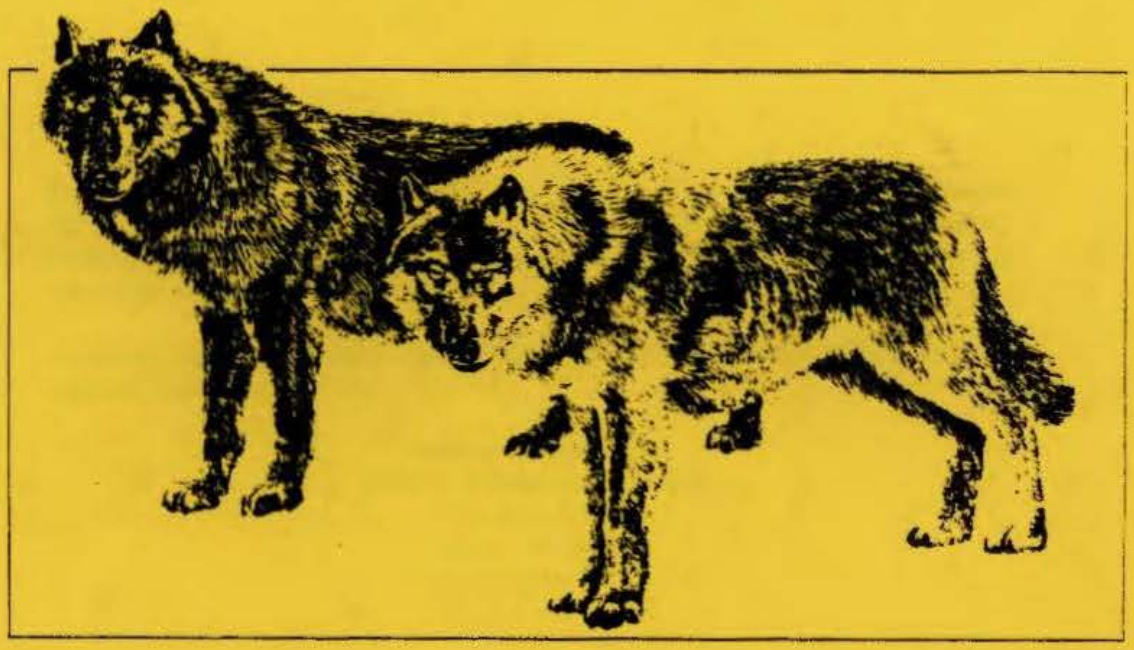
Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Survey-Inventory Management Report
1 July 1989 - 30 June 1991

WOLF



Susan M. Abbott, Editor
Projects W-23-3 and W-23-4, Study 14.0
December 1991

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LOCATION

Game Management Units: 1A and 2 (8,911 mi^2)

Geographical Description: Subunit 1A - That portion of Unit 1 lying south of Lemesurier Point, including all drainages into Behm Canal and excluding all drainages into Ernest Sound.

Unit 2 - Prince of Wales Island and all adjacent islands bounded by a line drawn from Dixon Entrance in the center of Clarence Strait, Kashevarof Passage and Sumner Strait to and including Warren Island, in Southeast Alaska.

BACKGROUND

Wolves occur throughout Game Management Units 1A and 2. They occur sporadically (from zero to several) on smaller islands in the units. As accomplished swimmers, wolves can move between adjacent land masses separated by a mile or more of open water.

Deer are the primary food source for wolves inhabiting islands of southern southeast Alaska and the lower Cleveland Peninsula. On most mainland portions of Subunit 1A, however, mountain goats make up the bulk of the wolves' diet. Substantial numbers of beavers are taken by some wolf packs, and all wolves feed heavily on spawning salmon in July, August, and September. In some areas wolves feed on fish as late as November.

Biological and harvest information has been collected for wolves through the bounty program (1961-1971) and the mandatory sealing program (1971-present). Pack sizes in southern Southeast Alaska range from 3 to 7 and are normally smaller than those in the Interior. However, pack sizes of 8 to 12 have been reported in years of high deer densities (Wood 1990).

The brown/gray color phase is most commonly observed in Southeast Alaska, but white and black wolves also occur. During the past 20 years, white or near-white wolves comprised less than 1% of the harvest, while black phase wolves accounted for 23% of the harvest in Subunit 1A and 17% in Unit 2.

Southeast Alaska wolves seldom reach 100 pounds. The average weight of 12 adult males caught in Units 1A and 2 during 1971-1978 was 87 pounds, while 10 male pups averaged 77 pounds. Ten adult females from the same units averaged 69 pounds, while 7 female pups averaged 64 pounds (unpubl. data, ADF&G files, Ketchikan).

Southeast Alaska wolf pelt quality is poor; hairs are shorter, coarser, and less dense than those of interior and northern Alaska wolves. They also tend to mat badly along the back. Trapping is generally conducted from December to mid-April. Typical wolf sets are made in tidepools at the heads of large bays.

MANAGEMENT DIRECTION

Management Objectives

Maintain an average annual harvest of 20 wolves from Subunit 1A and 39 from Unit 2. These numbers reflect the average harvests for these units during 1984-1990.

METHODS

Harvest data are from interviews with hunters and trappers when sealing wolves. Data collected include number and sex of harvested wolves, date and location of harvest, method of take, transportation used, and pelt color.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf populations in Units 1A and 2 were relatively high until the early 1970s, when extremely harsh winters dramatically reduced deer numbers. Both wolves and deer remained at low levels until the early 1980s in Unit 2 and the mid-1980s in Subunit 1A, when deer populations again increased. Wolf numbers, responding to increased deer, appeared to increase for several years. Current information suggests that wolf numbers in Subunit 1A are stable, while in Unit 2 they are believed to be increasing.

Population Size: In the late 1960s to early 1970s the wolf density in Subunit 1A and Unit 2 was estimated at a high of 1 wolf/10 mi^2 (Wood 1990). Subsequent low estimates for Revillagigedo and Prince of Wales Islands had wolf densities at 1 wolf/22-44 mi^2 (Wood 1990). Data collected on Revillagigedo Island during 1984-1985, resulted in an estimate of 39-51 wolves in early winter, and 26-37 in late winter (Smith et al. 1986). At least 9 wolf packs inhabited the island at that time.

Wolf densities on mainland portions of Subunit 1A, where mountain goats are wolves' primary food source, are thought to be lower than on islands, where deer make up the bulk of wolves' diets. Anecdotal information and field observations place the current population estimate for Subunit 1A at 205 wolves in 25 packs. In Unit 2, the estimate is 200 wolves in 20 packs (unpubl. data, ADF&G files).

Mortality

Harvest:

Season and Bag Limits.

Hunting. In Subunit 1A and Unit 2 there is no closed season or bag limit.

Trapping. In Subunit 1A and Unit 2 the open season is from 10 November to 30 April. There is no bag limit.

Hunter/Trapper Harvest. While the 1989-90 wolf harvest in Subunit 1A was the highest it has been for the past 6 seasons, the harvest in Unit 2 was down for the third consecutive year (Table 1). The decline in Unit 2 harvest is not necessarily cause for alarm because changes in reported harvest can be because of changes in trapping pressure rather than changes in wolf numbers. Harvest levels during the next two seasons need close monitoring. We also need to ask members of the public their thoughts on Unit 2 wolf numbers.

Harvest Chronology. Wolf harvests in Subunit 1A and Unit 2 were fairly evenly distributed throughout the year (Table 2). Numbers of people sealing wolves from Subunit 1A have increased steadily, while in Unit 2 the numbers of people have remained relatively constant for the past 4 seasons (Table 3).

Transport Methods. Differences in road access and human activity in the 2 units are reflected in the high percentage of successful hunters in Unit 2 who accessed wolves by road vehicles (Tables 1 and 2). These differences may decrease as road systems on Revillagigedo Island and the Cleveland Peninsula develop and provide access similar to that in Unit 2 (Wood 1990). Several Subunit 1A wolves were taken this season by people using highway vehicles to access wolf hunting areas (Table 2).

Board of Game Actions and Emergency Orders. No changes have been made in wolf harvest regulations for Units 1A and 2 since the bounty was discontinued in the late 1970s. It has been possible to reduce wolf populations in these units by hunting and trapping. Seasons and bag limits have reflected this fact. Trapping seasons coincide with the pelt-primeness and are closed when bears are most active. The year-round hunting season allows hunters to harvest wolves incidentally while seeking other species. Little specific hunting for wolves is done in Subunit 1A and Unit 2. No changes in seasons or bag limits are recommended.

Habitat

The expanding road system and increasing human population throughout much of Subunit 1A and Unit 2 will have a direct impact on wolves, primarily through hunting and trapping. Long-term permanent loss of wolf habitat can be expected indirectly through the loss of deer habitat. As the uneven-aged old growth forest continues to be logged, the carrying capacity for deer will be reduced. Wolf populations, supported by fewer deer, will be reduced. While fluctuations in wolf numbers will always occur, the potential for the land to support wolves will steadily decline.

CONCLUSIONS AND RECOMMENDATIONS

Wolf populations in Subunit 1A and Unit 2 do not appear adversely affected by hunting and trapping efforts. Population fluctuations appear to follow changes in deer numbers. Availability of alternate food sources such as salmon and beaver affect the extent to which wolves decline when deer densities are low.

In Unit 2, where road access and human settlement are extensive, substantial increases in hunting and trapping effort could result in serious reductions in wolf numbers. This would be especially true following substantial declines in both deer and wolf populations. However, while this possibility should be viewed seriously and watched closely, the current low value of wolf pelts makes this unlikely in the immediate future.

Wolf populations in southern Southeast Alaska presently appear healthy and stable. However, the extensive roading, logging, and human inhabitation in Unit 2 may cause problems for wolves on Prince of Wales Island. The current potential to support wolves in both units will decline from the loss of deer habitat caused by logging.

Wolf harvest from Subunit 1A was 65% higher than our average-based objective during this season. In Unit 2, however, the harvest was 18% below our objective. Because our objectives are based on a 6-year average, we expect to see fluctuations around the averages.

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Table 1. Annual wolf harvest from Subunit 1A and Unit 2, 1984-90.

Season	Males	Females	Unknown	Total	Method of take			Pelt Color			
					Shot	Trapped	Unk	White	Grey	Black	Unk
Subunit 1A											
1984-85	6	9	0	15	3	12	0	1	12	2	0
1985-86	6	5	0	11	1	10	0	0	7	4	0
1986-87	11	10	0	21	3	18	0	0	16	5	0
1987-88	14	9	0	23[a]	7	14	0	0	16	7	0
1988-89	13	8	0	21	10	11	0	0	14	7	0
1989-90	12	19	2	33[b]	14	19	0	0	25	8	0
Totals	62	60	2	124	38	84	0	1	90	33	0
Unit 2											
1984-85	26	16	1	43	21	22	0	0	29	14	0
1985-86	7	11	0	18	9	9	0	1	13	3	0
1986-87	22	16	1	39	16	23	0	0	32	6	0
1987-88	27	24	4	55	26	28	0	1	39	15	0
1988-89	27	16	2	45	31	14	0	0	41	4	0
1989-90	20	11	1	32	23	8	1	0	20	9	3
Totals	129	94	9	232	126	104	1	2	174	51	3

[a] Mistakenly reported as 21 in past survey-inventory reports.
[b] Does not include 1 gray female killed by a car on South Tongass Highway, Ketchikan.

Table 2. Transportation methods used by wolf hunters and trappers in Subunit 1A and Unit 2, 1985-1990.

Season	Air	Boat	Highway vehicle	Unknown
Subunit 1A				
1985-86	0	5	3	0
1986-87	10	11	0	0
1987-88	0	21	2[a]	0
1988-89	0	16	5	0
1989-90	2	26	5	0
Totals	12	79	15	0
Unit 2				
1985-86	0	4	5	0
1986-87	0	14	25	0
1987-88	0	31	20	0
1988-89	3	25	14	0
1989-90	0	12	15	5
Totals	3	86	79	5

[a] Mistakenly reported as 0 in past survey-inventory reports.

Table 3. Wolf harvest chronology in Subunit 1A and Unit 2, 1984-1990.

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Subunit 1A												
1984-85	0	0	2	0	0	1	4	4	3	1	0	0
1985-86	0	0	0	0	0	1	4	3	2	1	0	0
1986-87	0	1	0	0	1	2	3	11	2	1	0	0
1987-88	0	0	1	1	0	4	6	3	1	1	3	3[a]
1988-89	0	1	2	1	3	2	4	0	3	4	1	0
1989-90	0	1	1	4	4	5	3	3	6	5	1	0
Totals	0	3	6	6	8	15	24	24	17	13	5	3[a]
Unit 2												
1984-85	0	1	2	2	2	7	9	11	4	5	0	0
1985-86	0	0	4	1	2	2	3	4	1	1	0	0
1986-87	0	1	1	1	2	11	6	9	5	2	1	0
1987-88	0	1	1	7	7	11	3	11	8	1	4	1
1988-89	0	0	5	8	5	8	5	4	0	3	4	3
1989-90	0	2	3	3	2	5	3	2	2	2	4	4
Totals	0	5	16	22	20	44	29	41	20	14	13	8

[a] Mistakenly reported as 1 in past survey-inventory reports.

Table 4. Numbers of people sealing wolves taken from Subunit 1A and Unit 2, and average catch per person, 1985-1990.

Season	Number of people sealing wolves		Average catch/person	
	1A	2	1A	2
1985-86	7	14	1.6	1.3
1986-87	10	27	2.1	1.4
1987-88	12	34	1.9	1.6
1988-89	15	31	1.4	1.4
1989-90	18	28	1.8	1.1

LOCATION

Game Management Unit: 1B and 3 (5,946 mi^2)

Geographical Description: Southeast Mainland from Cape Fanshaw to Lemusurier Point and adjacent islands

BACKGROUND

Wolves are endemic to the Alexander Archipelago south of Frederick Sound, and to the mainland. Wolves probably immigrated into this region relatively late, after the post-glacial immigration and the establishment of deer populations.

Because Units 1B and 3 are heavily forested, wolves are seen infrequently. Wolf viewing opportunities are very limited.

Wolf trapping is a well-established, long-time use, and much of the current management program centers on that fact. From an historical perspective, current interest in wolf trapping is relatively low because of the effort involved, the expense of larger traps, and low pelt value. In the Petersburg and Wrangell areas, wolf trapping contributes less to the income of trappers than trapping other furbearers. Trapping of wolves and other furbearers is a secondary source of income for most trappers, many of whom have seasonal occupations in logging or fishing.

In years past, reducing the wolf population to benefit deer populations was often the main emphasis of federal and state management. Current public controversy over various aspects of wolf population manipulation have effectively eliminated it as a management option, at least for the present.

MANAGEMENT DIRECTION

Management Objectives

- Maintain a viable wolf population in all areas of historic wolf range.

