to high densities of wildlife (particularly moose and caribou) would satisfy everyone. By following this approach, the Division did not adequately acknowledge the fact that some individuals are opposed to manipulation of wildlife populations. In addition, this approach helped create the perceptions that the Division's wolf management was intended to mainly benefit hunters, and that the Division placed a higher value on prey species than on wolves. These perceptions have alienated many people. Ironically, efforts the Division has made to date to demonstrate our long-standing commitment to balanced management of wolves and prey have caused some rural residents and sportsmen's groups to believe the Division is ignoring their traditional hunting concerns. This feeling has contributed to opposition to license fee increases, jeopardizing the Division's ability to obtain additional funding needed for a wide range of wildlife management and conservation programs.

Some techniques which have been used in wolf management are no longer acceptable to some people. For example, poison, which was once widely used to kill wolves and other predators, is now banned in Alaska. Aerial shooting, as part of a state administered wolf control program, is increasingly unacceptable to some segments of the Alaskan and national public. The tools wildlife managers use and the conditions under which they are applied can be reevaluated or changed.

Poor communication is often a problem among various public interest groups and government agencies. As a result, interest groups have become more polarized, so resolving conflicts has become more and more difficult. Opposing groups often believe that their antagonists have little understanding of their values and have no desire to learn more. These same feelings extend to the Division when it proposes management programs which are unacceptable to various groups.

Decisions are currently made in a "win-lose" confrontational setting. This can be changed to a more constructive "win-win" problem solving atmosphere by involving all groups interested in wolf management in a planning process that will allow each to develop a better understanding of the others' values and contribute to the final product in a meaningful way. People who share a common interest in the future of Alaska's wildlife and have reached a common ground in their understanding of predator-prey ecology and management can work together to ensure the welfare of these species. We believe if people recognize their common interests and work together with the Division and the Board, we can satisfy a broad range of wildlife users, though not necessarily at the same time in every area.

PROBLEM CONSEQUENCES

Enough people are dissatisfied with wolf management policies and practices that groups which share common interests in wildlife have become divided instead of working together. This has been costly to both the resources and to Alaskans.

Because conflicts have not been effectively resolved, different interests have become more polarized. The atmosphere of recent Board meetings has become highly confrontational as various groups have attempted to impose their values on others. Costly law suits, inaccurate information campaigns, long and controversial meetings of the Board, and inefficient use of Division staff time and funds hurt Alaska's wildlife more than they help it.

COST OF NOT FINDING A SOLUTION TO THE PROBLEM

If we do not develop a different approach to resolving the existing conflicts and choosing management strategies, then everyone interested in the long-term welfare of Alaska's wildlife will suffer.

Our decision-making forum has been highly charged and confrontational. If this continues, the public will become more frustrated over not getting what they want. This problem affects all public interest groups and individuals as well as the Division.

People who favor the more extreme types of management (either full protection of wolves, virtually unlimited harvest, or government control programs) may find their influence dramatically affected by changes in elected officials or people appointed to the Board. Guarding their viewpoints and enforcing their desires may require constant lobbying efforts.

People who want more wolves may find their efforts blocked by their opponents even in areas where prey species are abundant. Illegal "vigilante" actions may be taken against wolves in some areas.

People who want more prey or fewer wolves may find their efforts blocked by legal maneuvering or political pressure. Opportunities to hunt or trap wolves and their prey in some areas may decrease or be greatly restricted.

Unless this issue is resolved, the Division and the Board will spend more time and money dealing with the controversy of wolf and prey management at the expense of other important activities. The Division's working relationship with all users will suffer and public support for a variety of programs will be reduced. Conflicts between the Division and other agencies will increase in number and cooperative research and management programs on federal areas may be reduced or damaged.

The most unfavorable consequence is that all concerned parties will be unable to work together in an effective partnership for wildlife conservation in Alaska.

ALASKA WOLF MANAGEMENT PLANNING TEAM

GOALS

To help increase public awareness, understanding, and agreement on wolf conservation and management in Alaska

To help promote communication among the public, interest groups, and the Department of Fish and Game

To advise the Department and the Board of Game on the management and conservation of wolves in Alaska

OBJECTIVES

To review the status and ecology of wolves in Alaska

To review existing policies and procedures for the management and conservation of wolves in Alaska

To recommend goals and objectives for the management and conservation of wolves in Alaska over the next 5 to 10 years

To identify public uses of wolves and their prey which are compatible with these goals and objectives

To identify which uses of wolves are in conflict with each other and recommend ways to reduce or eliminate these conflicts

To expedite the flow of information between the Department and the broad spectrum of public interest groups

To recommend specific management options for ensuring the long-term conservation of wolves in Alaska and for satisfying the greatest variety of public desires for wolf management in the state

ROLE

The role of the Planning Team is to make recommendations to the Department and the Board on how wolves should be managed in Alaska. Recommendations from this team and all interested parties will be used to help develop a statewide strategic management plan. The Department will then submit a proposed plan to the public and the Board for formal review and eventual adoption. It must be recognized that the Department considers these recommendations to be very important and will follow them as closely as possible, but that laws, regulations, and cooperative agreements with other agencies do limit how wolves can be managed. Also, any changes in hunting or trapping regulations must be adopted by the Board of Game.

MEMBERSHIP

Members will be appointed by the Director of the Division of Wildlife Conservation. The group will consist of up to 12 members representing a broad spectrum of interests.

One seat each will be allocated to a representative of the Board of Game and the Division. Team members should represent the following interests: recreational hunting, subsistence hunting, nonconsumptive use, environmental, animal welfare, big game guiding, trapping, tourism, and education. At least one member of the team should be a member of a fish and game advisory committee. The team should have a broad geographic representation within the state and include a national interest (e.g., a state resident who is a member of a national organization).

MEETINGS

During the first year, from four to six meetings will be held in Anchorage. The first meeting will be two to four days in duration and will include a public forum. We plan to contract the services of a professional facilitator to initiate this effort and to conduct a workshop on problem resolution and mediation. Following the initial session, meetings will be one to two days in duration. Teleconferences may be held between meetings. Guidelines for meetings will be developed during the initial meeting. Group consensus will be the preferred approach for resolving conflicts and formulating recommendations.

PUBLIC PARTICIPATION

To attain the broadest representation on the Planning Team, we are contacting all individuals and organizations who may have an interest in the planning process and asking for their recommendations on candidates. Below is a list of organizations we are contacting.

If you know of others (or individuals) we should contact, please inform us. Interested members of the public will be encouraged to share their ideas and concerns with team members and the Department throughout the planning process.

All local Fish and Game Advisory Committees and Regional Councils
Alaska Big Game Handgunners Association
Alaska Big Game Trophy Club
Alaska Bowhunters Association
Alaska Center for the Environment
Alaska Chapter of The Wildlife Society
Alaska Conservation Foundation
Alaska Environmental Lobby
Alaska Federation of Natives
Alaska Frontier Trappers Association
Alaska Outdoor Council
Alaska Professional Hunters Association
Alaska Professional Sportsmen's Association
Alaska Public Lands Information Center
Alaska Sports and Wildlife Club
Alaska State Archers Association
Alaska State Rifle & Pistol Association
Alaska Trappers Association
Alaska Wildlife Alliance
Anchorage Audubon
Anchorage Sportsmen's Association
Arctic Audubon
Clear Sky Sportsmen's Club
Delta Sportsmen's Association
Ducks Unlimited (Alaska Chapter)
Foundation for North American Wild Sheep (Alaska Chapter)
Ft. Wainwright Sportsmen's Association
Glacier Bear Archers
Golden North Archery Association
Greenpeace (Alaska Regional Office)
Interior Wildlife Association of Alaska
International Moose Federation
Izaak Walton League
Juneau Audubon
Kenai Audubon
Kenai Trappers Association
Kodiak Audubon
Kodiak Island Sportsmen's Association
Matanuska Valley Sportsmen
Midnight Sun Hybrid Wolf Association
Lynn Canal Conservation
Narrows Conservation Coalition
National Audubon Society (Alaska Regional Office)
National Wildlife Federation (Alaska Regional Office)
Nature Conservancy (Alaska Regional Office)
North American Wolf Society
Northern Alaska Environmental Center
Peninsula Sportsmen
Petersburg Rod and Gun Club
RuralCap
Safari Club International (Alaska Chapter)
Sierra Club (Alaska Regional Office)
Sitka Conservation Society
Sitka Sportsmen's Association
Southeast Alaska Conservation Council
Southeast Alaska Trappers Association
Taku Conservation Society
Tanana Valley Sportsmen's Association
Territorial Sportsmen
The Wilderness Society (Alaska Regional Office)
Tok Shooters Association
Trustees for Alaska
United States Wolf Hybrid Association (Fairbanks Chapter)
University of Alaska (Wildlife Department)
Valdez Sportsmen's Association
Wolf Song of Alaska
Wrangell Resource Council
Yakutat Resource Conservation Council

In Carbyn, L.N. ed. 1983. Wolves in Canada and Alaska
Canadian Wildlife Service Rep. Ser. No 45
Ottawa. 135p.