METHODS

Harvest of wolves by trappers and hunters was monitored through the mandatory hide-sealing program. Data routinely collected included number taken, location, date, sex,

and number of associated wolves. Reports of observations of wolves or wolf sign by the public were used to indicate wolves and gross differences in densities between areas.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Existing data are insufficient to determine wolf population trend in Units 1B or 3. Incidental observations by ADF&G staff and observations by trappers, hunters, and other members of the public demonstrate the continuing presence of wolves throughout their historic range, and suggest an increase in wolf numbers in some areas.

Mortality

Harvest:

Season and Bag Limit.

Trapping:	Unit 1B & 3	Nov. 10 - April 30	No limit
Hunting:	Unit 1B & 3	No closed season	No limit

Hunter/Trapper Harvest. The average annual harvest of wolves for the past 5 seasons was 12 in both Units 1B and 3 (Table 1). The previous average annual harvest for Unit 3, in 5-year increments starting in 1968, was 44, 21, and 20. The harvest pattern in Unit 1B has been much more stable, fluctuating from 4 to 16 before this year. The previous trend of decreasing harvest is indisputable, and no conclusions should be drawn from this one season of increased take. The reason for the decreased kill and now a sudden reversal trend is less clear. Deer numbers are generally up in both Units 1B and 3 and we expect that the wolf population is also increasing. Whether or not the harvest rises significantly in the future, commensurate with an increased number of wolves, depends largely on the economic incentive to trappers.

The increased harvest in Unit 3 from 10 in 1988 to 22 in 1989 was largely the work of 1 trapper who took 9 wolves. Twelve individuals harvested wolves from these units in 1988 and 21 people harvested wolves this year though only 3 individuals took more than 1 wolf. This illustrates the seemingly great changes in the harvest caused by a few individuals when small numbers of animals are involved.

The methods by which wolves were harvested (Table 1) in 1989-90 reflected the past trend; primarily trapping (23 wolves), followed by ground shooting (15 wolves), then snares (3 wolves).

Harvest Chronology. Most of the wolf harvest occurred in Units 1B and 3 during February before 1987. In 1989-90, only 1 wolf was taken in February, while 12 were killed in December, 8 in January, and the rest throughout the year (Table 2).

Transport Methods. Boats are the most commonly used form of transportation by those who harvest wolves in the Petersburg/Wrangell area (Table 3). Thirty-four of the 41 wolves taken in both units were taken by hunters or trappers using boats.

CONCLUSIONS AND RECOMMENDATIONS

Wolf populations, as reflected by harvest appear generally stable in Subunit 1B but may be increasing in Unit 3. Fluctuations in harvest numbers are probably associated more closely with changes in trapper effort than in population changes. Trappers in southeast Alaska usually have primary income from other sources and do not depend on trapping for a livelihood. No changes in regulations are needed at this time.

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Table 1. Units 1B and 3 wolf harvest, 1985-90.

Regulatory year	Unit	Reported harvest			Method of take		Successful
		M	F	Unk.	Trap/snare	Shot	Total trappers/hunters
1985-86	1B	6	3		6	3	4
	3	5	4		7	2	4
1986-87	1B	7	4		10	1	6
	3	6	3	1	9	1	7
1987-88	1B	8	6		11	3	6
	3	6	3		5	4	6
1988-89	1B	4	5		6	3	6
	3	5	5		5	5	6
1989-90	1B	12	7		14	5	8
	3	12	10		12	10	13

Table 2. Unit 1B and 3 wolf harvest chronology percent by time period, 1985-89.

Regulatory year	Unit	Harvest periods Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	?	n
1985-86	1B					33		66							9
	3							33	11	22		11		22	9
1986-87	1B			9		9	9	18	9	27	18				11
	3			10	10				70	10					10
1987-88	1B			7	7	50			29				7		14
	3				11		22		11		22	11	22		9
1988-89	1B		11		11	11	56	11							9
	3	10		10					50		20	10			10
1989-90	1B			11	11	16	32	26			15				19
	3		9	16	16		32	16	5	16	5				22

Table 3. Unit 1B and 3 wolf harvest percent by transport method. 1985-89.

Regulatory year	Unit	Percent of harvest								n
		Airplane	Horse or Dog team	Boat	3 or 4 wheeler	Snow machine	ORV	Highway vehicle	Other	
1985-86	1B	NA								
	3	NA								
1986-87	1B			82	18					11
	3			60				10	30	10
1987-88	1B		7	93						14
	3			89				11		9
1988-89	1B	11		78		11				9
	3	10		70				20		10
1989-90	1B			89		11				19
	3			77	5			18		22

LOCATION

Game Management Unit: Subunit 1C - (7,560 mile^2)
Subunit 1D - (2,670 mile^2)

Geographical Description: 1C - The southeast Alaska mainland, and the islands of Lynn Canal and Stephens Passage north of Cape Fanshaw to the latitude of Eldred Rock, including Sullivan Island and drainages of Berners Bay.

1D - That portion of the Southeast mainland north of the latitude of Eldred Rock.

BACKGROUND

Wolves are distributed throughout the mainland portion of both subunits. They are numerous in Glacier Bay National Park where hunting and trapping is not allowed and where wolf/human interactions may be minimal. No wolves were reported from Douglas, Shelter, Lincoln or the smaller islands adjacent to the mainland.

Wolf population estimates for these subunits were updated recently. These estimates were based on sightings, hunter and trapper interviews, and sealing data. Heavy timber makes it impractical to conduct aerial counts of wolves or their tracks.

Although both moose and mountain goats inhabit the subunits, and their numbers are influenced by predation, no intensive wolf-prey investigations have been conducted to date.

Trapping and hunting of wolves in both subunits are common uses of this resource. Pelt prices and the availability of other species probably influence participation in wolf trapping.

MANAGEMENT DIRECTION

The regionwide objective is to measure the economic value of all uses of wolves. A planned management system with measurable objectives will then be developed.

METHODS

The mandatory sealing of wolf hides taken by successful trappers provided data on sex, date and method of take, and transportation means. Discussions with hunters during sealing provided additional population status information.

RESULTS AND DISCUSSION

Population Status and Trend

Harvest data and discussions with trappers and other sportsmen, lead me to believe the wolf population is stable throughout subunits 1C and 1D. Data gathered in the sealing and interview process and from other sportsmen and pilots helps refine abundance estimates and identify individual packs.

Mortality

Harvest:

Season and Bag Limit.

Hunting	Unit 1C & 1D	No closed season	No limit
Trapping	Unit 1C & 1D	November 10 - April 30	No limit

Trapper Harvest. Trappers took 11 wolves (Table 1) in Subunit 1C (3 males, 7 females, and 1 wolf of unknown sex). In Subunit 1D (Table 2) 4 males and 1 female were sealed, as was 1 wolf of unreported sex. The harvest in both subunits increased substantially from the previous year. In both cases, however, the harvest was near, or equal to, the mean for the past 6-year period.

In Subunit 1C, 3 wolves were shot and 8 were taken in traps or snares. In contrast the majority (4) of the Subunit 1D wolves were taken by ground shooting and only 2 were taken in traps or snares.

Harvest Chronology. In Subunit 1C, 5 wolves were taken in December, 3 in January, and 1 each in October, November, and February. One half (3) of the Subunit 1D harvest was taken in November, and 1 wolf per month was trapped in December, February, and March.

Transportation Methods. Most Subunit 1C trappers used boats for transportation (8), while 2 used snowmachines and 1 used a highway vehicle. More Subunit 1D wolf were taken by highway vehicle borne sportsmen (3) than boaters (2) or snowmachine users (1).

CONCLUSIONS AND RECOMMENDATIONS

Based on harvest figures and other data, wolf numbers appear stable in Subunits 1C and 1D. I do not believe changes in seasons and bag limits are needed at this time. We will continue to develop population objectives this year.

Residents of Subunit 1D are concerned that wolves and brown bears are limiting moose and mountain goat populations. A better understanding of the predator-prey dynamics in the subunit would enhance our ability to deal with current and future resource conflicts there.

Additional data regarding wolf densities and population fluctuations should be available through trapper questionnaires that will be sent to all northern Southeast trappers this year.

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Table 1. Subunit 1C. Wolf harvest, 1983-84 through 1989-90.

Year	Males	Females	Unknown	Total
1984-85	--	--	10	10
1985-86	--	--	14	14
1986-87	4	4	0	8
1987-88	5	5	0	10
1988-89	3	2	0	5
1989-90	3	7	1	11
Mean	3.8	4.5		9.7

Table 2. Subunit 1D. Wolf harvest, 1983-84 through 1989-90.

Year	Males	Females	Unknown	Total
1984-85	3	1	0	4
1985-86	10	3	0	13
1986-87	5	3	0	8
1987-88	3	1	0	4
1988-89	0	1	0	1
1980-90	4	1	1	6
Mean	4.2	1.7	.2	6

LOCATION

Game Management Unit: 5A and 5B (5,770 mi^2)

Geographical Description: Cape Fairweather to Icy Bay, Eastern Gulf Coast

BACKGROUND

Comments from life-long residents of Yakutat indicate that wolves were in the Yakutat Forelands (Subunit 5A) before moose immigrated there in the early 1930s (ADF&G files). Klein (1965) suggests that wolves gained access to the Yakutat Forelands via the Alsek/Tatshenshini River valley. There are no reports of wolves for the west side of Yakutat Bay (Subunit 5B) before 1971, well after moose were established there. By 1976 viable wolf populations were probably established.

L. Johnson (1964) commented on an apparent increase in wolf numbers in Subunit 5A since the time he began conducting moose surveys. By 1967, 23 different animals were documented during moose surveys. D. Johnson documented 44-50 wolves during 1973-74 aerial moose counts. In winter 1977, R. Quimby estimated a minimum 6 discrete packs in Subunit 5A; Situk, Ahrnklin, Dangerous/Italio, Akwe, Tanis Mesa/East Alsek, and Doame/Clear. Minimum pack sizes were estimated at 9, 7, 6, 3, 5, and 6, respectively, for a total of 36. Quimby extrapolated this to a minimum estimate of 45-50 wolves (pre-pupping), at a density of 1 wolf/15 mi^2.

The presence of a breeding population of wolves in Subunit 5B was not determined by Quimby. In winter 1979, R. Ball estimated Subunits 5A and 5B wolf populations at 35 and 10 (minimum), respectively. By 1980 he felt wolf numbers were stable or increasing in Subunit 5A, and estimated a population of 50 wolves. By 1982 Ball suggested a minimum of 12 wolves in 2 Subunit 5B packs. Beginning in 1985, B. Dinneford noted increased reports from local residents of moose mortality in winter months. These reports reflect an increasing wolf population, responding to the increased food source of a larger moose population. Beginning in 1983, wolf harvests became higher than the long term average.

Wolves probably subsisted on area mountain goats and salmon before moose arrived. Salmon, especially as a late fall/early winter food source, are considered very important for wolves. Hares, with sporadic population peaks, and beavers, also contribute to the wolf diet.

Wolf predation reduced moose numbers in the mid-1970s, especially in Subunit 5A. Severe winter weather was the most important factor reducing the moose population at that time, but wolves, hunting, and reduction of browse quality (because of over-browsing

caused by moose populations above carrying capacity) contributed to the decline. An attempt was made to reduce wolf numbers from 1974-76, with 1 wolf taken aerially in 31 hours of effort. Bad weather, rough terrain, and dense forest prevented a higher take.

MANAGEMENT DIRECTION

Management Objectives

- Measure the economic value of all uses of wolves in Unit 5 and develop measurable objectives.

METHODS

Minimum harvest data was obtained from interviews with hunters and trappers when sealing wolf pelts. Collected harvest data included number and sex of animals, date and location of harvest, method of take, transportation used, pelt color and number in pack. Hunter/trapper information gathered included name, address, and hunting/trapping license number. Wolves were sealed by Division of Commercial Fisheries and Fish and Wildlife Protection staff in the Yakutat area office as well as Division of Wildlife Conservation staff in Anchorage.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: An estimated minimum wolf population of 50 (pre-pupping), in 5 to 7 different packs, occupies the Yakutat and Malaspina Forelands. While there are no quantitative data available, wolf numbers are apparently increasing in the area according to observations and reports from others in the field. Moose numbers are increasing across the forelands because of recent mild winters and conservative harvest quotas on the Subunit 5A moose herd. We speculate that the Subunit 5A wolf population is expanding in response to an increased food source. More reported sightings of wolves also suggest that wolves are increasing.

Mortality

Harvest:

Season and Bag Limit.

Hunting	Unit 1C & 1D	No closed season	No limit

Trapping Unit 1C & 1D November 10 - April 30 No limit

Hunter/Trapper Harvest. Thirteen wolves were taken in Unit 5 in 1989-90 (Table 1). This compares to the 5-year mean of 9 (range 4-13) and is the highest harvest in the 5-year period. The harvest was comprised of 7 males and 6 females. Three wolves came from the Situk River drainage, 1 from the Italio River, 4 between Tanis Mesa and the Alsek River, 3 from the East/Doame River area, and 2 from Russell Fiord. Nine gray and 4 black wolves were taken. Eleven wolves were shot and 2 were trapped.

Trapper Residency and Success. Eight nonresidents (including 3 aliens), 4 local residents, and 1 nonlocal resident succeeded in taking 1 wolf each.

Harvest Chronology. Harvest chronology is listed below.

September	4	March	1
October	1	April	2
November	1	May	4

Transport Methods. Access to wolf harvest sites was via aircraft (5), snowshoe (1), boat (1), off-road vehicle (2), and highway vehicle (4).

Other Mortality. No other mortality was documented during the report period.

Board of Game Actions and Emergency Orders. No actions were taken by the Board of Game during the report period.

Habitat

No known significant changes took place on wolf habitat this year. However, a growing moose population may be nearing habitat carrying capacity. No habitation rehabilitation was conducted. The U.S. Forest Service plans to cut back browse stands of willow, near Yakutat. This will be a pilot project to see if such manipulation can increase critical winter habitat for moose. Should this prove the case and the moose population increases significantly, a corresponding increase in predator numbers should be expected.

CONCLUSIONS AND RECOMMENDATIONS

As reported in recent wolf survey-and-inventory reports, the Subunit 5A moose population is growing. This is supported by an increase of young bulls in the moose harvest. In December 1988 staff on an aerial survey counted 515 moose, the highest count since the late 1960s. This growth in the moose population apparently caused a similar increase in the wolf population. Some Yakutat residents claim they observed more wolves as well

as more wolf-induced moose mortality during winter 1988-89 than they had seen in many years. Such reports were not as numerous in 1989-90. No changes in seasons or bag limits are recommended at this time.

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Table 1. Unit 5 wolf harvest, 1985 to 1990.

Year	Harvest
1985-86	4
1986-87	13
1987-88	8
1988-89	8
1989-90	13
Mean	9

LOCATION

Game Management Unit: 6 (10,140 mi^2)

Geographical Description: Prince William Sound and North Gulf Coast

BACKGROUND

Griese (1989) summarized historical accounts, apparent population trends, and the role of wolves as predators in Unit 6. Introductions of Sitka black-tailed deer and moose to Unit 6 supported expansion and growth of wolf numbers. Increasing wolf predation is believed responsible for declining mountain goat populations in parts of the unit. Griese also noted a lack of wolf management in Unit 6.

Management goals for Unit 6 wolf populations were first established through the 1976 Alaska Wolf Management Plans (Rausch 1977). The primary goal was to provide an optimum harvest of wolves, and the secondary goal was to provide the greatest opportunity to participate in hunting and trapping wolves. Present Unit 6 wolf management objectives were established in 1988.

MANAGEMENT DIRECTION

Management Objective

- Maintain a wolf population in a minimum of 5 packs that will sustain an annual harvest of 10 wolves.

METHODS

Observations of wolves or their tracks were collected from the public, noting date, location, pack size, colors of individual pack members, and nature of observation. Similar information was recorded for observations made during field activities such as moose surveys. These incidental observations were compared to reported harvest and contributed to a population estimate. Wolves harvested by hunters and trappers were checked (sealed) by staff or appointed sealers.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: The wolf population in Unit 6 is apparently increasing in size and expanding its range. The estimated number of wolves in the unit in fall 1990, was between 83 and 125 animals in 18 packs. The population estimate has increased from 20-30 wolves in at least 4 packs in 1984 to its present size (Table 1). Much of this increase results from improved understanding of wolf distribution rather than increased numbers. Evidence of wolves expanding their range includes direct observations of wolves and the decline of mountain goat populations in Subunit 6D. Observations and evidence of wolves in the developing shrub habitat on the Copper River Delta increased dramatically between 1985 and 1987 (Griese 1989).

Distribution and Movements: Variously sized wolf packs are distributed throughout mainland portions of Unit 6. Wolves or wolf tracks were observed in all subunits during the report period. Subunit 6A is thought to contain 7 packs of approximately 40 to 58 wolves. Two packs containing an estimated 12 to 17 animals reside in Subunit 6B, while Subunit 6C is also thought to support 2 packs containing 7 to 11 wolves. We estimate that 7 wolf packs numbering 24 to 39 animals roam Subunit 6D.

Mortality

Harvest:

Season and Bag Limit. The open hunting season in Unit 6 is from 10 August to 30 April. The bag limit is 2 wolves. The trapping season in Unit 6 is from 10 November to 31 March. There is no limit for trappers.

Board of Game Actions and Emergency Orders. Hunting and trapping season and bag limit regulations pertaining to wolves in Unit 6 did not change in the last 5 years. In 1988, the Board of Game adopted regulations making it unlawful to shoot wolves, which were not in traps or snares, until 3:00 AM the day following being airborne.

Hunter/Trapper Harvest. The total wolf harvest during 1989-90 in Unit 6 was 11 wolves (Table 2). The reported wolf harvest was 6 and an estimated 5 animals were taken and not reported. Only 5 wolves in the harvest were identified by sex: 3 were males and 2 females. Four of the legally harvested wolves were taken in Subunit 6A, while a single wolf was taken in both Subunits 6B and 6C. Hunters harvested 3 wolves while trappers took 2 animals with snares and 1 wolf by trap.

Harvest Chronology. The chronology of 6 legally harvested wolves was: September, 1; December, 3; February, 1; and April, 1. The wolf harvest chronology for the previous

6 years was: August, 1; October, 3; November, 4; December, 2; January, 9; February, 1; March, 4; and April, 1.

Transport Methods. Three wolves were harvested by hunters transported via aircraft and 3 animals were taken by trappers who utilized highway vehicles.

CONCLUSIONS AND RECOMMENDATIONS

Population objectives were attained or exceeded. Pack numbers far exceed the minimum of 5. Current population estimates suggest that an annual harvest of 25 to 50 wolves is reasonable to maintain a healthy population. However, harvest and effort in the unit is far below potential levels. Winter surveys of wolves and their tracks are recommended to enhance population estimates. No changes to current regulations are recommended.

The wolf's role as a predator in Unit 6 is speculative and should be investigated. Their increased presence on the Copper River Delta during the waterfowl nesting period may be detrimental to the recovery of the dusky Canada goose (Campbell and Griese, 1987). There is a growing local concern that wolves will continue their expansion to the near shore large islands of Hawkins and Hinchinbrook. These islands provide substantial deer hunting opportunity to Cordova residents. Wolves reaching these islands could have a dramatic impact on deer densities. Wolves are also suspected of contributing to the dramatic decline of mountain goats in the unit. While the socio-political atmosphere is unlikely to allow control measures as a management option, understanding impacts of predators is essential to prey species management.

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Submitted by:

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Table 1. Unit 6 fall wolf population estimates[a], 1985-1990.

Year	Population estimate	Number of packs	Basis of estimate
1985-86	46-59	8	b
1986-87	60-88	10	b
1987-88	62-92	12	b
1988-89	106-125	15	b
1989-90	83-125	18	b

[a] Fall estimate = pre trapping season population.
[b] Estimate generated from incidental observations, reports from public and sealing records.

Table 2. Unit 6 wolf harvest, 1985-90.

Regulatory year	Reported harvest			Estimated harvest[a]	Total Harvest
	M	F	Unk.		
1985-86	0	1	0	1	2
1986-87	1	1	1	5	8
1987-88	5	5	0	1	11
1988-89	3	1	2	11[b]	17
1989-90	3	2	1	5	11

[a] Includes unreported, unrecovered, and illegal kills.
[b] Represents wolves killed in Unit 6 but reported for Interior Alaska.

LOCATION

Game Management Units: 7 and 15 (8,397 mi^2)

Geographic Description: Kenai Peninsula

BACKGROUND

Wolves recolonized the Kenai Peninsula in the 1960s after a half-century absence. The first recent wolf documentation was in 1961 when Jack Didrickson observed a single wolf between Skilak and Tustemena Lakes (ADF&G files). Observations increased throughout the 1960s with the first pack sighting (10 wolves) reported in 1968.

Severe winters from 1971 to 1975 made moose calves and adults easy prey. In less than 15 years, wolves repopulated most suitable habitats. Peterson and Woolington (1981) estimated wolves killed 9-15% of moose calves and 5-7% of the adult moose on the Kenai Peninsula annually.

Aerial track counts conducted from 1975 to 1988 indicated that the Kenai Peninsula wolf population increased rapidly during the early 1970s, then remained relatively stable at about 200. According to Peterson and Woolington (1981), annual mortality of radio-collared wolves in Subunit 15A was 38%. Pups comprised 37% of the early winter population, reflecting the relative stability of the population in the northern Kenai Peninsula from 1976 to 1981. Considering the wolf population growth rate, natural mortality rates were low.

Regulated wolf harvests on the Kenai Peninsula began with a permit hunt in winter 1973-74; 2 wolves were harvested and 6 were harvested the following winter (Table 1). Hunting and trapping were allowed the following season (1975-76), and the harvest increased to 15 (i.e., 6 by trappers, 9 by hunters). Although the 9-month season was liberal, the wolf harvests increased only slowly until 1978-79, when 55 wolves were taken. The harvest from 1978-79 to 1988-89 ranged from 18 to 64 wolves, averaging 46. This mean annual harvest indicated 25% of the estimated population was removed annually since 1978-79; however, the harvests, were not equally distributed by unit or subunit. Subunit 15A supported the majority of the harvests, because of its high wolf population, good access, and proximity to the 2 largest communities on the Kenai Peninsula.

Over 90% of the wolf harvest occurred from 10 November to 15 March during the trapping season, while most nonconsumptive uses probably occur in summer and early fall. Almost all wolves were taken for recreational purposes; the dollar value received for pelts was a secondary benefit. Most wolves were killed by trappers and hunters

operating from the road system, although some aircraft were used. In spring 1986 the Board of Game prohibited same-day-airborne (SDA) wolf hunting. The land-and-shoot method was responsible for 6% of the annual harvest from 1973 to 1985, occurring in only 5 of the 12 years. The low harvest was attributed to poor tracking and landing conditions. Many areas were heavily forested or closed to aircraft (i.e., Kenai National Wildlife Refuge).

Biting lice infested 2 wolf packs in 1982-83. Wolves from these packs in Subunit 15A were brought in for sealing by local trappers, and ADF&G and USFWS personnel initiated a control program to treat all infested wolves. Wolves were either captured and treated or a medication (Ivermectin) was injected into moose recently killed by wolves or placed in treated baits near kills. Both methods proved unsuccessful, and the incidence of infestation spread rapidly. Infected wolves are now common, and there is little chance of controlling the parasite using acceptable means.

MANAGEMENT DIRECTION

Management Objectives

Maintain the wolf population in Subunit 15A and the Kenai National Wildlife Refuge portion of Unit 7 at 25 to 35 animals post-harvest and maintain the wolf population in the remainder of Unit 7 and Subunits 15B and 15C at maximum ratio of 1 wolf:50 moose. The specific minimum post-harvest objective in Subunit 15A is 28 wolves.

METHODS

Fixed-wing aerial surveys, using experienced pilots and observers, were scheduled in November and December after snow cover provided suitable conditions to count animals and fresh tracks. Additionally, members of several packs in Subunit 15A were radio-collared to locate packs and assess wolf population size in that subunit.

Local trappers provided information on wolf pack distribution and sizes of wolf packs in areas not surveyed. Harvest was monitored by sealing all harvested wolf pelts.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf surveys were not conducted over the entire Kenai Peninsula because of unfavorable snow conditions in early winter. Harvest data, observations by Department staff, and reports from trappers suggest little change occurred in wolf numbers.

Population Size: The estimated population size for Units 7 and 15 is 180 to 200 wolves in 18 to 21 packs. Unit 7 is estimated to contain 45 wolves in 7 packs. The wolf population in Unit 15 is composed of an estimated 52 animals in 5 packs in Subunit 15A, approximately 35 wolves in 3 large packs in Subunit 15B, and an estimated 60 wolves in 6 packs in Subunit 15C. These estimates were determined by incidental observations by Department and U.S. Fish and Wildlife Service (USFWS) staff, local trappers, and hunters. Subunit 15A is the only area where intensive radio-tracking occurred to comply with an experimental management objective. Subunit 15A has remained surprisingly stable at about 50 wolves (pre-season) over the past 3 years.

Distribution and Movements: Wolves are distributed throughout the Kenai Peninsula, however they are not commonly found in the southern coastal portion of the peninsula from Kenai Fjords National Park south and west to Seldovia.

Wolf movements were documented by monitoring radio-collared animals. The most recent significant movement occurred when a radio-collared wolf from the Pt. Possession pack in the northern portion of Subunit 15A was taken by a trapper near Fairbanks. This wolf had recently been captured and treated as part of the ongoing effort to reduce the spread of lice.

Mortality

Harvest:

Season and Bag Limit. The hunting season is from 10 August to 30 April with a bag limit of 1 wolf. The trapping season is from 10 November to 28 February with no bag limit. In 1989-90, in accordance with a joint Department and USFWS management plan, the trapping season in the western portion of Subunit 15A was extended until 31 March by Emergency Order when harvest goals were not achieved during the published trapping season of 10 November - 28 February.

Board of Game Actions and Emergency Orders. The Board of Game adopted an ADF&G proposal in the spring 1987 meeting to reduce wolf trapping season to 10 November to 28 February in Units 7 and 15. Hunting seasons and bag limits were not changed.

Hunter/Trapper Harvest. A total of 21 wolf mortalities were documented for Units 7 and 15 during the 1989-90 hunting and trapping season (Tables 1, 2 and 3). These mortalities included 3 non-sport kills: 2 in Subunit 15A and 1 in Subunit 15C. In addition, the sport harvest was 12 (67%) males and 6 (33%) females, and represented 9% of the estimated population of 200. Twelve (67%) of the 18 wolves harvested were classified as either pups or adults; 5 (42%) were pups and 7 (58%) were adults. Eight (44%) wolves were taken by ground shooting, 5 (28%) by trapping, and 5 (28%) by snaring.

Harvest Chronology. The harvest chronology was as follows: September, 2 (11%); October, 1 (6%); November, 3 (17%); December, 6 (33%); January, 4 (22%); February, 1 (6%); and March, 1 (6%).

Other Mortality: In March 1990, a 127 lb. radio-collared male that was believed to be the senior male of the Elephant Lake Pack dispersed into the adjacent Pt. Possession pack's territory and was killed on Coyote Lake. Examination of the carcass revealed the wolf was killed by wolves but not eaten.

CONCLUSIONS AND RECOMMENDATIONS

The documented mortality of 21 wolves represents 11% of the early winter population estimate of 200 for Units 7 and 15. With this level of mortality, the wolf population should increase during 1990-91 if prey availability remains adequate. Although interest in hunting wolves incidental to other big game remains high, the interest by trappers has declined steadily since 1985-86. Thirteen trappers reported taking wolves this winter compared to 33 in 1985-86. Interest in trapping wolves declined because of lower fur prices, lice affecting pelt quality, and new requirements and restrictions for trapping on refuge lands. Inclement winter weather in 1988-89 and 1989-90 also reduced effort and interest.

Subunit 15A should continue to be managed in accordance with the Interagency Management Agreement. A similar management plan should be developed for Subunits 15B, 15C, and Unit 7. Management guidelines described in these plans should provide consistent, long-term direction for maximum resource use by many users.

The trapping season in Subunit 15A should be extended to 31 March. The season was extended by Emergency Order in 1989-90, and the current system of opening by Emergency Order does not allow sufficient time for trappers to plan and adequately prepare. If the season is extended, and closed as necessary by Emergency Order, trapping interest may increase.

Additionally, the bag limit for hunting wolves should be increased to 10 to encourage hunters to harvest wolves. With the current lack of interest in trapping because of low pelt value, additional hunter harvest may accomplish population size objectives. Proposals to modify both the trapping season length and bag limit will be discussed with Department and Kenai National Moose Refuge staffs.

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Table 1. Unit 7 fall wolf population estimates[a], 1985-1989.

Year	Population estimate	Number of packs	Basis of estimate
1985-86	45	6	b
1986-87	45	6	b
1987-88	45	6	b
1988-89	45	6	b
1989-90	45	6	b

[a] Fall estimate = pre trapping season population.
[b] Estimates were generated from information gathered from incidental observations of staff, sealing records, and reports from the public.

Table 2. Unit 15 fall wolf population estimates[a], 1985-1989.

Year	Population estimate	Number of packs	Basis of estimate
1985-86	145	14	b
1986-87	140	14	b
1987-88	140	14	b
1988-89	146	14	c
1989-90	147	14	c

[a] Fall estimate = pre trapping season population.
[b] Information gathered from incidental observations of staff, and reports from public.
[c] Results of research and management studies in addition to incidental observations and trapper reports.