Historical and current perspectives on wolf management in Alaska

Samuel J. Harbo, Jr.
Frederick C. Dean

1. Abstract

The significant socio-political events and conditions relating to wolf control and management in Alaska since 1900 are summarized. Indiscriminate killing, characteristic of the early 20th century, was supplemented with territorial bounties. Following World War II a federal control program was developed with emphasis on poisons and aerial hunting. Statehood in 1959 coincided with increasing concern for wolf populations; formal control was discontinued except around domestic livestock. The 1970s were characterized by sharp increases in wolf numbers, declining ungulate populations, state-initiated control operations, and intense complex litigation. Each of these phases has been covered in considerable detail.

2. Introduction

Wildlife management programs result from complex relationships between human values and desires and are not based solely on the biological components of resource systems. Consequently we have focused on the historical and socio-political framework. A review of the biological aspects of at least one series of recent wolf control actions is currently being prepared by the Alaska Department of Fish and Game (ADF&G). The present paper gives the outline of this review, but those who require greater detail will have to read extensively in the many documents we have referred to.

The authors prepared the following review, presented as an annotated chronology, to highlight agency programs, public attitudes, and some of the factors influencing them. A great deal of information was obtained from annual reports submitted by the federal Branch of Predator and Rodent Control (BPRC), Alaska District, of the US Fish and Wildlife Service (USF&WS) for the fiscal years 1950–65. For economy of space, specific references to these reports as well as citations for commonly known information are excluded. Alaskan geographic names are referenced to appropriate Game Management Units (GMU) shown in Figure 1. Material in sections entitled phases I to IV are brief thumbnail sketches of events from the more distant past. Phase V deals with recent events.

Note: Copies of ADF&G Federal Aid Wildlife Reports and other unpublished reports may be obtained from the Alaska Dep. of Fish and Game, Subport Building, Juneau, AK 99801 or from the Fish and Wildlife Reference Service, Unit I, 3840 York St., Denver, CO 80205.

3. Phase I — Indiscriminate wolf control during the early 20th century

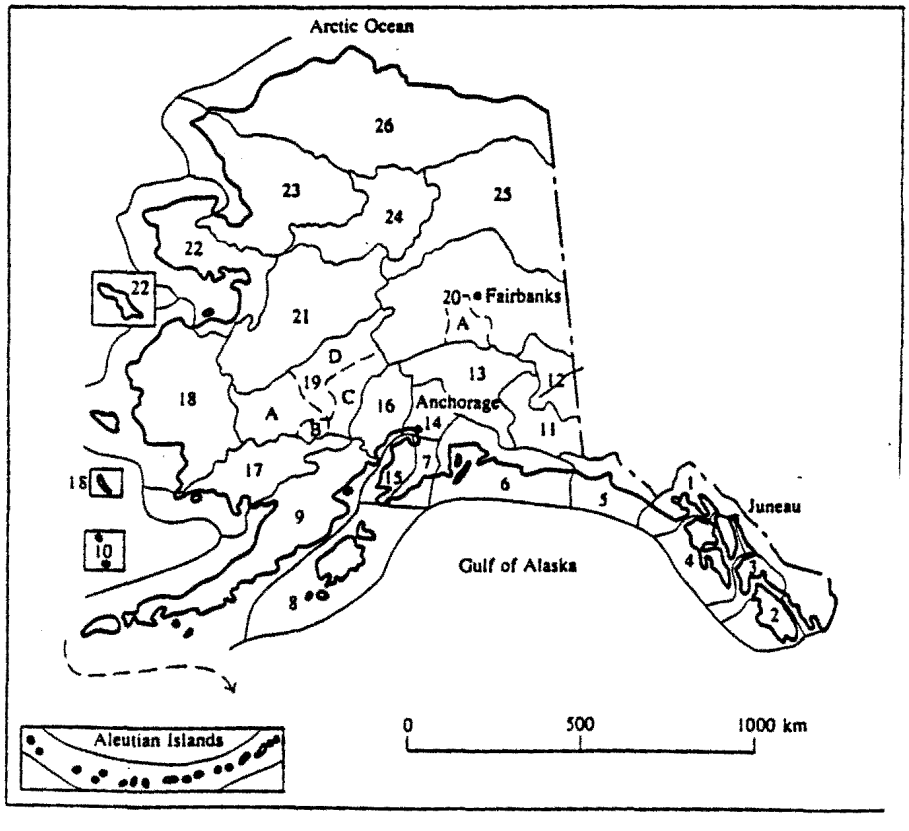
During the early white settlement and mining period there was little if any organized government wolf (*Canis lupus*) control; the public generally considered wolves as competitors. Private control efforts were widespread and quite possibly effective over large areas.

1900. There was extensive market hunting in interior Alaska because of the large number of miners. Dall sheep (*Ovis dalli*) were sold in Fairbanks (GMU 20) by the hundreds. Sledgeloads of moose (*Alces alces*) were dumped by the trail to town when outbound hunters reported that the price had dropped severely. Market hunters commonly poisoned the remains of carcasses in order to kill wolves. Wolf populations were reportedly low.

1903. The Camp Fire Club of America (CFCA) was formed. Influential members of the scientific community, such as Ernest Thompson Seton,

Figure 1
Game management units in Alaska

Figure 1



William T. Hornaday, and Gifford Pinchot lobbied strongly on Alaskan parks and wolf control (Belt 1956).

1914. The US Biological Survey was authorized by Congress to conduct experiments and demonstrations on animal control, including wolves (Young and Goldman 1944).

1915. The first federal appropriation was passed specifically for Biological Survey control work on federal lands (Young and Goldman 1944).

1915. The first territorial legislature passed a $10 wolf bounty (Lensink 1959, in ADF&G Annu. Rep. for 1958). Bounties were paid continuously until 1968 (later in some areas), well after statehood.

1917. Congress established Mount McKinley National Park (between GMUs 13 and 20) after heavy lobbying by CFCA and others.

1926. In one of few recorded counts from the period, Frank Glaser, a guide who eventually became an expert federal wolf hunter, tallied 5000 Dall sheep in a 240-km stretch of Alaska Range just east of McKinley Park (BPRC 1953, unpubl. rep.). This indicated an abundance of sheep.

1936. William Beach reported few sheep in Mount McKinley National Park compared to his observations in 1925 (Belt 1956). Cahalane (1946) described considerable evidence relating the sheep decline with severe winters.

1937–47. CFCA urged wolf control in Mount McKinley National Park because of low sheep numbers (Belt 1956). The National Park Service initially responded by starting Adolph Murie's study of wolves and sheep in the Park. The US Biological Survey's pre-World War II wolf control work in Alaska mostly concerned reindeer (*Rangifer tarandus*) herds.

1944. Murie (1944) concluded: "The wolf is the chief check on the increase of the Dall sheep in Mount McKinley National Park .... wolves prey mainly on the weak classes of sheep .... [such predation indicates] normal predator–prey adjustment....". Differences of views on park management flared. Belt (1956) commented: "Murie's report failed to outline any emergency policy. It was an elaborate treatise on animal behaviorism. The only ... indications of a policy were in favor of the wolf ...".

4. Phase II — Organized federal wolf control during territorial days

The federal wolf control program became one of the dominant aspects of wildlife management in Alaska. Biological information on predator–prey interactions was still scarce and public attitudes were still largely anti-wolf.

1945–46. CFCA drafted and had introduced into Congress Bill HR-5401, directing rigid control of wolves in Mount McKinley National Park (Belt 1956). The National Park Service reluctantly decided to kill up to 15 wolves (about 50%) on the Park sheep range before passage of the Bill (Cahalane 1946).

1948. The BPRC expanded its operations in Alaska. The acquisition of a Super Cub aircraft the following year allowed intensive aerial hunting.

1950. The BPRC's national policy contained the statement: "[On wilderness areas] ... where predators do not jeopardize livestock or game on or near the area, the Fish and Wildlife Service does not advocate or practice predator control" (Presnall 1950). However, operations in Alaska left room for argument about the interpretation of "wilderness", "jeopardize", and "practice".

1951. Mount McKinley National Park wolf control ended; probably fewer than 12 wolves had been shot, snared, or trapped during the 6 years since Bill HR-5401 was introduced (W. Nancarrow, pers. comm.).

1952. Territorial Sportsmen Inc., a Juneau (GMU 1) club, began continuing financial support of local BPRC control work. "Operation Umiat" established three two-man hunting teams with aircraft, which covered approximately 65 000 km^2 on the north slope of Brooks Range (GMU 26) between 21 March and 8 May. Aerial hunting and poison baits killed 259 of the 334 wolves seen (BPRC 1952, unpubl. rep.; Leveque 1954). National publicity produced substantial adverse reaction. "Umiat" probably intensified the debate between biologists and control agents in Alaska regarding the need for widespread control. A. Starker Leopold and F. Fraser Darling, sponsored by the Conservation Foundation, toured Alaska during much of the summer; they saw most aspects of USF&WS and Alaska Game Commission operations.