Table 3. Known wolf mortality by unit and subunit (7 and 15), 1973/74-1989/90.

Year	Unit 7	Subunit 15A	Subunit 15B	Subunit 15C	Total
1973-74	1	0	0	0 2[a]	
1974-75[b]	1	0	1	4 6	
1975-76[c]	9	3	1	821	
1976-77[c]	3	5	2	313	
1977-78[c]	16	5	7	819	
1978-79[c]	12	24	5	1455	
1979-80[c]	6	15	13	1246	
1980-81[c]	12	18	1	1142	
1981-82[c]	12	28	15	762	
1982-83[c]	8	27	10	348	
1983-84	10[c]	27[d,e]	5[d]	8[d]50	
1984-85	5[c]	32[d]	3[d]	7[d]47	
1985-86	13[c]	24[d,f]	15[d]	12[d]64	
1986-87	20[c]	8[d]	13[d]	8[d]49[g]	
1987-88	3[c]	8[d]	9[d]	5[d]25	
1988-89[h]	2	6	6	317	
1989-90[h]	3	6	10	221[i]	

[a] Two non-sport kills.

[b] First open season since 1961. Hunting only with unlimited permits, 238 permits were issued. Season Nov. 1-Feb. 28.

[c] Trapping season Nov. 10-March 31.

[d] Trapping season Nov. 10-March 15.

[e] Western portion of 15A closed to trapping and hunting Feb. 12 due to lice control efforts.

[f] Trapping and hunting closed Feb. 15, 1986 (quota set at 20) Two non-sport kills in Subunit 15A during 1985-86.

[g] One non-sport kill in Unit 7 and one non-sport kill in Subunit 15B.

[h] Trapping season Nov. 10-Feb. 28, extended to Mar. 31 in 15A, 1989-90.

[i] Three non-sport harvest, 2 in Subunit 15A and 1 in Subunit 15C.

Table 4. Unit 7 wolf harvest, 1985-89.

Regulatory year	Reported harvest			Method of take			Total Successful
	M	F (%)	Unk.	Trap/snare (%)	Shot	Unk.	Trappers/hunters
1985-86	5	8 (62)	0	13 (100)	0	0	8
1986-87	7	12 (63)	1	14 (78)	4	2	7
1987-88	2	0 (0)	1	2 (67)	1	0	2
1988-89	0	2 (100)	0	1 (50)	1	0	2
1989-90	0	3 (100)	0	3 (100)	0	0	2

Table 5. Unit 15 wolf harvest, 1985-89.

Regulatory year	Reported harvest			Method of take			Total Successful
	M	F (%)	Unk.	Trap/snare (%)	Shot	Unk.	Trappers/hunters
1985-86	29	20 (41)	0	39 (80)	10	0	25
1986-87	17	12 (41)	0	23 (79)	6	0	16
1987-88	13	8 (38)	1	15 (68)	7	0	17
1988-89	9	6 (40)	1	9 (56)	7	0	11
1989-90	9	6 (40)	0	8 (53)	7	0	11

LOCATION

Game Management Units: 9 (33,638 mi^2) and 10 (1,586 mi^2)

Geographic Description: Alaska Peninsula and Unimak Island

BACKGROUND

Wolves occur throughout the Alaska Peninsula and on Unimak Island in low-to-moderate densities. Specific data on historic wolf abundance are lacking, but the population was probably reduced by wolf control work during the 1950s. Prey abundance varied in the past 20 years. Moose densities decreased in all areas north of Port Moller. The Mulchatna Caribou Herd increased from about 14,000 in 1974 to over 80,000 in 1990. The Northern Alaska Peninsula herd increased from about 13,000 in the mid-1970s to about 20,000 in 1984, and it has remained relatively stable since then. Caribou decreased dramatically on Unimak Island from a peak of 5,000 in 1975 to only a few hundred by 1977. No change in caribou numbers on Unimak Island was noted in the last decade. The mainland segment of the Southern Alaska Peninsula herd peaked at over 10,000 in 1983 and declined to 4,000 by 1988.

MANAGEMENT DIRECTION

Population Objective

- Maintain a wolf population that will sustain a 3-year-average annual harvest of 50 wolves.

METHODS

No specific data were collected on wolf densities in Units 9 or 10. Trends were monitored through observations made during other field work, reports from hunters and guides, and responses to the annual Trapper Questionnaire. Harvests were monitored from mandatory pelt-sealing reports.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf numbers appear stable at low-to-moderate levels throughout the study area. Eight trappers rated wolf abundance as low (4) or moderate (4), and none rated abundance as high. Compared with the previous report period (1988-89), 2 trappers said there were fewer wolves, and 6 said there were about the same number.

Population Size: By piecing together miscellaneous observations of wolf packs and general knowledge of territory size, Units 9 and 10 were estimated to contain at least 200 wolves. This is a very rough, conservative estimate, but it cannot be refined without considerable expense combined with abnormally good snow and flying conditions.

Mortality

Harvest:

Season and Bag Limits. The open hunting season in Units 9 and 10 is 10 August to 30 April. The bag limit in Unit 9 is 10 wolves, while the bag limit in Unit 10 is 2 wolves. The trapping season in Units 9 and 10 is 10 November to 31 March, and there is no bag limit.

Board of Game Actions and Emergency Orders. During the 1987 fall meeting, the Board of Game prohibited wolf harvesting on SDA hunts in most areas of the state, including Unimak Island; however, it was not prohibited in Unit 9. In Unit 9 the bag limit was 10 wolves. Hunting regulations on Unimak Island remained unchanged, i.e., bag limit of 2 wolves. For 1990-91 SDA hunting of wolves was put under a registration permit system with numbered locking tags issued to each permittee.

Hunter/Trapper Harvest. The reported wolf harvest for 1989-90 was 39 animals. Thirty-eight wolves (20 males, 18 females) were taken in Unit 9, and 1 female was harvested on Unimak Island (Table 1). This harvest level is about average. Thirty-eight wolves were shot, and 1 was trapped.

Harvest Chronology. Harvest chronology for the past 5 years is shown in Table 2.

Transport Methods. Inaccurate reporting of transportation methods used for harvesting wolves hampers analysis; however, at least 50% of the harvests involved aircraft use in 1989-90 (Table 3).

CONCLUSIONS AND RECOMMENDATIONS

Although wolf harvests in Unit 9 vary widely, depending on weather conditions and the activity of several individuals who use aircraft, they have had little impact on the wolf populations in Units 9 and 10. For practical and budgetary reasons, it is unlikely that more accurate estimates of population size will be possible in Unit 9; however, the National Park Service wants more information on wolves in the park and preserves in Unit 9. If funding is available, the resulting population density estimates could be extrapolated to the remainder of Unit 9. No regulatory changes are recommended.

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Table 1. Units 9 and 10 wolf harvest, 1985-89.

Regulatory year	Reported harvest				Method of take			Successful
	M	F	Unk.	Total	Trap/snare	Shot	Unk.	Total Trappers/hunters
1985-86	14	12	2	28	9	19	0	N/A
1986-87	24	14	0	38	10	27	1	N/A
1987-88	25	13	1	39	5	31	3	N/A
1988-89	35	25	3	63	10	52	1	28
1989-90	20	19	0	39	1	38	0	31

Table 2. Units 9 and 10 wolf harvest chronology, 1985-89.

Regulatory year	Harvest periods								
	August	September	October	November	December	January	February	March	April
1985-86	0	2	4	0	2	11	7	1	1
1986-87	0	4	6	0	4	9	11	4	0
1987-88	0	0	12	1	2	11	5	7	1
1988-89	0	0	6	1	15	15	20	5	1
1989-90	0	1	7	3	3	2	15	6	2

Table 3. Units 9 and 10 wolf harvest by transport method, 1985-89.

Regulatory year	Percent of harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1985-86	11	8	0	0	0	0	4	5	28
1986-87	21	7	0	3	2	0	1	4	38
1987-88	19	2	2	1	3	0	2	10	39
1988-89	37	3	1	10	9	0	2	1	63
1989-90	19	0	2	7	8	0	1	2	39

LOCATION

Game Management Unit: 11 (13,257 mi^2)

Geographical Description: Wrangell Mountains

BACKGROUND

Wolf population estimates and trends are, for the most part, unavailable for Unit 11 before the 1950s. Based on written accounts by settlers, Skoog (1968) concluded that wolf numbers were low from 1900 into the 1930s, then increased somewhat. In 1948 an extensive wolf control program began that lasted until 1953. After the control program terminated, wolf numbers increased and probably peaked in the mid-1960s. In the early 1970s, wolves were still abundant (McIlroy 1974) i.e., 1 wolf/80 mi^2 or a unitwide population of 100-125 animals.

Although wolf harvest levels are unknown before mandatory sealing began in 1971, they were probably similar to harvest levels reported in the early 1970s because hunting and trapping seasons were comparable and there were no bag limits. Wolf harvests since 1972 averaged 25 wolves per year, ranging widely from 6 to 51 wolves/year.

MANAGEMENT DIRECTION

Management Objective

Maintain the posthunting population at a minimum of 50 wolves.

METHODS

The annual wolf harvest was monitored by sealing all wolf hides harvested in the unit. Pack size and distribution were derived from aerial track surveys conducted in the lower Chitina Valley in late March. Information on wolf numbers and distribution in areas not surveyed was obtained by interviews with hunters and trappers when pelts were sealed, and from the number and distribution of wolves observed incidentally while conducting surveys for other species.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: The spring 1990 population estimate for Unit 11 was 100-110 wolves, up slightly from the 1989 estimate of 70-90 wolves (Table 1). Current wolf numbers approach the 5-year (1985-89) mean population estimate of 105 wolves in Unit 11. Using survival rates for exploited wolf populations (Ballard et al. 1987), the estimated fall wolf population in Unit 11 was 149 to 173 wolves. The overall wolf population in Unit 11 has been relatively stable the past few years.

Distribution and Movements: Wolf numbers are higher in the northern portions of the unit, especially from the Dadina River northeast to the Copper River. Caribou are available to wolves at least part of the year in this area, and moose are more abundant than in the southern portions of the unit. Wolf numbers in the lower Chitina River Valley increased somewhat this past year, but densities will probably remain lower than in the northern portion of the unit because caribou are absent and moose are less abundant. Sheep and mountain goats are heavily used by wolves in the lower Chitina Valley but, because of their smaller body size and the difficult terrain they inhabit, they do not support as large a wolf population.

Track surveys in Unit 11 suggest a general wolf distribution pattern that is somewhat different than wolves in Unit 13. Wolves in Unit 11 appear more restricted to rivers for their primary travel routes. Wolves travel the larger rivers that flow out of steep mountains as a route to higher elevations to hunt for sheep and then back down to lower elevations to hunt moose in the riparian zone. Because much of the habitat in Unit 11 is mature spruce, with lower moose densities, wolves spend less time hunting away from riparian moose areas. In Unit 13 some rivers are used extensively because of high moose concentrations, but for the most part, these wolves are not restricted to rivers because of prey distribution.

Movement patterns of wolves in the unit are largely unknown, because wolves were not radio-collared. Occasionally movements of wolves are documented when animals radio-collared elsewhere are tracked or harvested in Unit 11. During the report period a male that was radio-collared on the Teklanika River in Denali National Park in March 1986 was trapped near Tanada Lake. Wolves radio-collared in Unit 12 were also located in Unit 11 (Dave Kelleyhouse, pers. commun.)

Mortality

Harvest:

Season and Bag Limit: The open hunting season in Unit 11 is from 10 August to 30 April and there is no bag limit. The trapping season runs from 10 November to 31 March, also with no bag limit.

Board of Game Actions and Emergency Orders. In 1986 the Board of Game prohibited the land-and-shoot method of harvesting wolves, unless it was first caught in a trap or snare. During the 1990 Board of Game meeting Unit 11 was opened to SDA wolf hunting with a 10-wolf bag limit effective with the 1990-91 season. However, all National Park/Preserve lands within Unit 11 were subsequently closed to SDA hunting of wolves to align state and federal regulations.

Hunter/Trapper Harvest. Hunters and trappers sealed 24 wolves from Unit 11 in the 1989-90 season (Table 2). This is similar to both the previous year's harvest of 25 and the 5-year (1984-88) average of 22 wolves. Males were 65% of 1989-90 take. Since 1985 males have composed 54% of the total harvest. The 1989-90 harvest was not distributed evenly through the unit. Hunters and trappers reported taking 22 wolves (92%) from the Dadina River northeast to the Unit 12 border, a harvest pattern similar to last year when 84% of the take (n = 21) came from the northern portion of the unit.

From 1985-1989, trapping and snaring accounted for 69% of the harvest for which the method of take was known (Table 2). Only during the 1987-88 season were more wolves harvested by shooting than by trapping and snaring. From 1985 to 1987, when the land-and-shoot method was legal, ground-shooting and land-and-shoot methods accounted for equal wolf numbers and were responsible for 39% of the legal harvest (Table 2).

Unreported and illegal harvests were considered minimal in the report period except in 1987-88 when 1 individual took a minimum of 5 wolves by the use of poison.

Hunter and Trapper Residency and Success. In the 1989-90 season 10 individuals sealed an average of 2.4 wolves from Unit 11. During the preceding 4 seasons, the average harvest was 1.7 wolves per trapper. In 1989-90 2 nonresidents took 4 wolves, while 6 trappers living in or adjacent to Unit 11 took 18 wolves.

Harvest Chronology. The proportion of the harvest by month varied from year to year but January and February had the highest harvests (Table 3). The annual harvest chronology for trapped wolves probably reflected snow, river ice, and weather conditions, rather than any particular pattern of trapper effort or success. The number of wolves taken in the fall, presumably by big game hunters, ranged from 1 to 4 since 1985.

Transport Methods. The method of transport used in harvesting wolves has been recorded on sealing certificates only since 1985. In Unit 11 most wolves were taken with the use of snowmachines (58%) and aircraft (24%) (Table 4). Thirteen (57%) individuals using aircraft to harvest wolves were big game hunters on fly-in hunting trips. Few trappers reported using aircraft.

Nonregulatory Management Problems/Needs

Wolf estimates are difficult to obtain in Unit 11. All wolf estimates for Unit 11 are based on pack or track sightings by ADF&G staff, hunters, trappers, and the general public. Track surveys were only done periodically and in different locations since 1978. The lack of a systematic survey method hampers estimating wolf numbers. I recommend establishing a survey area northeast of the Dadina River and initiating track surveys to obtain more dependable population density and trend data. Even establishing a yearly trend area will not assure yearly population estimates. The occurrence of high winds in Unit 11 often obscures tracks or blows snow to the extent that surveys may not be feasible.

CONCLUSIONS AND RECOMMENDATIONS

Wolves are considered numerous in Unit 11 with the highest densities found from the Dadina River northeast to the unit boundary. Wolves are less common in the Chitina River Valley, presumably because of low prey densities but their numbers in this area increased in 1989-90. In recent years estimates of the wolf population greatly exceeded the post-season management objective of at least 50 wolves.

Human harvest rates were not high enough to cause reductions in the Unit 11 wolf population. The 1989-90 harvest rate was only 14-16% of the fall wolf population estimate. Reasons for the lower wolf harvest rates observed in Unit 11 include the illegality of land-and-shoot hunting and the unit's remoteness.

Trapping pressure and resulting harvests tend to be concentrated in the northern portion of the unit and along the Chitina-McCarthy Road which are accessible by ground transportation. Wolf packs in other portions of the unit are normally unharvested. Dispersal from untrapped areas occurs with wolves moving into trapped areas of Unit 11 as well as neighboring Unit 13. Because wolf harvests are currently well within sustainable levels, no changes in season dates or bag limits are recommended.

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Table 1. Unit 11 fall and spring wolf population estimates[a], 1985-1989.

Year	Population estimate		Number of packs	Basis of estimate
	Fall	Spring		
1985-86	119-149	80-100	8-11	b, c
1986-87	149-179	100-120	11-13	b, c
1987-88	160-189	110-130	11-13	b, c
1988-89	103-133	70-90	8-10	b, c
1989-90	149-173	100-110	11-13	b, c

[a] Fall estimate = pre-trapping season population.
[b] Fall estimates based on known spring pack sizes, mean birth rate of 5-6.5 pups/pack, a pup survival rate of 0.82 (Ballard et al. 1987) and fall sightings.
[c] Basis of spring estimate is from limited track surveys, incidental observations, reports from public, and sealing records.

Table 2. Unit 11 wolf harvest, 1985-89.

Regulatory year	Reported harvest				Estimated harvest		Method of take				Total Successful Trappers/hunters
	M (%)	F (%)	Unk. (%)	Total	Unreported	Illegal	Trap/snare (%)	Shot (%)	(L&S) (%)	Unk.(%)	
1985-86	4 (50)	4 (50)	0	8	2	3	6 (55)	1 (9)	4 (36)	0	4
1986-87	7 (54)	6 (46)	1	14	2	3	12 (85)	2 (14)	0	0	8
1987-88	15 (56)	12 (44)	0	27	2	8[a]	10 (37)	6 (22)	5 (19)	1 (3)	16
1988-89	12 (48)	13 (52)	0	25	2	3	21 (84)	4 (16)	0	0	13
1989-90	15 (65)	8 (35)	1	24	2	3	19 (79)	5 (21)	0	0	10

[a] Five wolves included in the total harvest were eventually found to be taken by means of poison bait.

Table 3. Unit 11 wolf harvest chronology percent by time period, 1985-89.

Regulatory year	Harvest periods									n
	August	September	October	November	December	January	February	March	April	
1985-86[a]	0	0	13	13	13	25	0	37	0	8
1986-87	0	14	0	0	0	43	36	7	0	14
1987-88	0	7	0	4	11	19	33	19	7	26
1988-89	4	8	4	0	16	28	24	16	0	25
1989-90	19	0	0	24	19	28	10	0	0	21

[a] In 1985-86 2 wolves were unknown.

Table 4. Unit 11 wolf harvest percent by transport method, 1985-89.

Regulatory year	Percent of harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1985-86	25	0	0	0	50	0	0	25	8
1986-87	36	0	0	0	57	0	7	0	14
1987-88	33	0	0	0	37	0	8	22	27
1988-89	16	12	0	4	64	4	0	0	25
1989-90	13	0	0	0	79	0	0	8	24

LOCATION

Game Management Unit: 12 (10,000 mi^2)

Geographical Description: Upper Tanana and White River drainages; includes the North Wrangell, Nutzotin, and Mentasta Mountains and the eastern Alaska Range

BACKGROUND

Land ownership patterns and management authorities in Unit 12 are relatively complex. The southeastern quarter of the unit is in the Wrangell-St. Elias National Park and Preserve which is managed by the National Park Service (NPS), while the approximately 1 million acres in eastern Unit 12, immediately north of the preserve, is in the Tetlin National Wildlife Refuge (NWR) managed by the U.S. Fish and Wildlife Service (USFWS). Tetlin Native Corporation lands encompass approximately 750,000 acres west of the refuge. A mixture of state and other private lands compose northern and northwestern Unit 12.

Only about 7,000-8,000 mi^2 of Unit 12 is considered normal wolf habitat. Wolves seldom use the remaining 2,000-3,000 mi^2 of glacial ice fields and high rocky terrain.

Wolves are important in Unit 12 primarily because of their effect on big game prey populations. Few hunters or trappers purposefully hunt or trap wolves in Unit 12 because wolves are relatively scarce, are of limited economic or subsistence value, and are wary animals which require considerable time and expense to hunt or trap. Conversely, people highly value moose and caribou and expend considerable time and money seeking these animals for both consumptive and nonconsumptive uses. Wolf predation has been significant in the past 15 years and has helped keep moose and caribou numbers low. It has substantially reduced opportunities for consumptive and nonconsumptive uses of moose, caribou, and wolves while public demand for such opportunities has increased.

In Unit 12 the public has been considerably dissatisfied with the management of wolves and their prey species over the past 20 years. The past 5 years were particularly controversial. This dissatisfaction stems from the fact that moose are the most important and sought after subsistence animals in Unit 12 (Haynes et al. 1984, Halpin 1987) as well as the primary wolf prey species (Breeser et al., in prep.; Doyle et al., in prep; Kelleyhouse et al., in prep.). People and wolves have competed for moose in this area for many years, and management has failed to provide for noticeable increases in moose density and harvest levels.

During the past 20 years, moose declined from moderate to relatively low densities in most of the area. Human consumptive use of moose has declined. However, moose numbers have not increased predation by wolves and, to a lesser extent, grizzly bears remain the primary reason for the continued moose scarcity.

There have been complete hunting closures in the important Nabesna Road and Little Tok River areas and various combinations of hunting restrictions in the remainder of Unit 12. Extremely low rates of local hunter success have characterized the short fall bull seasons. The problem with out-of-season moose taking for personal use has increased with the worsening local economic situation.

Many visitors to Alaska are also dissatisfied with the paucity of moose in this area. Wildlife viewing, particularly viewing and photographing of big game species near the road system in summer months, is important to most visitors judging from complaints concerning game scarcity received by ADF&G and local tourism industry workers. This was not the case before the mid-1970s. At that time, moose and wolf densities in Unit 12 compared favorably with other areas along Alaska's road system.

Following a series of severe winters, heavy predation, and high either-sex harvest by moose hunters in the mid-1960s and early 1970s, moose numbers declined to low levels. Eventually, the wolf population responded to the prey shortage and declined precipitously before late winter 1975-76. At this point, predation prevented growth or significant human use of moose populations in the area. This mutually limiting depression of moose and wolf populations persisted until the early 1980s.

In winter 1980-81, a limited wolf control program began in adjacent Subunit 20D. During the next winter, the control area was expanded into Subunit 20E and Unit 12 north of the Tanana River. These efforts continued until November 1983 when the program was halted. One-hundred-and-four wolves were removed, reducing wolf densities by 30-40%. The wolf populations took 3-5 years to substantially recover (Boertje et al. 1985). Moose populations increased by approximately 50% in the Robertson River drainage. These beneficial effects of wolf control have continued to diminish. Moose populations in other areas of Unit 12 received no benefit at all from this program.

The wolf population in Unit 12 is probably limited more by the scarcity of moose than it is by human harvest of wolves. Annual harvests have been much lower than required to control wolf population growth (Keith 1983). Very few trappers in Unit 12 aggressively trap for wolves, preferring to concentrate instead on species requiring less investment of effort and money for a greater return to the trappers. Wolves are wary and difficult to trap and require specialized equipment. At low densities (i.e., small packs and large territories) wolves are especially difficult to catch and it is economically unfeasible for most trappers to seek them.

After the wolf control program ended, ADF&G staff entered into a series of cooperative studies with USFWS personnel to document wolf predation on moose in the Tetlin NWR vicinity. These studies confirmed that moose are the most important prey species for wolves in Unit 12 and that the moose kill rates observed for both winter and summer could easily maintain current low moose densities. This has been the contention of local residents since the mid-1970s. Some specific information about these studies follows.

In 1984, 15 adult moose were captured and radio-collared. Ages were determined for 8 of these moose and 5 (63%) were $\geq$10 years of age. This small sample indicated an old age structure reflecting poor recruitment. During the next 3 years, predation was the probable cause of death for 5 of these 15 adults. Wolves killed 2 moose and both wolf and grizzly bear tracks were present at the other 3 kill sites. In 1985, 22 newborn moose calves were captured and equipped with radio collars to determine the extent and causes of calf mortality. Predators killed 8 of the calves; wolf predation caused 5 (63%) of the deaths and was the suspected cause of death in 1 other. Exceptionally high calf survival occurred in 1985, yet 55% of the study calves died within 34 weeks of birth. This study concluded that wolves were the most important predator on moose that spring, and wolf predation alone could have prevented moose population growth.

During winter 1986-87, personnel radio-monitored 4 wolf packs containing 38 wolves (range 5-15 wolves/pack) daily. One lone male was also located daily during the same period (16 Jan-13 Feb) (Breeser et al., in prep.). The observed time interval between kills ranged from 2.5 days for a pack of 15 wolves to 7 days for a pack of 5. Two packs with 9 members averaged a kill every 4 and 5 days, respectively. The lone wolf killed only once in 29 days. Of 29 kills observed, 90% ($\underline{n}$ = 26) were moose, with adult caribou ($\underline{n}$ = 3) accounting for the remainder. The rate of kill for individual wolves was about 0.7 moose equivalents (1 adult moose = 3 adult caribou) per wolf per month.

From 16 May-15 June 1988, 7 radio-collared members in a pack of 8 wolves were monitored twice daily (Doyle et al., in prep.). This wolf pack killed at least 11 moose (8 calves, 2 yearlings, 1 adult), 1 Dall sheep, 1 beaver, and 3 unidentified small mammals during the month. Again, moose were clearly the most important prey and were killed at the rate of 1.37 moose per wolf per month, approximately twice the winter kill rate. The moose biomass per wolf was lower than in winter because most kills were calves. This kill rate is based strictly upon moose numbers and not moose equivalents.

MANAGEMENT DIRECTION

Management Goals

Provide for an optimum harvest of wolves.

Provide the greatest opportunity to participate in hunting and trapping wolves.

Management Objectives

Monitor wolf numbers, population characteristics, and harvests.

Temporarily reduce wolf numbers to less than 100 by 1993 to permit moose numbers to increase to 5,000-7,000 by the year 2000. The actual number of wolves to remain in Unit 12 during any control program will be determined during review and approval of a control plan.

After the moose population objective is achieved, manage wolf numbers to maintain sustained yield objectives for the moose population.

The purpose of these objectives is to increase human-use opportunities for moose and wolves by increasing moose numbers significantly and by maintaining a healthy, productive wolf population. Population objectives for moose and wolves must be met before strategic use goals for both species can be realized in much of Unit 12.

METHODS

Estimating Wolf Population Size

Late winter wolf population size was estimated based upon sightings of wolves and numbers of wolf tracks observed (Stephenson 1978, Gasaway et al. 1983). Similar surveys were conducted periodically since 1980. The number, size, and location of individual wolf packs were noted and mapped. Estimates of wolf numbers were increased by 10% to account for lone wolves present but not found (Mech 1973). The estimate included all wolf packs having territories which were wholly or partially in Unit 12. Previous attempts to adjust the estimate for "border" packs confused some people.

Fall wolf population estimates were back-calculated by adjusting the late winter estimate upward based on the number of wolves harvested before surveys, observed fall pack sizes, and reliable pilot and trapper reports. In any given year, many wolf packs counted in March and April were also observed the previous fall and early winter. Therefore, changes in pack size for these packs were known.

Determining Wolf Population Characteristics

During the past 10 years, wolves in Unit 12 were captured by aerial darting, trapping, or live-snaring, and fitted with radio collars. Activities of radio-collared wolves were then monitored incidental to other work throughout the year. Observations allowed accurate determinations of seasonal pack size, territory and den site location, and pup survival. Only 1 pack in Unit 12 had members with functioning radio collars during this report period.

Harvest Monitoring

Wolves taken in Alaska must be sealed by an ADF&G representative or an appointed fur sealer. During the sealing process, information is obtained on the specific location of take, sex, color of pelt, estimated size of the wolf pack, method of take, and access used. While "Raw Fur Export Reports" are required for wolf pelts shipped out of Alaska, such reports provide only minimal estimates of take because many wolves are marketed within Alaska.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Between 7 March and 3 April 1990, we spent 21 hours surveying wolves in both Unit 12 and adjacent Subunit 20E. No survey flights were made in the Wrangell-St. Elias National Park or Preserve. Estimates of wolf numbers in the Tetlin NWR were based upon observations by USFWS staff during an unknown number of flight hours. We also recorded wolf sightings and track counts during an additional 30 hours of flying for moose and lynx work.

After several years of decline, wolf numbers apparently increased in Unit 12 during this report period. The fall 1989 estimate of 178 wolves represented a 31% increase over the 136 wolves estimated in fall 1988 (Table 1). Similarly, the spring 1990 estimate of 157 wolves represented an increase of 39% over the estimate of 113 wolves in spring 1989. Mean pack size for the 27 packs was 6.0 wolves per pack ($\underline{R}$ = 2-15) in fall 1989 and 5.3 wolves per pack ($\underline{R}$ = 2-13) in spring 1990.

I believe that this apparent wolf population increase is real and I attribute it to 3 causes. First, harvest of Unit 12 wolves has been low since SDA taking of wolves was made illegal. Second, tens of thousands of Nelchina, Mentasta, and Fortymile herd caribou have wintered in Unit 12 during the past 2 years, greatly expanding the prey base for wolves. Third, the 33–inch snow accumulation by late winter 1989-90 made caribou more vulnerable to wolf predation and contributed to a noticeable winter kill during April on the Northway-Tetlin Flats. These severe winter conditions helped provide more numerous prey to wolves.

Mortality

Harvest:

Season and Bag Limit.

Wolf Trapping		
Units 12 and 20(E)	Oct. 1-Apr. 30*	No limit
3X or larger snares only during October, March, and April		
Wolf Hunting		
Units 11-13, 20, 22, 25(A), and 26		
	Aug. 10-Apr. 30	No limit

* No hunting same-day-airborne

Hunter/Trapper Harvest. Unit 12 wolf harvests declined during the 1988-89 and 1989-90 seasons since the ban on SDA wolf hunting became effective (Table 2). The 19 wolves harvested during this report period represented a harvest of only 11% of the 178 wolves estimated in fall 1989.