BPRC restricted poison stations in southeast Alaska (GMUs 1–4) to the period 15 October – 31 March as protection for bears. Baits were often set on lakes by aerial drops (Fig. 2).

5. Phase III — Transition preceding state management

During the 1950s there were increasing differences of opinion between many biologists and most control agents about the necessity of wolf control. Public attitudes were slowly becoming pro-wolf, based largely on the wilderness symbolism of wolves and their rarity elsewhere; reaction against the use of poison increased.

Wolf control was becoming more oriented toward specific situations. Bounty systems were being questioned more frequently although many people justified them as a form of rural welfare.

1953. BPRC modified the "coyote getter" (cyanide bait gun) for use on wolves; in spite of problems, this became the standard control method in summer. A BPRC staff of six or seven field men covered the territory. Leopold and Darling (1953) discounted the significance of predation in unhunted or lightly hunted moose and caribou populations and urged local assessment before implementing wolf control. Fire was considered a major factor in the reduction of caribou winter ranges, and predation was recommended as one tool for regulating caribou numbers.

1954. Heavy reindeer losses to wolves were documented for the Kotzebue area (GMU 23).

1953–54. In southeast Alaska, the BPRC agent stated he was concentrating on specific problem areas in contrast to the scattered approach previously used.

> It has to be admitted that after many years of bait station work on the beaches of southeastern Alaska nothing was learned of wolves except that they do come to the beaches and will be killed if they eat lethal baits (BPRC, unpubl. Annu. Rep. FY1954).

Three teams of private aerial hunters shot about 200 wolves in arctic Alaska; caribou

Figure 2
A USF&WS biologist and assistant examine wolf carcasses from a poison bait station near the interior village of Northway in the early 1950s. This scene closely parallels those seen at the time in coastal southeast Alaska (photo courtesy of USF&WS)

killed annually by Iñupiaq in the Arctic were estimated at 15 000 (Woolford 1955, USF&WS, unpubl. rep.).

1955. Five teams of aerial bounty hunters shot more than 90 wolves in 6 weeks in northern Alaska.

1956. Crisler (1956) concluded that there was significant selection by wolves for weak and crippled caribou. Wolf populations were generally increasing throughout Alaska except on the Alaska Peninsula (GMU 9). Bounty hunters took over 200 wolves in the Kotzebue region.

1957. The Secretary of the Interior closed the Nelchina Basin (GMU 13) to the taking of wolves to permit research on undisturbed predator–prey interaction; biologists felt caribou were nearing the carrying capacity of the range and thus increased predation was desirable.

The Territorial legislature transferred the Co-operative Predator Control Program from the Treasurer's Office to the new ADF&G. A new co-operative agreement was signed: BPR was to be in charge of control and ADF&G i charge of investigations. BPRC admitted that predator–prey interactions were not well understood, and that wolf populations were increasing in spite of the control program.

A private aerial bounty team killed 1 wolves in the first significant hunt in the for ted interior.

Figure 3
Seal blubber baits (3000 L) being prepared with strychnine in the 1950s (photo courtesy of USF&WS)

Over 200 dead moose, presumed wolf kills, were reported from the Koyukuk Valley (GMU 24); the spring snow had a hard crust, easing wolf travel.

BPRC was to decide the priorities, under its predator priority rating system, of three factors: human use of the area; predator and prey population levels; and range conditions. Strychnine was the common poison used (Fig. 3).

1958. Arctic Wild, a book by Crisler (1958), fostered much pro-wolf sentiment.

More than 1500 wolves were killed in the previous 6 years in GMU 26, which includes the Operation Umiat area. It was only in this year that biologists discovered the location of the calving grounds of the Western Arctic Caribou Herd, which uses parts of GMUs 23, 24, and 26. This late discovery is an example of the general lack of biological knowledge of Alaska wildlife. The total cost of wolf and coyote bounties in Alaska up to 1958 was over $1.5 million.

1959. ADF&G analysis of bounty systems stated (Lensink 1959, ADF&G Annu. Rep. 1958):

> Predator control is a necessary and valuable tool of wildlife and fisheries management. To be most useful this tool should be applied at the right place, at the right time, and in the most efficient way possible. All of these requirements can be met by a carefully designed program, but none of them is achieved with a bounty system.

BPRC reopened the Kotzebue station, particularly for wolf control around reindeer herds.

ADF&G began intensive studies on wolf carcasses. Burkholder (1959) reported no discernible prey selection in his Nelchina study.

The Predator Control Committee of the Tanana Valley Sportsmens Association failed to reach agreement, after many interviews and two winters of study, on the need for wolf control or the methods to be used (Tanana Valley Sportsmens Association, 1959, Fairbanks, AK, unpubl. rep.).

Figure 4
Methods used by the federal Branch of Predator and Rodent Control to remove predators in Alaska

6. Phase IV — State assumption of predator management

Control of predator management was assumed by the State of Alaska. Increased game, trophy, and aesthetic status for the wolf was widely promoted: at the same time public interest in environmental concerns grew rapidly.

1960. On 1 January the new State of Alaska assumed authority over decisions concerning resident wildlife and whether to conduct control. Game biologists felt it advisable to reduce both the Arctic and Nelchina caribou herds because of deteriorating range conditions.

Some polar bear guides, responding to the public's changed perception of wolves as trophies, began introducing their clients to aerial wolf hunts following the bear hunts.

BPRC wolf control was restricted to reindeer range. By local agreement at Fairbanks, ADF&G decreed: (a) "getters" were to be used only in emergency situations, (b) bait stations were to be checked every 10 days, and (c) wolf carcasses should be recovered for biological study whenever possible. ADF&G required reduced wolf control on Tanana Flats (GMU 20) because the moose population was large and generally inaccessible; wolf numbers there were increasing slightly. In another area four wolves were released on Coronation Island (GMU 3) as an experiment with wolf–deer relations (Merriam 1964).

1961. The Alaska Big Game Trophy Club actively promoted trophy status for wolves taken after "fair chase". BPRC reduced their staff in Alaska to three permanent employees and ADF&G assumed responsibility for the Nelchina wolf study. Figure 4 summarizes BPRC control effort through 1962. Numbers of wolves were reported to be increasing generally except in arctic areas. Rausch presented a review paper on wolf management at the Alaska Science Conference (Rausch 1961).

1963. Mowat (1963) published a largely unsupported account of wolves; he discounted the significance of wolf predation on caribou. The book became a bestseller and generated widespread sympathy for wolves.

The Alaska Board of Fish and Game classified wolves both as big game and furbearers. The Board also promulgated regulations imposing a limit of two wolves taken by aerial bounty hunting in arctic Alaska.

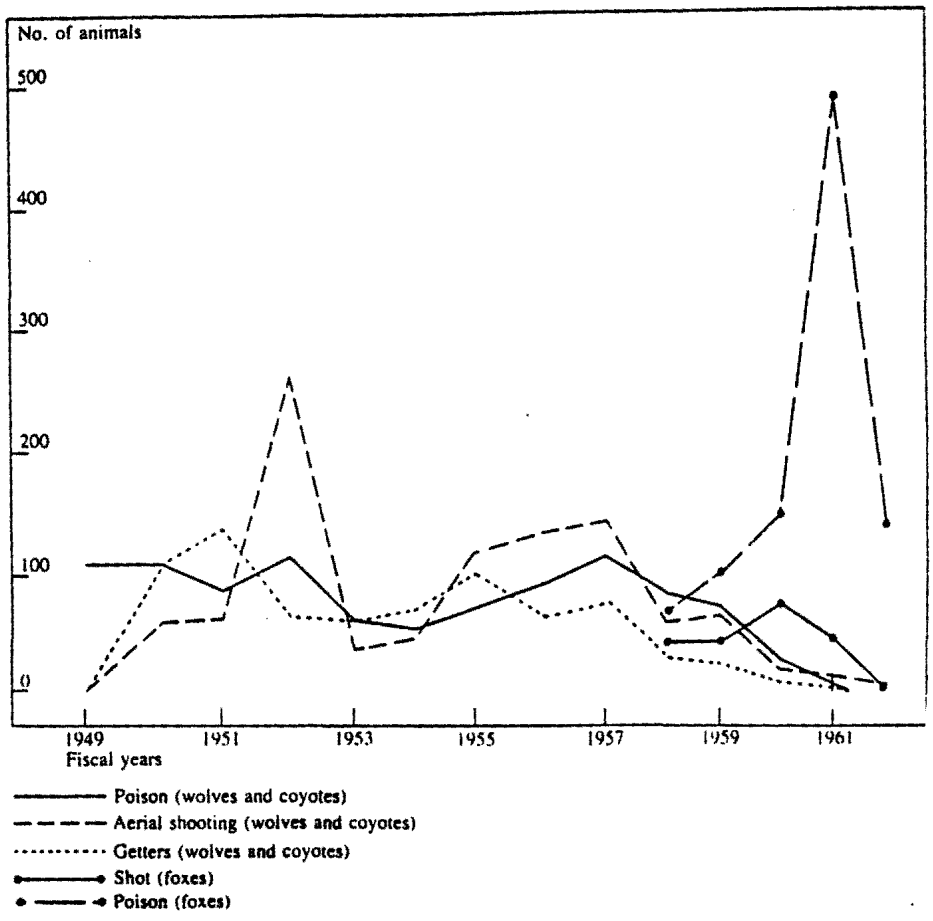
1964. A study of Coronation Island showed a drastic reduction in the number of deer as a result of the wolves released there in 1960 (Merriam 1964).