Except for the harvest of 45 wolves during the deep snow winter of 1985-86 when SDA wolf hunting was still legal, recent harvests have not been high enough to limit wolf numbers in Unit 12 (Table 1). Had SDA wolf hunting been allowed, deep snow conditions during the past 2 winters would probably have resulted in much larger harvests than actually occurred.

Wolf kill locations were well distributed throughout the area. Six wolves each were taken in the large Nabesna and Tok River drainages, 4 from the White River, 2 from the Chisana River, and 1 from the Tanana River drainage.

Although the mean number of wolves taken per successful hunter/trapper (= 1.9) did not differ from previous years, the actual number of successful hunters/trappers has declined by over 50% since the mid-1980s. This may reflect waning interest in wolf hunting/trapping caused by increased value of marten pelts and/or the prohibition on the more efficient "land-and-shoot" method of harvesting wolves.

Harvest Chronology. Chronology of wolf harvest in Unit 12 is presented in Table 3. This table reflects a modest incidental harvest of wolves each fall during normal hunting seasons in August and September, a lull in October, then a noticeable increase in wolf trapping activity in midwinter. Harvests with the use of 3X or larger snares and with

snares and land-and-shoot (before the 1988-89 season) have been significant in March and April.

Transport Methods. Table 4 presents data on transport methods used by successful wolf hunters/trappers. Snowmachines have been the most common access means since 1985. Winter 1985-86 was the last year that snow conditions were good for land-and-shoot taking and the practice was still legal. During that winter, 42% of the successful wolf hunters/trappers accessed the area via aircraft.

Other Mortality: Estimated harvest rates have been relatively low since winter 1985-86 (Table 2). This indicates the wolf population was regulated more by natural mortality factors, dispersal, and poor pup production/survival correlated with prey density and vulnerability, than by human-caused mortality factors. I believe that the wolf population declined throughout most years in the late 1980s because prey were scarce. This resulted in lower pup production, increased natural mortality, and increased dispersal. The influx of increasing numbers of wintering Nelchina and Mentasta caribou since winter 1987-88 has contributed to the apparent wolf population increase noted this report period.

Natural wolf mortality occurs from interpack and intrapack strife and physical injuries inflicted by moose intended as prey. Pup starvation or undernourishment may also significantly effect mortality.

Habitat

Assessment:

Good wolf habitat is determined more by ungulate prey abundance than by vegetative characteristics. Using this criteria, the better wolf habitat in Unit 12 occurs along the foothills of the Wrangell, Mentasta, and Nutzotin Mountains and the eastern Alaska Range where either resident or migratory moose are available to wolves year-round. Even though mountainous areas support dense populations of Dall sheep, wolves apparently cannot thrive on sheep alone as a primary prey species (Sumanik 1987). The nonmigratory Chisana Caribou Herd also provides a reliable food source for wolves in eastern Unit 12, but the herd probably contains only 1,600-1,800 caribou. Caribou from the Mentasta, Nelchina, Macomb, and Fortymile herds have also used portions of Unit 12 in recent years, but seasonal movements have been unpredictable and the number of these caribou seasonally available to wolves has fluctuated widely.

Approximately 30 years of wildfire suppression in Unit 12 have resulted in less diverse and productive wildlife habitats than would have occurred under natural conditions. Human developments and disruption of wildlife habitat are largely restricted to the immediate vicinities of existing communities and have had a minor impact on wolves in Unit 12.

Enhancement: A large percentage of Unit 12 has been afforded "Limited Suppression" status for wildfires in the Fortymile Area Interagency Fire Management Plan. This includes nearly all of the Wrangell-St. Elias National Park and Preserve and most of the Tetlin NWR. Unfortunately, much of the Limited Suppression area is essentially unburnable because of sparse fuels, high fuel moistures, low temperatures, and lack of ignition through lightning. Much of the more fire-prone land is in State or private ownership and was afforded Critical, Full, or Modified Suppression status.

In valley bottom areas near human developments, mechanical habitat improvement is done to increase habitat diversity and winter browse supplies for moose. This in turn should benefit wolves. Over 1,000 acres of tall, decadent willow stands have been crushed since 1982; 380 acres were treated during this report period. Plans exist to conduct prescribed fires in the Little Tok, Tok, and Robertson River drainages in future years.

From June to September 1990, a wildfire burned approximately 97,000 acres of primarily decadent black spruce muskeg in the Tetlin Hills and the adjacent Tok River lowlands. This fire is expected to improve moose winter browse supplies continually for the next 15 to 20 years to the benefit of both moose and wolves.

Nonregulatory Management Problems/Needs

In my opinion, wolf predation remains the most important factor limiting moose populations in Unit 12. Recent estimates of moose density in the Tanana Valley and in eastern Unit 12 range from only 0.4 to 0.5 moose/mi^2. While Nelchina and Mentasta caribou have provided wolves with a buffer prey species recently, caribou are only available in any number from November through April. From late April through October, moose remain the primary ungulate prey. In much of western Unit 12, moose are the primary prey species year-round.

Conversely, limited prey abundance during summer is probably limiting the Unit 12 wolf population. Efforts to produce a larger, more productive moose population for the benefits of both humans and wolves are currently being frustrated by wolf:moose ratios of approximately 1:14-20, particularly in an area where both black and grizzly bears are present.

CONCLUSIONS AND RECOMMENDATIONS

Temporary manipulation of the wolf population to achieve the interim population objective of fewer than 100 wolves would immediately lead to a wolf:moose ratio of 1:25-35 and subsequent growth of the Unit 12 moose population. After the moose population objective of 5,000-7,000 is achieved, the wolf population could be allowed to increase to 200 and still maintain a ratio of 1 wolf:25-35 moose. Such a ratio would be expected to maintain a healthy population of wolves larger than presently exists and to

provide for a sustained yield moose harvest of at least 5%, or 250-350 moose per year. The Unit 12 moose population presently supports only 178 wolves and annual moose harvests of fewer than 100 per year.

With a substantially higher prey base, Unit 12 wolves would also be more productive. Sustained yield harvests from a productive population of 200 wolves would approach 30%, or 60 wolves per year, double the mean harvest of 30 wolves for the past 5 years. As mentioned earlier, it would also be possible to maintain a wolf population 12% larger than the current population.

In view of the present controversy over subsistence hunting preferences for Unit 12 moose and the potential for even greater future controversy caused by declining moose populations and declining moose hunting opportunities in southcentral Alaska, I recommend that intensive management of moose and wolves in portions of Unit 12 be given serious consideration.

I further recommend that land-and-shoot wolf hunting in Unit 12 be reinstituted and maintained as the only reasonable method to achieve optimum wolf harvest. Reinstituting land-and-shoot wolf hunting would provide greater opportunities for additional people to hunt wolves. Because of the physiography of Unit 12, land-and-shoot hunting should not be construed as wolf control. Actual wolf control in Unit 12 can only be achieved at this time through direct ADF&G involvement in harvesting wolves.

Lastly, I recommend that ADF&G initiate research in Unit 12 to explore alternative means of wolf population control, specifically birth control. Antifertility compounds now exist which might be successfully administered orally, have only a temporary effect on fertility and, with care, pose only minimal risks to wolves. The development of such a nonlethal control technique as a feasible alternative to aerial shooting is long overdue.

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Table 1. Unit 12 fall wolf population estimates[a], 1985-89.

Year	Population estimate[b]	Number of packs	Mean pack size	Basis of estimate
1985	170-190	NA	NA	Extrapolation from known density area
1986	209	25	7.6	Spring survey, reports, observations, sealing records
1987	185	26	6.5	Spring survey, reports, observations, sealing records
1988	136	21	5.9	Spring survey, reports, observations, sealing records
1989	178	27	6.0	Spring survey, reports, observations, sealing records

[a] Fall estimate = pretrapping season population.
[b] Includes 10% estimated number of single wolves present.

Table 2. Unit 12 wolf harvest, 1985-89.

	Reported harvest							Method of take							Successful	
Regulatory year	M	(%)	F	(%)	Unk	Total	% of fall population estimate	Trap/ snare	(%)	Shot	(%)	L&S[a]	(%)	Unk	Total trappers & hunters	Wolves/ person
1985	23	(55)	19	(45)	3	45	24-26	31	(64)	4	(9)	9	(20)	1	23	1.9
1986	13	(39)	20	(61)	3	36	17	29	(83)	4	(11)	2	(6)	1	24	1.6
1987	13	(59)	9	(41)	10	32	17	31	(97)	1	(3)	0	(0)	0	15	2.1
1988	6	(40)	9	(60)	1	16	12	12	(75)	4	(25)	--	--	0	8	2.0
1989	15	(83)	3	(17)	1	19	11	7	(89)	2	(11)	--	--	0	10	1.9

[a] Land-and-shoot (L&S) taking prohibited during 1988 and 1989.

Table 3. Unit 12 wolf harvest chronology by time period, 1985-89.

Regulatory year	Harvest periods											
	Aug (%)	Sep (%)	Oct (%)	Nov (%)	Dec (%)	Jan (%)	Feb (%)	Mar (%)	Apr (%)	May (%)	Unk	n
1985	0 (0)	4 (9)	0 (0)	3 (7)	3 (7)	5 (11)	9 (20)	18 (40)	2 (4)	1 (2)	0	45
1986	1 (3)	2 (6)	3 (8)	3 (8)	8 (22)	1 (3)	7 (19)	9 (25)	1 (3)	0 (0)	1	36
1987	1 (3)	0 (0)	0 (0)	4 (13)	4 (13)	4 (13)	8 (25)	7 (22)	0 (0)	0 (0)	0	32
1988	1 (6)	0 (0)	0 (0)	3 (19)	3 (19)	3 (19)	3 (19)	1 (6)	2 (13)	0 (0)	0	16
1989	1 (5)	0 (0)	0 (0)	1 (5)	7 (37)	3 (16)	3 (16)	4 (21)	0 (0)	0 (0)	0	19

Table 4. Unit 12 wolf harvest by transport method, 1985-89.

Regulatory year	Airplane (%)	Dogsled, skis, or snowshoes (%)	Boat (%)	3- or 4-wheeler (%)	Snowmachine (%)	ORV[a] (%)	Highway vehicle (%)	Unknown	n
1985	13 (42)	0	0	0	15 (48)	0	3 (10)	14	45
1986	5 (15)	1 (3)	0	0	23 (70)	3 (9)	1 (3)	3	36
1987	4 (17)	1 (4)	0	2 (8)	13 (54)	0	4 (17)	8	32
1988	1 (6)	0	0	0	13 (81)	0	2 (13)	0	16
1989	5 (26)	0	0	0	13 (68)	1 (5)	0	0	19

[a] Other than snowmachine and 3- or 4-wheeler.

LOCATION

Game Management Unit: 13 (22,857 mi^2)

Geographical Description: Nelchina Basin

BACKGROUND

Wolf numbers in Unit 13 were low from the late 1900s until the early 1930s, reflecting corresponding low prey densities (Skoog 1968). Wolf numbers increased after this period, and by the mid-1940s were considered common (Ballard et al. 1987). Predator control by the USFWS between 1948 and 1953, reduced wolf numbers dramatically. Based on estimates by Rausch (1967), as few as 12 wolves may have remained in the unit in 1954. Following cessation of wolf control, wolf numbers increased rapidly. A population of 350 to 450 wolves was estimated in 1965, and fall population estimates in subsequent years exceeded 300 wolves through the 1970s (Ballard et al. 1987).

Before statehood (1959), wolves were harvested under USFWS regulations that provided year-round seasons and no bag limits. Denning and aerial shooting were legal, and bounties were paid. Starting in 1959 the wolf season was closed for 5 years. In 1965 a short season was held. By the late 1960s seasons approximating current dates were established with no bag limits. In 1971 mandatory sealing was established and aerial shooting without a permit was prohibited (Harbo and Dean 1983). Harvest levels prior to mandatory sealing are unknown. Since 1971 an annual average of 86 (range = 46-128) wolves have been sealed in the unit.

MANAGEMENT DIRECTION

Management Goals

- Regulate wolf harvests on a subunit basis to distribute harvest throughout the unit to prevent overharvesting of readily accessible areas. This would be accomplished by Emergency Order closures of the land-and-shoot permit hunt.

Management Objective

- Maintain the posthunting wolf population at a minimum of 150 wolves.

METHODS

To estimate the wolf population size in Unit 13, aerial track surveys were conducted during late February or March in the upper Susitna Trend Count Area (TCA) in Subunits 13B and 13E. In addition, wolf track survey flights were conducted in 2 study areas in Unit 13 during February and March 1990 as part of a research project to estimate wolf densities. One study area covered 5,335 km^2 in Subunits 13B and 13C, extending from the Chistochina River to the Alphabet Hills. The 2nd study area covered 5,201 km^2 within Subunit 13A and included most of the Lake Louise Flat. Additional information on wolf numbers and distribution was collected from trapper surveys and incidental sightings by Department personnel and the public. This information was combined with survey data to extrapolate a unitwide population estimate. Harvests were monitored by requiring the sealing of all wolves taken in the unit.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: During autumn 1990 an estimated 400 (357-443) wolves in a minimum of 40 packs were present in Unit 13 (Table 1). This estimate was based on aerial surveys (70 hours flight time), trapper reports, and estimated pup production. Known pack size ranged from 2 to 21 wolves. The estimated autumn density was 8.8 wolves/1,000 km^2 (7.9-9.8 wolves/1,000 km^2), the highest since 1975 (10 wolves/1,000 km^2). The 1990 spring density estimate also reflected an increasing wolf population and, at 6.3 wolves/1,000 km^2, was the highest since spring 1976. The population has increased by 48 (63%) since fall 1985.

Continued growth of the unit's wolf population at the current rate is not expected because of decreasing prey availability. In Unit 13 between 1988 and 1990, the moose population declined by 20-30% because of severe winters and predation. Also, the majority (> 85%) of the Nelchina Caribou Herd was unavailable to wolves in Unit 13 between October and April of 1989 and 1990 because the herd migrated east to Unit 12. This lower prey density, in concert with high wolf densities, could have a negative effect on wolf productivity and pup survival (Ballard et al. 1987). However, there is no fast-acting feedback mechanism that regulates the total number of wolves relative to declining prey (Gasaway et al. 1983). Therefore, the unit's wolf population will probably remain high relative to prey populations for several years, even with lower recruitment, unless the human harvest of wolves increases.

Beginning in August 1990, SDA hunting became legal after a 2-year hiatus. This hunting method has proven very effective in Unit 13. Ballard et al. (1987) found that human harvest primarily through SDA hunting controlled the wolf population at low levels in Unit 13 in the 1970s and early 1980s. During this period there were no restrictions on

bag limit or on areas open to hunting. However, in 1990 SDA hunting in Unit 13 will be managed through subunit quotas and bag limits. This method will limit local overharvesting of wolves and make it easier to maintain a stable unitwide wolf population at the management objective level.

Distribution and Movements: Distribution and movement patterns of wolves in Unit 13 depend primarily on prey availability (Ballard et al. 1987). Smaller wolf territories and higher productivity are functions of greater moose densities. Aerial surveys conducted during spring 1990 found greater densities in the Alphabet Hills study area than in the Lake Louise study area (23.3 wolves/1,000 km^2 compared to 9.5 wolves/1,000 km2) (Becker and Gardner 1991). Moose survey data indicate that the Alphabet Hills study area supports 4 to 8 times more moose than the Lake Louise area.

Mortality

Harvest:

Season and Bag Limit: The open hunting season in Unit 13 is from 10 August to 30 April with no bag limit. Trapping season runs from 10 November to 31 March, also with no bag limit.

Board of Game Actions and Emergency Orders: In November 1987 the Board of Game prohibited SDA wolf harvests. This regulation was effective beginning with the 1988-89 season. Hunters or trappers using aircraft for transportation could not shoot an untrapped wolf until after 0300 hours on the following day on which flying occurred. At the spring 1990 Board of Game meeting, a land-and-shoot wolf hunting season was established in Unit 13. The Board also required land-and-shoot wolf hunters to obtain a permit and metal locking tags before participating in this hunt. The metal locking tags must be attached to wolves in the field as soon as they are killed. The Board also established a 10-wolf bag limit for the land-and-shoot permit hunt.

Hunter-Trapper Harvest: Hunters and trappers sealed 84 wolves in Unit 13 during the 1989-90 season. This was a 163% increase over the previous year's harvest of 32 but only 11% above the 5-year (1985-90) mean harvest of 76 (Table 2). Males comprised 54% (n = 43) of the 1989-90 harvest, compared to the past 5-year average of 58% males.

From 1985 to 1988, SDA hunting accounted for 51% of the harvest, compared with 40% for trapping and snaring (Table 2). During the 1988-89 season, trapping and snaring were the major harvest methods (62%), as SDA hunting was no longer legal. In 1989-90, however, more wolves were reported taken by ground shooting (n = 43) than by trapping or snaring. Although some of these were shot by big game hunters as incidental targets, most of the wolves reported as ground shot were taken in the winter by wolf hunters and trappers.

Hunter and Trapper Residency and Success. During the report period, 38 trappers harvested an average of 2.2 wolves in Unit 13. The average take per trapper over the previous 5 years (1984-89) was 1.9 wolves per year. The most wolves reported taken by any individual was 14 by a resident trapper. Two wolves were sealed by 2 nonresidents, 16 local residents sealed 42 wolves (= 2.6), and 18 nonlocal Alaskan residents sealed 40 (= 2.2).

Harvest Chronology. Harvest chronology varies from year to year depending on whether trapping or SDA hunting was the most important harvest method (Table 3). Ground trappers usually concentrate their activities right from the start of the season or as soon after the opening as snow conditions allow snow machine travel. Ground trappers usually attempt to take all furbearers species available on their line and don't just target wolves. As a result, most of the early season wolf harvest is by ground trappers. SDA hunters tend to wait until later in the season, when deep snow facilitates landing and there is more daylight for tracking purposes.

Transport Methods. Since the restriction on SDA hunting in 1988, snow machines have been the most important method of transportation (Table 4). Historically, more wolves have been taken with the use of aircraft, reflecting both the remote nature of the unit and the importance of SDA harvesting. Many wolf packs never come near a road or established trapline. Comparisons of reported harvest locations from 1986 to 1989 show that the wolf harvest was well distributed throughout the unit from 1986 to 1987. However, during 1988 and 1989, few wolves were taken far from the road system, leaving remote, interior portions of the unit virtually unharvested.

Other Mortality: Natural mortality rates for radio-collared wolves in a portion of Unit 13 were determined by Ballard et al. (1987). They attributed 11% of annual mortality to intraspecific strife and 9% to accidents, injuries, starvation, and drowning. The remaining 80% was attributed to legal and illegal human harvest. Illegal wolf harvests, mostly by aerial shooting, occur in Unit 13. The low number of observations of suspected illegal harvest sites as well as sealed wolf pelts that appear to have been shot from the air suggest the annual number of wolves taken illegally is small and probably does not affect the unit's population. However, in some years illegal harvest has detrimental impacts on individual packs in local areas.

Nonregulatory Management Problems/Needs

Between 1975 and 1982 Unit 13 wolf population estimates were obtained by extrapolating from densities determined for radio-collared packs in a portion of the unit (Ballard et al. 1987). Since 1983, estimates have been primarily derived by extrapolating the number of wolves determined from TCA track surveys. Sightings reported by hunters, trappers, and others and observations made by ADF&G personnel while conducting aerial surveys for other species are also considered when making this estimate. Extrapolations based on track surveys and incidental sightings are less accurate than estimates obtained with the

use of radio-collared packs. A more reliable, cost-effective method of determining wolf numbers and trends is needed in place of, or in addition to, track surveys. A new line transect technique for estimating wolf densities, without the extensive use of radio collars, was tested in Unit 13 in spring 1990 (Becker and Gardner 1990). While this method shows promise for censusing wolves, more testing is needed. This method is limited to use in areas where wintering caribou are scarce. Difficulty identifying tracks, and the presence of dense overstory inhibit the use of this method as well. Research should continue to focus on developing survey or sampling procedures that would allow managers to obtain reasonably accurate population estimates without radio-collaring a large number of wolves.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers have increased 48% to 63% in Unit 13 since fall 1985. Current estimates approach the historic population high reported for 1965 and 1975 and are twice as high as reported for the early 1980s. The Unit 13 spring 1990 population estimate of approximately 285 wolves exceeds by 135 the minimum population objective of 150 wolves following the hunting and trapping season. Wolf densities were especially high in areas where moose are relatively abundant, such as the Alphabet Hills, Subunit 13A West, and northern Subunit 13C.

The 1988-89 wolf harvest was the lowest reported in Unit 13 since the sealing requirement began in 1971. Analysis of harvest locations and the methods of transportation used since 1985 indicates that most wolves in the interior portions of the unit were harvested by SDA hunting, while harvests by ground trappers were primarily in close proximity to the road system. After SDA hunting was prohibited, most of the harvest in 1988-89 occurred adjacent to the road system. Because human harvests have limited wolf numbers in Unit 13, wolf numbers responded positively to the low harvest in 1988-89. Although the wolf harvest increased in 1989-90, it was not high enough to result in an appreciable reduction in wolf numbers. During 1989-90 more wolves were taken in remote portions of the unit than during the previous season, but the majority of the harvest still came from readily accessible areas.

Wolf harvests are expected to increase in the 1990-91 hunting/trapping season because the Board of Game established a land-and-shoot permit wolf hunt in Unit 13 for this season. Until this harvest method became illegal in 1988, land-and-shoot was the most popular and successful wolf harvest technique in Unit 13. Wolves could be overharvested in portions of the unit with more open terrain, which is suitable for land-and-shoot technique, if a large number of hunters were to participate in this hunt. Because of the possibility of local overharvesting and to comply with the management objective of maintaining a minimum post-hunting population, I recommend establishing a harvest quota for wolves in Unit 13.

Managing wolves by establishing a harvest quota has never been done before in Unit 13. Previously, as wolf numbers declined trapping effort and harvest decreased and wolves recovered. Because the management objective calls for maintaining a minimum population, we cannot rely on a decline in hunting/trapping effort to control harvests. A wolf harvest quota based on an allowable harvest of 30-40% of the estimated 1990 population should provide a harvest level that is low enough to assure the management objective is met. Quotas should be established on a subunit basis in an attempt to avoid overharvesting accessible areas. Also, this would tend to redistribute the wolf harvest to provide adequate harvest in remote areas that are important moose, caribou and sheep habitats. Quotas can also be adjusted annually, based on current population estimates. Harvest quotas that exceed 40% of the fall population may result in a population decline. Lower harvests will stabilize the population or allow it to increase. Because wolves are at record levels, I recommend that harvests in 1990-91 be allowed to approach 40% of the estimated population in Subunits 13A, 13B, 13C and 13E. Harvest in Subunit 13D should be limited to 20% of the population. Such harvest rates, if attained, would still result in a spring 1991 population estimate well above the minimum population objective. I also recommend the quota be maintained by closing SDA hunting only, not the general trapping season. Trappers have established lines and once the season is closed in their area, they are done for the year. Also, canine sets will catch fox and coyote, as well as wolf. Most trappers use large (No. 4) traps for all canines; therefore, closing the wolf season would require either stopping fox and coyote trapping or making trappers use smaller traps. On the other hand, land-and-shoot hunters are targeting just wolves, are mobile, and can easily move to another subunit; thus they are not affected as much by a subunit closure.

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Table 1. Unit 13 fall and spring wolf population estimates[a], 1985-1989.

Year	Population estimate		Number of packs	Basis of estimate
	Fall	Spring		
1985-86	245-270	200 (178-223)	28	b
1986-87	245-270	160 (140-180)	25	b
1987-88	270-310	130 (110-150)	20	b
1988-89	175-225	150 (125-175)	25	b
1989-90	357-443	285 (275-295)	40	b
1990-91	357-443	N/A		

[a] Fall estimate = pre-trapping season population, spring estimate = post-trapping season population.
[b] Basis of estimate - aerial track surveys, incidental observations, reports from public, sealing records.

Table 2. Unit 13 wolf harvest, 1985-89.

Regulatory year	Reported harvest				Estimated harvest		Method of take				Total Successful Trappers/hunters
	M (%)	F (%)	Unk. (%)	Total	Unreported	Illegal	Trap/snare (%)	Shot (%)	(L&S) (%)	Unk. (%)	
1985-86	38 (55)	26 (38)	5 (7)	69	5	5	33 (48)	8 (12)	28 (40)	0 (0)	39
1986-87	54 (64)	30 (36)	0 (0)	84	5	5	37 (44)	7 (8)	37 (44)	3 (4)	36
1987-88	63 (58)	46 (42)	0 (0)	1,095	30[a]	34 (31)	6 (6)	69 (63)	0 (0)	50	
1988-89	16 (50)	15 (47)	1 (3)	32	5	5	20 (62)	12 (38)	0 (0)	0 (0)	22
1989-90	43 (51)	36 (43)	5 (6)	84	5	5	41 (49)	43 (51)	0 (0)	0 (0)	38

[a] Estimated illegal take of 2 individuals known to have aerially shot a number of wolves in Unit 13 but who were never convicted.

Table 3. Unit 13 wolf harvest chronology percent by time period, 1985-89.

Regulatory year	Harvest periods									n
	August	September	October	November	December	January	February	March	April	
1985-86[a]	0	6	1	10	6	12	17	45	0	69
1986-87	1	6	10	12	7	32	24	17	0	84
1987-88	0	2	1	4	19	22	37	14	1	109
1988-89	3	12	0	25	16	9	16	19	0	32
1989-90	2	7	1	25	16	19	8	19	2	84

[a] In 1985-86 2 wolves were unknown date of harvest.

Table 4. Unit 13 wolf harvest percent by transport method, 1985-89.

Regulatory year	Percent of harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1985-86	42	4	0	0	39	0	12	12	69
1986-87	44	2	2	0	33	1	10	7	84
1987-88	68	0	3	0	27	0	2	0	109
1988-89	3	9	0	0	59	3	22	3	32
1989-90	13	13	4	1	61	1	7	0	84

LOCATION

Game Management Unit: 14 (6,624 mi^2)

Geographical Description: Eastern Upper Cook Inlet

BACKGROUND

Wolf numbers in Unit 14 are believed to have been low to moderate in the 1950s and early 1960s, primarily because of the federal government's predator control efforts (Rausch 1967). Wolf populations probably increased during the late 1960s and early 1970s, after predator control activities and bounty payments ceased. Development in the Anchorage area and along the highway system in the Matanuska and Susitna Valleys was probably responsible for wolf numbers remaining low near human settlements in the 1970s. Subsequent large increases in human population resulted in substantial increases in hunting and trapping pressure. It is believed that by the mid- to late 1980s wolf numbers were relatively low throughout Unit 14. Land-and-shoot wolf hunting was legal before winter of 1986-87; prohibition of this technique may have reduced the number of reports regarding wolf numbers and distribution (Harkness and Steen 1988).

MANAGEMENT DIRECTION

Management Goals

In Subunits 14A and 14B the primary goal is to provide for optimum harvest of wolves. In Subunit 14C the primary goal is to provide opportunity to view, photograph and enjoy wolves. The secondary goal for all of Unit 14 is to provide maximum opportunity to participate in hunting and trapping wolves.

Management Objective

- Maintain a post-harvest population of at least 35 wolves in Subunits 14A and 14B combined, and a post-harvest population of at least 20 wolves in Subunit 14C.

METHODS

No systematic surveys were conducted to determine wolf numbers or distribution. A questionnaire was mailed to all trappers who sealed fur taken in Unit 14, and observations

were made incidental to other wildlife (primarily moose) surveys. Harvest was determined by sealing all wolves presented for examination.

RESULTS AND DISCUSSION

Population Status and Trend

Given the lack of systematic surveys, precise estimates of wolf population size and trend in Unit 14 are unknown. Occasional sightings and harvest indicate low numbers of wolves do exist.

Population Size: Based on responses from the trapper questionnaire and general observations by members of ADF&G, I believe there are 30-40 wolves in Subunits 14A and 14B (combined), and approximately 20 wolves in Subunit 14C (Grauvogel pers. comm.). It is believed that wolf numbers have remained low but stable during the past 5 years (Table 1). With wolf numbers and production in Unit 13 remaining relatively high (Tobey 1990), some dispersal to the northern portion of Unit 14 from Unit 13 has probably occurred at a relatively constant rate.

Twenty-nine persons responding to the trapper questionnaire actively trapped in 1989-90. When asked to categorize the number of wolves on their trapline, 12 (63%) of 19 respondents listed wolves as scarce, 5 (26%) respondents listed wolves as common, and 2 (11%) trappers categorized wolves as abundant. When asked to compare the number of wolves in their area during winter 1989-90 with winter 1988-89, 5 of 25 respondents (20%) said wolves were not present on their lines, 7 (28%) listed numbers as fewer, 8 (32%) reported no change, and 5 (20%) said there were more wolves in 1989-90.

Distribution and Movements: Resident wolf packs occur in the Ship Creek and Knik River drainages, and I saw 2 wolves on the Kashwitna River in February 1991. Other packs are suspected in the more remote northeastern portions of Unit 14, although there are no recent sightings. Historically, packs used the Talkeetna and Kings River drainages, though these wolves may have been from packs located primarily in Unit 13. Packs from the western part of Unit 13 use portions of Unit 14 on occasion.