The report of the Leopold Committee on federal predator control policy, given at the North American Wildlife Conference, recommended the establishment of an advisory board, the need for internal reassessment, and explicit criteria pertaining to the legal control of poisons, etc. (Leopold 1964).

Rausch (1964) summarized progress in wolf management and research in Alaska since 1959 and reported low wolf productivity in arctic Alaska.

1965. The Secretary of the Interior adopted the Leopold Committee report as policy. A study wolf predation on moose on Isle Royale reported that wolves were strongly selective of calves and older adults and that, in general, predation was maintaining the moose herd within food limits and in good condition (Mech 1966). The study further promoted the positive image of the species.

Figure 4



1966. Gordon Haber began studies in Mount McKinley National Park; these led to an ecosystem model (Haber 1977) and hypotheses which he later invoked during a long debate with ADF&G.

1967. It was stated in the proceedings of a symposium on wolves that wolves in Alaska showed strong reproductive performance and that pup mortality was the cause of fluctuating populations (Rausch 1967).

A new federal policy on the control of damage by animals emphasized co-operation with states and landowners; operational guidelines appeared restrictive but essentially permitted most earlier practices (Anon. 1967, 1979).

7. Phase V — Active wolf control by state and court intervention

The next section deals with the last decade in greater detail. The various developments discussed in phases I–IV concerning changes from near-colonial status to statehood, increases in ecological understanding, changing emphasis from consumptive to non-consumptive interest in wildlife, and the development of legal processes to support public concern about environmental problems should be kept in mind.

During this decade, bounties were abolished, tight controls on aerial hunting were imposed, state biologists' attitudes toward wolf control changed, wolf control resumed, and the courts became involved.

In 1968 the Alaska State Legislature granted the Board of Fish and Game the authority to abolish bounties on an individual GMU basis. The Board did so in all except some GMUs in southeast Alaska, where a bounty persisted for several more years.

In 1971 US Congress enacted Public Law 92-157, known as the Airborne Hunting Act, which prohibited use of aircraft in hunting except under state permit. Alaska chose to continue issuing aerial hunting permits through the winter of 1971/72, which infuriated those who thought the federal law had completely banned such hunting. Partly in response to public outcry, the ADF&G Commissioner halted further issuance of aerial wolf-hunting permits.

Some groups bitterly denounced the cessation of aerial hunting. The Interior Wildlife Association, a newly formed organization whose goals were cessation of cow-moose hunting and reinstitution of wolf control, published the first issue of Alaska Wildlife Digest in the latter part of 1972. The Digest's articles attacking the ban on aerial permits matched the fervour of the arguments that only months earlier had castigated ADF&G for continuing permits. Thus, one segment of society elevated wolves to a value above that of other animals, while another seemed to place only negative values on wolves. A report on predator control and bounties in Alaska briefly summarized the situation that prevailed during the early years of statehood (Anon. 1972).

In 1973, the Board of Fish and Game and ADF&G published a series of policy statements made necessary by increasing human population and resource development (ADF&G 1973, unpubl. rep.). They included the statement that:

> Traditionally, game management has emphasized maximum production of ungulates for man's use .... [but] aesthetic or nonconsumptive uses are gaining prominence in resource management.... Wolves ... will survive if ungulates are managed successfully, providing they receive a minimum of protection from humans. In this sense wolves can be considered an indicator of our stewardship of Alaska's land. Land areas supporting substantial populations of wolves have not been severely abused by man....
> Whenever substantial conflicts arise between humans and wolves over the use of prey, the wolf population will be managed to minimize such conflicts. The various recreational and aesthetic values of the wolves will be considered equally with similar values of the prey species in the final management decision.

Many significant reductions in the sizes of important prey populations had occurred concurrently with increased protection afforded wolves from 1969 to 1972. Some examples are: the Nelchina Caribou Herd decreased from approximately 70 000 animals in 1962 to less than 8000 in 1972 (Bos 1975); the moose population in GMU 20A decreased from more than 10 000 in 1965 to about 2900 in 1974 (Coady 1976*a*,*b*; ADF&G 1979, unpubl. issue paper 79-07); and the Steese-Forty Mile Caribou Herd decreased from 40 000 in the 1960s (Skoog 1968) to approximately 5000 by 1974 (Davis *et al*. 1975, ADF&G Fed. Aid Wildl. Rep.). The coincidence of prey population declines and increased protection (and populations) of wolves increased the clamour to reduce wolf numbers, although other factors such as winter mortality and the increased take by humans were also clearly responsible for the declines.

By 1973 Alaskan wildlife managers had data from several depressed prey populations that seemed to implicate wolves (Rausch and Hinman 1975). In southeast Alaska for example, the abundant deer populations of the late 1950s and early 1960s declined by the early 1970s to low levels on all major islands where there were wolves, but persisted at moderate levels on major islands without wolves (Rausch and Hinman 1975, Olson 1979).

The decline of the GMU 20A moose population, a population now hunted mainly by Fairbanks residents using motorized surface vehicles seemed to be caused by weather (Fig. 5), harvest by humans (Fig. 6), and predation by wolves (Coady 1976*a*,*b*). Although the GMU 20A moose population had declined by 1971 to well below the carrying capacity of the habitat (Coady 1976*a*,*b*), poor calf and yearling survival followed the mild winters of 1971/72, 1972/73 and 1973/74 (McKnight 1974, 1975, and 1976, ADF&G Fed. Aid Wildl. Rep.; Coady 1976*a*,*b*). By 1973 the data convinced wildlife managers in Alaska that wolves, at the very least, contribute to declines in prey populations and help keep them low. By 1974 the managers reached a conclusion that was unthinkable 10 years earlier: in order to rehabilitate the depressed GMU 20A moose population so that desired levels of harvest by humans could be reinstated in a reasonable time, wolf control should be undertaken. ADF&G officials recognized public controversy would ensue.

Figure 5
Estimated moose abundance and yearlings per 100 cows in GMU 20A moose populations (courtesy of ADF&G)

Figure 6
GMU 20A moose harvest from 1963 to 1975 (courtesy of ADF&G)

Figure 5

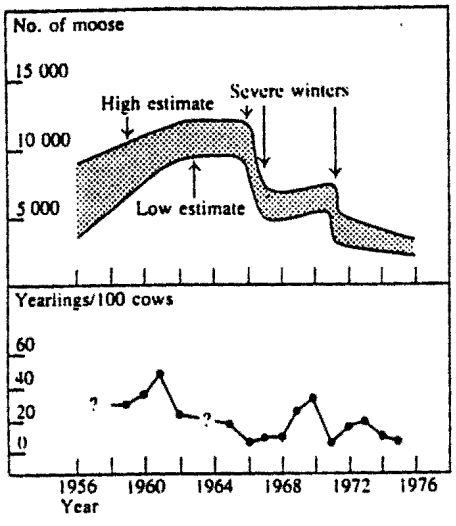
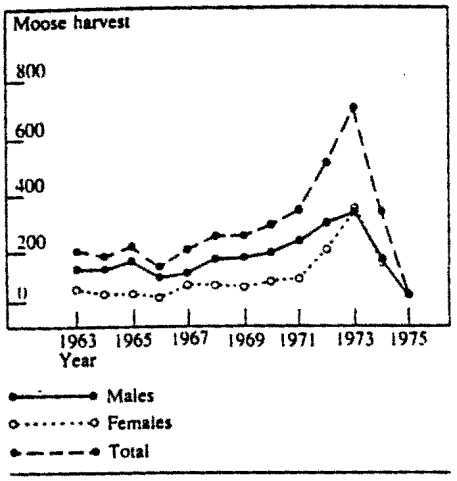


Figure 6



requiring a cautious and considered approach on their part. In early 1975 a recommendation was submitted to the Board of Fish and Game for approval.

Using limited survey data, ADF&G biologists estimated the GMU 20A wolf population at about 175 (Rausch and Hinman 1975). Fairbanks residents believed wolves were numerous locally because during the winters of 1974 and 1975 30–35 dogs were killed by wolves at outlying homes in the Greater Fairbanks area. There was increased concern for the safety of school children walking to and from school buses during the dark, but in fact there were no instances of wolves attacking humans.

In February 1975 the Board approved a plan to hire private pilot-gunner teams to shoot wolves, directing the Commissioner to implement the plan immediately. A prompt law suit filed on 18 February 1975 in the Alaska Superior Court, Third Judicial District, by the Fairbanks Environmental Center, Friends of the Earth, and several individuals, resulted in an injunction on 3 March 1975 halting the program. The suit was resolved in favour of the plaintiffs, not on the grounds that the control activity was biologically inadvisable, but on a technical violation of an Alaskan statute involving promulgation of regulations. Rausch and Hinman (1975) reported on the managers' perception of the wolf control controversy.

The acrimonious public controversy over wolf management in Alaska prompted the Commissioner, in a letter dated 17 June 1975, to request the National Audubon Society to conduct an impartial review of wolf management policies in Alaska. The Society confirmed their willingness to undertake such a review, specifying the funding needed. At the same time, ADF&G continued with its wolf reduction plans.

In spring 1975 the Alaska Legislature split the Board of Fish and Game into two seven-member boards, the Board of Fisheries and the Board of Game. In December 1975, ADF&G submitted a modified wolf control plan to the Alaska Board of Game (following the legal rebuff the previous March). Moose investigations in GMU 20A during 1975, following another favourable winter, revealed continued low calf and yearling survival with the depressed population either stable or still declining (McKnight 1976, ADF&G Fed. Aid Wildl. Rep.).

GMU 20A was not the only location in which officials felt action had to be taken. In GMU 5 a small moose population, important to local hunters, was subjected to significant wolf predation after severe winters and possible overexploitation by humans had reduced the herd (Rausch and Hinman 1975). The human harvest of moose had declined from more than 300 annually in 1968 and 1969 to only 147 in 1973 (McKnight 1975, ADF&G Fed. Aid Wildl. Rep.). Wolf reductions were to be recommended if the monetary resources of ADF&G permitted.

A third project planned by ADF&G in 1975 was to carry out research on wolves in relation to moose in GMU 13, in order to learn more about wolf–prey ecology in Alaska. The project necessitated complete extirpation of wolves (about 45) in an 8000 km^2 experimental area, and subsequent comparison of moose (calf and yearling) survival with that in a nearby area where wolves had not been removed. A study on food habits and ecology was already in progress in those two areas, using radio-collared wolves; the study was supported by federal Pittman-Robertson funds (Stephenson 1978, ADF&G Fed. Aid. Wildl. Rep.). The new ADF&G project was reviewed and approved by USF&WS officials for federal aid. The Board of Game approved all three projects (GMU 20A, GMU 13 control study, and GMU 5) in December 1975, directing ADF&G to use fixed-wing aircraft and helicopters, with only ADF&G personnel participating. This last directive enabled the operation to be monitored and closely regulated in order to alleviate public concern about numbers and locations of wolves taken. The Board specified that wolf reductions in GMUs 5 and 20A should not exceed 80% and that the objective should be a ratio of 1 wolf to 100 moose. This ratio was based on observations that moose populations with ratios of 1 wolf to 20 or fewer moose declined (ADF&G 1979, unpubl. issue paper 79-07). Therefore it was considered that a population with a 1:100 ratio should surely increase. The wolf reductions in the three GMUs were tentatively scheduled to run for 3–4 years, but the GMU 5 project was never implemented because of inadequate funds.

Meanwhile ADF&G and the National Audubon Society had finalized the terms of the review of Alaskan wolf management policies.

However, in view of the above actions by the Board, the Society's Executive Vice-President, in two letters to the Commissioner, dated 16 January and 4 February 1976, expressed concern that the credibility of the review would probably be severely damaged. He reasoned that the public might gain the impression that "... the National Audubon Society consented to or gave tacit approval to ..." the control programs, and that "... our study team would be handicapped in its search for facts and unbiased opinion in the present atmosphere of emotionally charged controversy". Unless ADF&G cancelled the hunts, the Society would withdraw from the contract. The Commissioner responded in a letter on 9 February 1976 by stating, in part:

> There was never a suggestion much less a commitment that any of our programs ... would be put on ice until the ... study had been concluded. We are certainly not attempting to polish our image by associating with the Audubon Society and ... our motives are sincere in seeking an objective third-party assessment of the wolf situation in Alaska.
>
> If such an endeavor at this time would unavoidably implicate the Audubon Society in issues that could only prove damaging to your conservation objectives and credibility, then I can certainly understand the decision to abandon the study that we had contemplated.

The control programs proceeded, and the Society withdrew from the contract.

Meanwhile efforts to delay or stop the control programs were initiated. National television editorials generated a great deal of attention: ADF&G had to contend with substantial misrepresentation. Thousands of protesting letters were addressed to the Governor or ADF&G.

A calendar of the most important events follows:

5 Jan. 1976. A letter was sent by the Defenders of Wildlife to the Secretary of Defense demanding an Environmental Impact Statement (EIS) before allowing control by ADF&G on the Department's lands in GMU 20A.

19 Jan. 1976. The USF&WS suspended funds for the wolf reductions in GMU 13. However, the State decided to continue the project using State funds.

22 Jan. 1976. The Deputy Assistant Secretary of Defense requested certain information about control programs and officially requested that the programs not be implemented on the Department's lands until further notice. The State acquiesced.

23 Jan. 1976. Defenders of Wildlife *et al.*[1] filed suit against the Secretary of the Interior in US District Court for the District of Columbia (DC) claiming that an EIS was needed for the GMU 20A project. A preliminary injunction was requested.

26 Jan. 1976. Preliminary injunction for GMU 20A was denied by the DC judge. Defenders of Wildlife *et al.*[2] filed suit against ADF&G and several officials in District Court for Alaska claiming that an EIS was needed for the GMU 13 control study. An injunction was requested.

28 Jan 1976. A temporary restraining order was issued by the District Court judge in Alaska on the GMU 13 control study.

30 Jan. 1976. The Director, Bureau of Land Management (BLM) asked the Governor of Alaska to suspend wolf hunts in GMU 20A pending a resolution of the question raised in District Court in DC of BLM's management responsibility. The State acquiesced.

6 Feb. 1976. The Assistant Director of the BLM sent a memorandum to the State stating that the point raised on 30 January had been resolved. The State could, and did, continue the GMU 20A hunt.

[1]Natural Resource Defense Council, Inc.; Animal Protection Institute; Int. Fund for Animal Welfare — USA; The Humane Society of the US; the Fund for Animals; Animal Welfare Institute; The Wild Canid Survival and Research Center — Wolf Sanctuary; and 4 private parties.

[2]The Humane Society of the US; Animal Protection Institute; Int. Fund for Animal Welfare — USA; The Wild Canid Survival and Research Center — Wolf Sanctuary; the Fund for Animals; Alaska Field Representative for Friends of the Earth; and 4 private parties.

17 Feb. 1976. Defenders of Wildlife *et al.*, in their suit in Alaska District Court, amended the complaint to include the Secretary of the Interior and the Director of USF&WS as defendants.

25 Feb. 1976. The District Court judge in DC ruled against Defenders of Wildlife *et al.*, stating that no EIS was required for GMU 20A.

27 Feb. 1976. Defenders of Wildlife *et al.*, in their suit in the Alaska District Court, further amended their complaint to include GMU 20A (designated Count II; Count I is the GMU 13 complaint) and unsuccessfully requested a temporary restraining order to stop the GMU 20A hunt.

8 Mar. 1976. The District Court judge in Alaska ruled that an EIS was not needed in the GMU 13 control study. He denied the permanent injunction relief requested and dismissed Count I.

9 Mar. 1976. Defenders of Wildlife *et al.* filed notice of appeal against Count I decision.

31 Mar. 1976. A telegram from the Office of the Secretary of Defense cancelled his request for temporary suspension of control programs on Defense lands.

5 Aug. 1976. Defenders of Wildlife *et al.* appealed the decision of the Alaska District Court to the Court of Appeals, Ninth Circuit.

13 Sept. 1976. The Alaska District Court granted ADF&G's motion for summary judgement of Count II. Count II was dismissed.

22 Aug. 1977. The Court of Appeals, Ninth Circuit, reaffirmed the Alaska District Court's decision of 8 March 1976.

The timing of these events gains meaning when it is realised that the short daylight period prior to late January, particularly in GMU 20A, and the predictably poor snow conditions after late March severely limit effective wolf control operations. Moreover, the actions relate almost exclusively to the National Environmental Policy Act of 1969 (NEPA), which requires a written assessment of environmental impacts before any major action by a federal agency can be undertaken.

The actions by the Secretary of Defense and the two court cases established several important points. The action regarding the Defense lands clarified that the State did have manage-

ment responsibility and authority on such lands. The case in the District Court for DC clarified that a 1968 Memorandum of Understanding between Alaska and BLM did not require BLM approval for a wolf-control project unless poisons were used, hence the project could not be considered a "federal-state program". The case also brought out that the fact of federal land being involved does not by itself make wolf control a "federal action". The judge in the DC case further stated that, "... even if a federal action is involved, ... such action does not constitute major federal action significantly affecting the quality of human environment ...." (criteria specified in Federal Register 1 August 1973.) The Alaska District Court reaffirmed the latter point, finding that killing all wolves in the GMU 13 experimental area would only reduce the entire GMU 13 wolf population by 13%; such reduction "... will not significantly affect the quality of the human environment ..." and hence is not a major action requiring an EIS. The Alaskan judge did not rule on the question of whether the action was a federal one.

One action not resolved to the State's satisfaction was the withholding of federal Pittman-Robertson funds from the GMU 13 control study. Even though the Alaska Court ruled that an EIS was not required, USF&WS did not reinstate the funds. In a 27 January 1976 letter to USF&WS the Chairman of the Board of Game questioned the appropriateness of the cutoff. He also implied an improper use of the EIS requirement when he stated:

> Another major concern is that your recent directive contributes to a practice that in the long run may have serious consequences for all of us. That practice is the increasing use of the National Environmental Policy Act of 1969 in an obstructionist way. That is, if an impending action cannot be stopped on any other basis, demand an EIS. At the very least, the process will delay the action. Using environmental quality legislation in that fashion, particularly in an instance such as ours where our man-made perturbation (i.e. reducing the wolf population in all of Unit 13 by approximately 14%) is of less magnitude than others generated by natural environmental processes (i.e. naturally occurring fluctuations in wolf numbers), will substantially reduce public confidence in such legislation, possibly stimulating proposals to substantially weaken the 1969 Act. I hope that the Fish and Wildlife Service's abrogation of the wolf study is not a correct measure of your willingness to be a party to the obstructionist practice.

Despite the obstacles placed in their path, ADF&G personnel thought they had removed all except two or three of the wolves inhabiting the GMU 13 experimental area (Stephenson 1978, ADF&G Fed. Aid Wildl. Rep.). In GMU 20A, the goal was not achieved; the ADF&G operation removed 66 wolves, 69 others were taken by private individuals engaged in commercial or recreational trapping (ADF&G 1979, unpubl. issue paper 79-07). The post-control wolf/moose ratio of 1:29–40 fell short of the desired 1:100, but did represent a substantial change from the pre-control ratio of 1:13 (ADF&G 1977, unpubl. rep.).

The lack of success at stopping the wolf control operation in court led some groups to seek redress in Congress. Four essentially identical bills were introduced into the House of Representatives during the summer of 1976. The bills specified that the Secretary of the Interior, in co-operation with the states, would make a comprehensive study of the wolf for the purpose of developing "... adequate and effective measures ... to conserve such animals and to insure humane treatment in all cases". The bills also specified that "... a moratorium of all hunting of these animals from aircraf ... and all large-scale killing of these animals, whether for research or any other purpose ..." would stop until the Secretary completed the study and made his recommendation. Congress would be authorized to appropriate $50 000 for fiscal year 1977 and for each of two succeeding fiscal years. The bills were not enacted, undoubtedly due in part to very reasoned and persuasive testimony submitted by the Director of USF&WS on 20 September 1976 at a subcommittee hearing. The Director pointed out that the bills infringed on the rights of states to manage their resident wildlife; the inadequacy of the suggested appropriation was also mentioned. Of special interest to Alaska officials were these segments of his testimony:

> In January of this year we issued notice to the State Fish and Game Department suspending federal funding under the Pittman-Robertson Act of a wolf removal project pending review of the project design which subsequently was determined to be adequate. However funding for this project has not been reinstated....
>
> As you know, Mr. Chairman, there was tremendous public interest generated over this matter. We are still receiving letters almost daily pleading for preservation of the wolf.... There is ... no evidence that wolves are either declining or in critically low numbers in Alaska. The opposite, however, is true with regard to moose and caribou populations in certain areas of Alaska.

Although the advent of summer curtailed the wolf operation, thus quieting the controversy, there were new developments. Preliminary analysis of the July 1976 aerial surveys of the Western Arctic Caribou Herd indicated that the herd had declined from approximately 240 000 animals in 1970 to about 50 000 in 1976 (ADF&G 1976). The herd represented a critical subsistence resource for rural residents in northwest Alaska, with an annual take of approximately 25 000 animals (ADF&G 1976, unpubl. rep.). ADF&G immediately undertook emergency actions to rehabilitate the herd. As studies suggested that the herd's range was not implicated and that humans and wolves caused most of the mortality (ADF&G 1976, unpubl. rep.; Davis *et al.* 1975, ADF&G Fed. Aid Wildl. Rep.; Doerr 1979), emergency action to reduce the take by both was initiated. ADF&G closed the year-long open hunting season in August, pending development of very restrictive

new regulations, and formulated plans for wolf reductions in the herd's winter range. The agency held public hearings in Barrow (GMU 26), Fairbanks, and Kotzebue during early August to obtain public input on management plans. At the 4 August 1976 meeting in Fairbanks, the Alaska Conservation Society recommended the human take of caribou be reduced as much as possible (preferably to zero) and suggested that the current plight of the Western Arctic herd

> ... may be one of those unusual situations where short and long term human benefit, and perhaps even long term benefit to wolves themselves (since wolves depend on caribou) requires that the Department of Fish and Game reduce wolf numbers as a temporary, emergency measure to lessen the decline in the Western Arctic Caribou Herd [see also Weeden 1976].

Some conservation groups outside Alaska did not share those views. In an August news release, the Wildlife Committee, Atlantic Chapter, Sierra Club criticized ADF&G and cited numerous reasons why the control operation should not be undertaken. In addition, the news release contained these suggestions:

> You may well ask what you can do to stop these hunts; all concerned citizens and environmental groups can take the following actions:
> The State of Alaska has recently requested the federal government lift the moratorium on the taking of 9 marine mammals ... now protected under the Marine Mammals Act. Though the populations of these animals have reached somewhat healthy levels ... the State of Alaska, in light of its wasteful and environmentally unsound management of wolves, [should] not be given ... management of these mammals unless Alaska proves it is capable of conservative wildlife management practices such as in regard to its wolf population. Express these views to: Thomas Kleppe, Secretary of Interior ...

The release further suggests:

> We know from last winter's experience that appeals to stop the wolf hunts were met with deaf ears by Governor Hammond of Alaska, the ADF&G and President Ford. This year we are approaching the one political figure we believe to have a deep enough interest in the environment to do something about stopping these perversions of game management. Write to Jimmy Carter asking him to publicly back-up our views concerning the destructiveness of these hunts and their unhealthy environmental character.

The Alaska Conservation Society, through its Vice-President, responded to that news release on 6 October 1976. The response included the following:

> The news release "Alaska Plans Massive Expansion of Aerial Wolf Hunts" issued this summer by your committee is an embarrassment to Alaskan and national conservationists. You use bad facts and — not surprisingly — reach unsupportable conclusions. I hope this letter helps set you straight and can be the basis for a more accurate information program on your part.... We have enclosed some information you should study carefully. Next time you want to make something public about Alaska, please check the facts. We'd be glad to help.

The Board, during the fall of 1976, directed ADF&G to conduct a wolf-reduction program in the high wolf density portions of the Western Arctic herd's winter range, located in GMUs 23 and 24. Again, up to 80% of the wolves in the designated areas were to be removed during the winter 1976/77, but by private hunting teams with permits and not by ADF&G personnel. On learning of the proposed action, legal representatives of the National Resources Defense Council, Defenders of Wildlife, and the Alaska Chapter of the Sierra Club asked the Secretary of the Interior, in a letter dated 11 November 1976, to prepare an EIS prior to any State control activity. They contended that a Memorandum of Understanding of May 1976 between ADF&G and BLM, plus the fact that most lands involved were BLM lands, made BLM responsible for the control action, thus requiring an EIS. The Secretary did not write such an EIS. Meanwhile ADF&G implemented the program, making up to 30 permits for pilot–gunner teams available for issuance in November, a period of short days and poor snow cover. Few teams participated because most were waiting for the more favourable day length and snow conditions of late February. In February, however, court action ensued as follows:

4 Feb. 1977. Defenders of Wildlife *et al.*[1] filed suit against the Secretary of the Interior in US District Court for DC. The plaintiffs contended that two federal statutes, the Federal Land Policy and Management Act of 1976 (FLPMA) and the Alaska Native Claims Settlement Act required that the Secretary provide an EIS; they asked for an injunction.

14 Feb. 1977. The judge for the DC District court issued a preliminary injunction compelling the Secretary to order the State to halt the program on BLM-administered lands in GMUs 23, 24, and 26 (see Secretarial Order No. 2999 of 17 February 1977).

22 Feb. 1977. The State of Alaska and the Mauneluk Association, an Alaskan native organization, filed suit in US District Court for Alaska against the Secretary of the Interior (defendant) and Defenders of Wildlife *et al.* (intervenors) asking for a stay of the DC court's order. The State asked the court to declare that the Secretary had no power to stop the control effort.

1 Mar. 1977 (approx. date). The Secretary of the Interior appealed the injunction to the Court of Appeals for DC.

16 Mar. 1977. The judge in Alaska District

[1]Natural Resources Defense Council; Int. Fund for Animal Welfare — US; The Humane Society of the US; the Fund for Animals; Animal Welfare Institute; The Wild Canid Survival and Research Center — Wolf Sanctuary; Friends of the Earth, Inc.; and 7 private parties.

Court declared in a preliminary finding that Alaska should have been a party to the case. He declared that no EIS was required. However, he did not grant the request for a stay of the DC Court's injunction, contending that two opposing decisions of District Courts placed the Secretary of the Interior in an untenable position.

11 Apr. 1977. The judge in the Alaska District Court case reaffirmed his preliminary finding. He also held that the Secretary of the Interior had the power to halt the wolf control program, but that an EIS was not required because the Secretary refrained from exercising that power.

21 July 1977. The State of Alaska appealed the judge's decision in the Alaska District Court case to the US Court of Appeals, Ninth Circuit. The State contended that the Secretary did not have power to halt programs. Eleven other states and the International Association of Fish and Wildlife Agencies joined as interested parties; the issue was rapidly widening to cover all non-migratory wildlife.

26 July 1977. Defenders of Wildlife *et al.* appealed the Alaska District Court judge's decision on EIS. They asked for confirmation of the judge's ruling on the authority of the Secretary to stop the control hunts.

22 Feb. 1979. The Ninth Circuit Court ruled that the Secretary of the Interior was not required to file an EIS, but it did not rule with regard to the power of the Secretary.

16 Mar. 1979. Court of Appeals for DC rescinded the injunction on Western Arctic Caribou Herd "for want of equity", and directed that the complaint be dismissed. "In an unpublished memorandum accompanying our order, we said that '[s]ound principles of comity dictate that this court should not undertake an independent examination of issues resolved by the Ninth Circuit ruling' ".

28 Feb. 1980. The Secretary of the Interior filed Secretarial Order No. 3047 in the Federal Register rescinding the previous order closing all BLM-administered lands in GMUs 23, 24, and 26 to aerial hunting.

The court cases during 1977 again centred on NEPA requirements. The cases raised and clarified several important issues regarding EISs but failed to address one concerned with federal–state authority.

The Ninth Circuit Court, ruling on an appeal from the Alaska District Court decision, avoided the issue of federal–state authority, but did specify that the non-exercise of any authorities and duties possessed by the Secretary does not require an EIS. Also, the Ninth Circuit judges were reluctant to impose NEPA requirements in the absence of federal funding, as occurred in the Western Arctic herd action.

The Court of Appeals for DC essentially affirmed the Ninth Circuit Court's decision and reversed the injunction issued by the District Court for DC.

Although court action stymied western arctic wolf control after only nine wolves had been taken, the caribou herd was probably exposed to decreased wolf predation during the winter. Unexpectedly, about half the herd stayed throughout the winter on their summering area north of the Brooks Range; that area has low wolf densities (ADF&G 1977, unpubl. rep.). Of the half that wintered south of the Brooks Range, 75% wintered in an area from which 75 wolves were removed by the short-lived control action and by intensive private trapping and hunting. The latter was probably by Alaskans disgruntled over the litigation that stopped the control effort. In all of GMUs 23 and 24, nearly 200 wolves were taken by trappers and hunters during the winter of 1976/77 (ADF&G 1977, unpubl. rep.).

The wolf-reduction program in GMU 20A continued during the winter of 1976/77, with 27 wolves taken by the ADF&G control program and 26 more by trappers and hunters (ADF&G 1979, unpubl. issue paper 79-07). By April 1977 the wolf/moose ratio was estimated to be 1:50–80 (ADF&G 1977, unpubl. rep.). The decline in the moose herd was arrested and there was substantially increased survival of calves and yearlings in the control area. In adjoining areas with no reductions in wolves, the calf and yearling survival rates appeared unchanged from the pre-control levels (Hinman 1978, ADF&G Fed. Aid Wildl. Rep.).

The GMU 13 control study continued. During the winter of 1976/77, 12 wolves that either moved into the experimental area or had been there since the inception of the study were removed, bringing the total removed to 52 (ADF&G 1979, unpubl. issue paper 79-07). Moose-calf survival appeared to be slightly better in the wolf reduction area than outside it, based on mortality of radio-collared moose calves, but brown bear predation appeared to be a significant mortality factor (Ballard *et al.* 1981). ADF&G initiated a study to measure this.

No new wolf control programs were started during the winter of 1977/78. The program continued in GMU 20A with 39 wolves taken by ADF&G and 4 by trappers, resulting in a fall wolf/moose ratio of 1:40 by 1978. The moose population continued to increase; the available data suggested a 15% annual increase in the control area and only a 1% increase outside it. The pre-control population of 2900 moose in the fall of 1975, with a ratio of 14 calves/100 cows, reached 3500 by the fall of 1978, with a ratio of 50 calves/100 cows (ADF&G 1979, unpubl. issue paper 79-07). The results convinced ADF&G and the Board of Game that the control action in GMU 20A was the primary factor responsible for the increases. Furthermore, a wolf/moose ratio of 1:50, and not the originally proposed 1:100, seemed adequate for desirable growth.

The GMU 13 control study continued 1977/78. Seven wolves were taken in the experimental area (ADF&G 1979, unpubl. issue paper 79-07). The moose–bear study confirmed that bears were causing heavy mortality to calves for several weeks after birth, creating additional problems for managers responsible for moose management (Ballard *et al.* 1981).

The success in GMU 20A stimulated increased demand by residents elsewhere for wolf control in their areas. Recognizing that additional wolf control projects were likely, the Board took steps during the spring of 1978 to make wolf control a routine management tool for ADF&G and not a special action imposed by the Board. On 7 April 1978 the Board adopted a Statement of Direction indicating the Commissioner could permit the use of aircraft in wolf control when he found that all the following conditions prevail:

1) the highest priority use of wildlife in an area is determined to be the use of prey species for food or recreational hunting;

2) the prey populations have been reduced to or are held at a level below that deemed to be the capacity of the habitat;

3) the prey populations are below levels that could reasonably satisfy the priority uses;

4) adequate control of predation cannot be accomplished by manipulation of hunting and trapping seasons and bag limits;

5) predation control based on aircraft use governed by a permit is judged to be an effective method for that area, and;

6) such predation control in an area can be adequately supervised and regulated.

The Commissioner was no longer always expected to seek prior approval before implementing aerial hunting, but he was directed to keep the Board informed of his actions.

An ADF&G report presented to the Board on 28 November 1978 identified seven new areas with chronically low ungulate populations that were being considered for wolf reductions. The ADF&G staff prepared issue papers for these areas and submitted them to the Commissioner for his approval.

By December 1978, Alaska lands legislation, which would ultimately be enacted and entitled the Alaska National Interests Lands and Conservation Act, was a sensitive issue in Washington, DC, and in Alaska. The entire series of legislative proposals was commonly referred to as "d(2)" legislation. Any Alaskan issue that could be controversial, both within and outside Alaska, received intense scrutiny with respect to repercussions on d(2). Consequently, the political ramifications as well as the biological worth of the new wolf-control projects needed careful evaluation. Four of the projects were deleted by the Commissioner before he informed the Governor of the proposed actions.

ADF&G held seven public meetings to assess reaction to the three remaining proposals; the reaction was mostly favourable. However, the Commissioner, caught between concerns of national and local politics, sought concurrence from the Board before acting. Meanwhile the GMU 20A control continued (18 wolves were removed during the winter), as did the GMU 13 control study in which 2 wolves were removed (ADF&G 1979, unpubl. issue paper 79-07).

The Board agreed on 9 March 1979 to wolf control in three new areas: GMUs 19A and B; the Innoko drainage of GMU 21; and the Nowitna drainage of GMU 21. The stressed populations were moose. All but GMU 19B are areas of importance to local subsistence hunters. Wolf/moose ratios in GMUs 19A and B, the Innoko, and the Nowitna were estimated (later revised) to be 1:15, 1:28, and 1:10 respectively. Issuing of aerial hunting permits to private pilot–gunner teams commenced on 11 March 1979.

The three new actions immediately provoked controversy. The Special Committee on Subsistence in the Alaska Legislature, in a news release dated 22 February 1979, criticized the actions as politically unwise in regard to d(2). Two court cases were initiated as follows:

12 Mar. 1979. Defenders of Wildlife *et al.*[1] filed suit against the Secretary of the Interior *et al.* in US District Court for DC, asking for declaratory and injunctive relief. The plaintiffs contended that the secretary had authority over control programs based on the Federal Land Policy and Management Act (FLPMA); hence an EIS was required.

13 Mar. 1979. The District Court for DC issued a temporary restraining order that enjoined the Secretary to "... take all steps necessary to halt aerial killing of wolves by agents of State of Alaska...." on the federal lands in the three control areas.

23 Mar. 1979. The District Court for DC issued a preliminary injunction and ruled that an EIS was needed. The Court also denied the Secretary's requests that the case be transferred to the US District Court for Alaska and that the action be dismissed for failure to join Alaska as an indispensable party.

Mar. 1979. Three private parties filed a case against ADF&G *et al.* in Alaska Superior Court, Third Judicial District, contending that the Board of Game had delegated powers to the Commissioner in excess of those authorized by the Legislature, and that the Governor had exerted undue political influence regarding the proposed wolf control projects. A requested temporary restraining order was denied.

Early Apr. 1979. The Secretary of the Interior *et al.* appealed the District court ruling to US Court of Appeals for DC.

31 Mar. 1979. The Secretary of the Interior filed Secretarial Order No. 3036 in the Federal Register, which closed all BLM-administered lands in the three control areas (GMUs 19A, 19B, and 21) to aerial hunting.

Aug. 1979. The Superior Court judge dismissed the case, ruling that proper authority existed and that no undue political influence was evident.

5 Feb. 1980. The Court of Appeals for DC ruled that the Secretary was not required to file an EIS. It also ruled on the authority of the State in wolf control (see below).

28 Feb. 1980. The Secretary of the Interior filed Secretarial Order No. 3047 in the Federal Register, which rescinded previous order (No. 3036).

The Alaskan Superior Court case emphasized the political sensitivity in Alaska. In a memorandum supporting a motion for summary judgement filed with the Court on 2 April 1979, the attorney for the plaintiffs stated:

> This hunt, willingly or not, is a factor in the Congressional dynamics surrounding the d(2) deliberations. It has raised questions regarding the State's ability to manage wildlife (both moose and wolves), created controversy among the constituents of Congressmen from urban areas far removed from Alaska, and created some controversy between subsistence hunters and environmentalists who support a strong d(2) bill. Whether one views this hunt as a gesture of political suicide, or as a carefully orchestrated, if unsuccessful, attempt to split the ranks of the backers of the bill, it is clear that the hunt is enmeshed in political controversy.

[1]Natural Resources Defense Council, Inc.; Int. Fund for Animal Welfare; The Humane Society of the United States; the Fund for Animals; Animal Welfare Institute; The Wild Canid Survival and Research Center — Wolf Sanctuary; World Wildlife Fund — US; and 2 private parties.

The actions in the DC courts essentially reaffirmed previous court findings regarding EISs. In addition, an important statement on state–federal authority emanated from that action.

The Defenders of Wildlife *et al.*, in their suit in District Court for DC, contended that FLPMA gave the Secretary of the Interior the power to close federal lands to the wolf control program, hence an EIS was needed regardless of whether he exercised those powers. The Court of Appeals for DC spoke directly to the authority question, stating that under the BLM Organic Act, Congress "... assigned the states the primary responsibility for the management of wildlife programs within their boundaries". The Court did note that Congress may pre-empt state management of wildlife on federal lands, but there must be clear intent by Congress to do so. In summary the Court stated, "Far from attempting to alter the traditional division of authority over wildlife management, FLPMA broadly and explicitly reaffirms it". The Circuit Court of Appeals reversed the District Court's ruling.

The hunts during the spring of 1979 accounted for 29, 11, and 5 wolves in GMUs 19A and B, the Innoko, and the Nowitna respectively. ADF&G judged the hunts effective only in the Aniak River drainage in GMU 19A; bad weather and closure of federal lands substantially decreased effectiveness in the other areas (ADF&G 1979, unpubl. issue paper 79-07).

During the fall of 1979, ADF&G presented to the Board issue paper 79-07 and supporting material about wolf control programs. The paper contained a statement clarifying the agency's position on wolf control, as follows:

> The Department of Fish and Game acknowledges, as a basic proposition, that wolf-reduction programs which are intended to rehabilitate depressed ungulate populations are not needed to increase the population of either predator or prey species, but are for the sole purpose of providing more animals for human consumption.

The issue paper also reaffirmed that ADF&G would reduce wolf numbers only in response to a specific problem in a specific area; the Department would not issue aerial permits for sport-hunting purposes.

The issue paper made three recommendations for the winter and spring of 1980: first, that the control operations previously initiated in GMUs 19A, 19B and 20A be continued; second, that the programs in the Innoko and Nowitna drainages of GMU 21 be cancelled "due to budgetary constraints and in recognition of marginal effectiveness of wolf reductions in these areas as long as federal lands remain closed" (although a subsequent decision continued the operations in both areas); and third, that control be initiated in three new areas in GMU 20. Two of the new areas had depressed moose populations showing virtually no improvement even with very restrictive hunting seasons and bag limits (ADF&G 1979, unpubl. rep. issue paper 79-07). The other area had reduced moose and caribou populations.

Private pilot–gunner teams, under limited permits, were to conduct the operations, with the number of wolves to be removed from each unit specified. Based on the experience in GMU 20A, ADF&G managers hoped to establish a wolf/moose ratio of 1:50, rather than the previously used 1:100 ratio.

A fourth new area that had previously been included for control was deleted; the reason was given as follows:

> In spite of the fact that all biological data strongly support the need for temporary wolf reduction in the area, the Department believes that it would not be in the best interests of the State to attempt a reduction program at this time. Factors involved in this decision include the proposed Yukon-Charlie federal withdrawal, the large percentage of other federal land, and the sensitivity of the land settlement question.

The control operations in GMUs 23 and 24 (the Western Arctic Caribou Herd action), begun in 1977, were still halted by a Secretary of the Interior's order, as mentioned earlier. The order was only lifted on 28 February 1980, after the Court of Appeals in DC ruled favourably for the State.

The new wolf control operations did not occasion substantial new controversy, although several organizations such as Greenpeace did voice opposition. Apparently the public, particularly in Alaska, was accepting ADF&G's and the Board's assertions that, in order to attain goals they had defined following public input, both prey and wolves must be managed. Operationally, wolf control was becoming more of a routine management activity and less of a special, high visibility event requiring extensive public hearing and debate.

The wolf control situation during the winter of 1980/81 essentially remained unchanged from that of 1979/80. Even though all legal prohibitions against control were lifted with the 5 February 1980 Appeals Court decision, control operations were not resumed in the winter range of the Western Arctic herd. That herd had increased substantially, due to favourable winters, to restrictive hunting seasons and bag limits, and to the fact that most of the herd continued to winter in areas of low wolf densities.

The wolf control program in GMU 20A, initiated in the spring of 1976, is considered a success by ADF&G and the Board. Although the desired level of wolf reduction was never achieved, a dramatic increase in moose numbers occurred in the control area. The interim management objective of 5000 moose will be reached within 2 or 3 years. Whether that stocking level is the desired one in terms of habitat conditions, wolves, and humans is still an open question. Based on the desires of the public, particularly those living near the area, the main use of GMU 20A's wildlife resources is the consumptive use of moose. In order to sustain this use, it may be necessary to maintain wolf populations at an artificially reduced level.

What of the future?

Alaska's growing human population coupled with increased use of land for agriculture, forestry, mineral production, and urbanization will steadily reduce the habitat available for

wildlife, especially the many wide-ranging mammals. The Alaska National Interests Lands and Conservation Act has resulted in park or monument status, and thus legal protection for wolves, for about 6% of the gross area of the State. Seven of the National Park Service areas under complete legal protection each exceed 6900 km^2, and most units in this group exceed 13 000 km^2. These areas are well distributed over the entire State except in the southeast panhandle. In addition, this legislation placed another 5% in "preserve" status; although hunting will be permitted on preserves, wolf control is unlikely. The new refuges and the Forest Service's National Monuments in southeast Alaska probably have a similar status. It will be difficult to define or map the status of wolves on specific lands until regulations provided for under the d(2) legislation have been promulgated.

The demands on wildlife populations will increase significantly as the rural human population continues to grow, as the road system expands, and as the nation's food supplies become more expensive or scarcer for reasons paralleling the above. Consumption of wildlife will continue to be assigned high priority in Alaska on lands not managed intensively for primary uses incompatible with wildlife production. There will certainly be strong pressure for the control of wolf populations in areas from which humans are attempting to gain the highest possible yield of wild meat.

We anticipate further acceptance among ecologists and eventually the public of the role of predators in depressing prey populations and in prolonging recovery from lows caused by predation and other factors. The effectiveness of bears as predators in certain situations will be better understood; however, it seems that adjustments of hunting pressure on bears can substitute for "control" in this case. Wolf control will continue to become more of an operational process for ADF&G but will be conducted within clearly stated goals and criteria. The agency, working with the public, is well along in the development of detailed population-level management plans. Additional study is needed to understand sufficiently both predator–prey interactions and the most effective strategies of control.

Although it may appear to some that wolf management in Alaska has come full circle, the second round will be made under vastly different conditions and much stricter rules. ADF&G policy will probably continue to preclude poisons except in the most extreme circumstances; aerial hunting, objected to by some as unfair, is one of the most target-specific control methods possible; and wolf reduction will be directed at clearly specified areas. We hope that the future will be characterized by substantially increased knowledge of basic ecology and significantly more effective and mutually sympathetic communication between the many interested segments of society.