There is little evidence of wolves using areas of Unit 14 where prey species other than moose do not occur, e.g., the lower Susitna Valley. Winter 1989-90 was especially severe for moose in the Susitna Valley, but no wolves were seen during moose carcass surveys conducted in April. Few (<8) wolves were seen during regular aerial radio-tracking of instrumented moose in the Susitna Valley over the past 6 years, and no wolf-killed (or wolf-scavenged) moose carcasses were noted (Modafferi pers. comm.). Wolves found on the Kashwitna River in February 1991 were near the only group of caribou in the area, and 2 wolf-killed caribou were found nearby. The eastern parts of Subunits 14C and 14A, areas known to have wolves, have moose, Dall sheep and mountain goats as

potential prey. Wolves in northern and eastern 14B have caribou and some Dall sheep as prey, and this is where wolf densities are assumed highest in Unit 14.

Mortality

Harvest:

Season and Bag Limit. Wolves could be taken under either a hunting or trapping license. The hunting season for Unit 14 was 10 August - 30 April, with a bag limit of 4 wolves in Subunits 14A and 14B, and a bag limit of 1 wolf in Subunit 14C. The trapping season was 10 November - 31 March in Subunits 14A and 14B, and 10 November - 28 February in Subunit 14C; in all of Unit 14 there was no bag limit for trappers.

Hunter/Trapper Harvest. During 1989-90, 2 male wolves were taken from Unit 14; 1 from Subunit 14A and 1 from Subunit 14B (Table 2). One wolf was trapped, 1 was shot from the ground. Wolf harvest has been low since the prohibition of land-and-shoot wolf hunting/trapping in this area. From 1978-86 (8 seasons), when land-and-shoot hunting was legal, the wolf harvest averaged 6.5 wolves per year for Unit 14. During 1986-90 (4 seasons) wolf harvest has averaged 2.0 wolves per year for Unit 14.

Harvest Chronology. During the 1989-90 hunting/trapping season, 1 wolf was taken in December and 1 wolf was taken in January (Table 3). Chronology of harvest was probably most affected by snow conditions, which were quite variable in GMU 14, especially in Subunits 14A and 14C.

Transport Methods. Both persons taking wolves during 1989-90 used snow machines to get to their hunting/trapping area (Table 4). While some wolves were taken using highway vehicles for transportation during 1985-88, in recent years successful trappers/hunters travelled to more remote areas. In Unit 14 most trappers no longer run long trap lines into remote country, but rather stay near the road system. Many parts of Subunit 14B, where wolves would most likely be found, receive little trapping/hunting pressure.

CONCLUSIONS AND RECOMMENDATIONS

Although estimated at 50-60 wolves, the population size of wolves in Unit 14 is unknown. Without systematic surveys it is not possible to say whether the population objectives were met. However, harvest levels have been low since the abolition of land-and-shoot trapping/hunting, and probably have not exceeded sustained yield. As a result, no change in season or bag limit is recommended at this time.

With increasing urbanization of Unit 14, it is unlikely that wolf numbers will substantially increase, and harvest will probably continue only in the Unit's more remote parts. Also,

changes in allowable methods of hunting/trapping wolves in Unit 13 may affect wolf numbers in northeastern Unit 14. Periodic surveys would allow biologists to better assess wolf population trends.

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Table 1. Unit 14 fall wolf population estimates, 1985-1989.

Year	Population Estimate	Number of Packs	Basis of Estimate
1985-86	50-55	10	Incidental observations/ Reports from public
1986-87	50-60	10	Incidental observations/ Reports from public
1987-88	30-60	10	Incidental observations/ Reports from public and trapper questionnaire
1988-89	30-60	10	Incidental observations/ Reports from public and trapper questionnaire
1989-90	50-60	10	Incidental observations/ Reports from public and trapper questionnaire

Table 2. Unit 14 wolf harvest by Subunit, 1985-89.

Regulatory year	Reported Harvest				Method of take			
	M	F	Unk.	Total	Trap	Snare	Shot	Unk.
Subunit 14A								
1985-86	3	1	0	4	3	1	0	0
1986-87	0	0	1	1	0	0	0	1
1987-88	1	1	0	2	0	2	0	0
1988-89	0	1	0	1	1	0	0	0
1989-90	1	0	0	1	0	0	1	0
Subunit 14B								
1985-86	0	2	0	2	1	0	1	0
1986-87	0	0	0	0	0	0	0	0
1987-88	0	0	0	0	0	0	0	0
1988-89	0	0	0	0	0	0	0	0
1989-90	1	0	0	1	1	0	0	0
1985-86	3	1	0	4	0	0	4	0
1986-87	0	1	0	1	0	0	1	0
1987-88	0	1	0	1	0	1	0	0
1988-89	0	0	0	0	0	0	0	0
1989-90	0	0	0	0	0	0	0	0
Subunit 14C								
1985-86	3	1	0	4	0	0	4	0
1986-87	0	1	0	1	0	0	1	0
1987-88	0	1	0	1	0	1	0	0
1988-89	0	0	0	0	0	0	0	0
1989-90	0	0	0	0	0	0	0	0

Table 3. Unit 14 wolf harvest chronology by month, 1985-89.

Regulatory year	Harvest Periods						n
	August	November	December	January	February	March	
1985-86	1	2	1	0	2	4	10
1986-87	0	0	0	0	0	100	2
1987-88	0	0	1	0	2	0	3
1988-89	0	0	0	1	0	0	1
1989-90	0	0	1	1	0	0	2

Table 4. Unit 14 wolf harvest by transport method, 1985-89.

Regulatory year	Percent of Harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	Other ORV	Highway Vehicle	Unknown	
1985-86	3	0	0	0	0	1	2	4	10
1986-87	0	0	1	0	0	0	1	0	2
1987-88	0	0	0	2	0	0	1	0	3
1988-89	0	1	0	0	0	0	0	0	1
1989-90	0	0	0	0	2	0	0	0	2

LOCATION

Game Management Unit: 16 (12,225 mi^2)

Geographical Description: West side of Cook Inlet

BACKGROUND

In the past wolves were more abundant in Unit 16. Their numbers declined over the past decade, particularly in accessible areas where they are highly sought after by recreational hunters and trappers. Clearly the decline is not attributable to a shortage of prey since Unit 16 has a large population of moose and smaller populations of both caribou and sheep. In recent years over 80% of the harvest occurred when snow conditions favored ski-equipped aircraft and smowmachine use.

MANAGEMENT DIRECTION

Management Goals

Provide the greatest opportunity to participate in hunting and trapping wolves.

Management Objectives

Maintain a wolf population that will sustain an annual harvest of up to 25 wolves.

METHODS

Interviews with hunters and trappers at pelt sealing provided harvest data for wolves. Observation by staff while conducting aerial moose surveys and input from local residents, pilots, and trappers provide information on the distribution and numbers of wolves.

RESULTS AND DISCUSSION

Population Status and Trend

The fall population in Unit 16 is estimated at 35-45 wolves (Table 1). It seems the wolf population has declined substantially over the past decade. Three packs totaling 27 individuals were observed this past year. The largest of these (15) was seen in the

Peters-Dutch Hills and ranges into adjoining units. Of the 2 remaining packs one was observed near Mt. Susitna and the other along the Drift River. Additional sign of 2-3 wolves was observed on the Upper Yentna River. Other small packs frequent portions of the unit.

Mortality

Harvest:

Seasons and Bag Limits. The open hunting season in Unit 16 is from 10 August to 30 April; the bag limit is 4 wolves. The open trapping season is from 10 September to 31 March; there is no bag limit.

Board of Game Actions and Emergency Orders

A major regulation change occurred beginning in the 1988-89 regulatory year when SDA trapping of wolves was terminated and placed under the hunting regulations. SDA hunting is not allowed in Unit 16.

Human Induced Mortality. During the 1989-90 hunting and trapping seasons, the reported harvest in Unit 16 was 10 wolves, including 4 males, 4 females and 2 of unknown sex. The unit harvest for 1988-89 was 7 wolves. The 1985-89 mean harvest was also 7 wolves. However, from 1980 through 1984 a mean of 18 wolves were taken from the unit, while from 1962 through 1969 and in the 1970s a mean of 28 wolves were taken annually. Of the 10 taken in 1989-90, 4 were killed by ground shooting and 6 were trapped. Transportation via snowmachine was used in 8 of the 11 and aircraft in 2 (Table 2). In the past 4 years the harvest has been relatively stable, ranging from 7 to 10 annually.

Harvest Chronology. During the 1989-90 hunting and trapping seasons, 2 wolves were killed in December, 2 in January, 5 in February, and 1 in April (Table 3). Over the past 3 decades the vast majority of wolves taken from Unit 16 were killed November through March.

CONCLUSIONS AND RECOMMENDATIONS

Past harvest levels suggest the Unit 16 wolf population may have declined substantially from levels of the 1960s and 1970s. Aircraft use to access wolf hunting and trapping is believed the primary factor in the wolf population decline. Harvest levels fell from a mean of 28 annually during the 1960s and 1970s to 18 per year from 1980 through 1984, and 7 per year from 1985 through 1989. The percentage of wolves taken via aircraft declined from 75% in 1985-1987 to 33% from 1988-1989 (Table 4). The 1989-90 harvest was the largest since 1984-85.

Additional work should be done to produce a more accurate estimate of the unit's wolf numbers. SDA hunting prohibition may allow the population to increase significantly over the next few years. If this does not occur, additional regulation changes may be necessary.

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Table 1. Unit 16 fall wolf population estimates[a], 1985-1989.

Year	Population estimate	Number of packs	Basis of estimate
1985-86	60-75	7	Incidental observations, sealing records, reports from public
1986-87	60-75	7	same as above
1987-88	60-75	7	same as above
1988-89	30-40	6	same as above
1989-90	35-45	6	same as above

[a] Fall estimate = pre trapping season population.

Table 2. Unit/Subunit 16 wolf harvest, 1985-89.

Regulatory year	Reported harvest				Method of take			Successful
	M	F	Unk	Total	Trap/snare	Shot	Unk.	Total No. Trappers/hunters
1985-86	1	1	1	3	2	1	0	3
1986-87	6	3	0	9	8	1	0	6
1987-88	7	1	0	8	7	1	0	5
1988-89	6	1	0	7	4	3	0	6
1989-90	4	4	2	10	6	4	0	6

[b] L&S (land-and-shoot) refers to animals taken by hunters the same day hunters were airborne.

Table 3. Unit 16 wolf harvest chronology by time period, 1985-89.

Regulatory year	Harvest periods							n
	Sept.-Oct.	November	December	January	February	March	April	
1985-86	0	0	0	1	2	0	0	3
1986-87	1	1	3	0	2	2	0	9
1987-88	2	2	2	1	0	0	1	8
1988-89	2	0	3	1	0	1	0	7
1989-90	0	0	2	2	5	0	1	10

Table 4. Unit 16 wolf harvest by transport method, 1985-89.

Regulatory year	Harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1985-86	2	1	0	0	0	0	0	0	3
1986-87	7	2	0	0	0	0	0	0	9
1987-88	8	0	0	0	0	0	0	0	8
1988-89	4	0	0	0	0	0	1	2	7
1989-90	2	1	0	0	7	0	0	0	10

LOCATION

Game Management Unit: 17 (18,771 mi^2)

Geographical Description: Northern Bristol Bay

BACKGROUND

Objective research or management data are not available on the historic or current abundance of wolves in Unit 17. Harvest data since 1962 provide some indication of wolf distribution and relative abundance, but these data are inconsistent. From 1962 to 1971 bounty records provide a partial harvest record. From 1972 to the present, mandatory sealing records provide greater accuracy in harvest reporting (Figure 1). In 1988, a trapper questionnaire program was implemented to collect information on relative abundance of furbearers, including wolves.

MANAGEMENT DIRECTION

Management Objective

Maintain a wolf population that will sustain an annual harvest of 25 wolves.

METHODS

Harvest data were collected from trappers when they brought wolf pelts in for sealing. In 1988, a trapper questionnaire was sent to selected trappers in the unit to quantify their observations of furbearers during the trapping season and to estimate trends in the populations. Wolf population trend and distribution data were also collected incidental to moose and caribou surveys.

RESULTS AND DISCUSSION

Population Status and Trend

Trapper reports and general observations indicated that the wolf population declined during this report period. The wolf population in this unit reached its highest density in 1974-77, but declined sharply by 1980. Rabies was reported in wolves in 1981 and was probably a contributing factor. Densities seemed to increase until 1989 when another apparent rabies epidemic affected the unit's canid populations.

Population Size: The fall wolf population in Unit 17 is estimated at 150 to 200 wolves in 20 to 30 packs (Table 1). Wolves apparently declined since 1988 when the estimated fall wolf population in Subunit 17A was 7-15 wolves in 1 to 3 packs, Subunit 17B contained 150 to 200 wolves in 20 to 30 packs, and Subunit 17C had 20 to 30 wolves in 3 to 6 packs (Taylor 1990). These estimates were based on subjective data.

Distribution and Movements: Highest densities occur in the Nushagak Hills area, particularly in the King Salmon River and Mosquito Creek drainages. Wolves are also found in the Koktuli River and Upper Kvichak River drainages during winter when the Mulchatna Caribou Herd winters in these areas.

Mortality

Harvest:

Season and Bag Limit. The open hunting season in Unit 17 is from 10 August to 30 April. The bag limit is 10 wolves. The trapping season in Unit 17 is from 10 November to 31 March. There is no limit for trappers.

Board of Game Actions and Emergency Orders. No Board of Game actions or Emergency Orders were enacted during this report period.

Hunter/Trapper Harvest. The wolf harvest in Unit 17 increased slightly during the 1989-90 season, but it was still below the 5-year average of 33.6 wolves (Table 2). Nine trappers reported taking 25 wolves (13 males, 8 females, and 4 unknown sex). Twenty-four (96%) were taken in Subunit 17B and 1 (4%) was killed in Subunit 17C. All were taken with a firearm.

Harvest Chronology. Harvest chronology has been quite variable from year to year (Table 3). This season most wolves were harvested in March (72%). Harvest chronology generally reflects the suitability of snow conditions for tracking and landing rather than the availability of wolves.

Transport Methods. Aircraft were the most common means of transport for wolf trappers/hunters in Unit 17 (Table 4). In 1989-90, 96% of the wolves harvested were taken with assistance of an aircraft.

CONCLUSIONS AND RECOMMENDATIONS

Few data are available to interpret the status of the wolf population in Unit 17. General observations and public contacts suggest that the wolf population is healthy, though it has experienced a decline in the past 2 years. Prey densities have increased steadily in most of this unit since the early 1980s, and predator densities are also expected to increase.

Wolf abundance appears greatest in Subunit 17B, and aerial surveys should be flown throughout this subunit to improve population estimates. Good survey conditions seldom last more than 1 day. Survey efforts need to be coordinated with Unit 19 and Lake Clark National Park personnel to maximize the area surveyed during optimum weather conditions.

LITERATURE CITED

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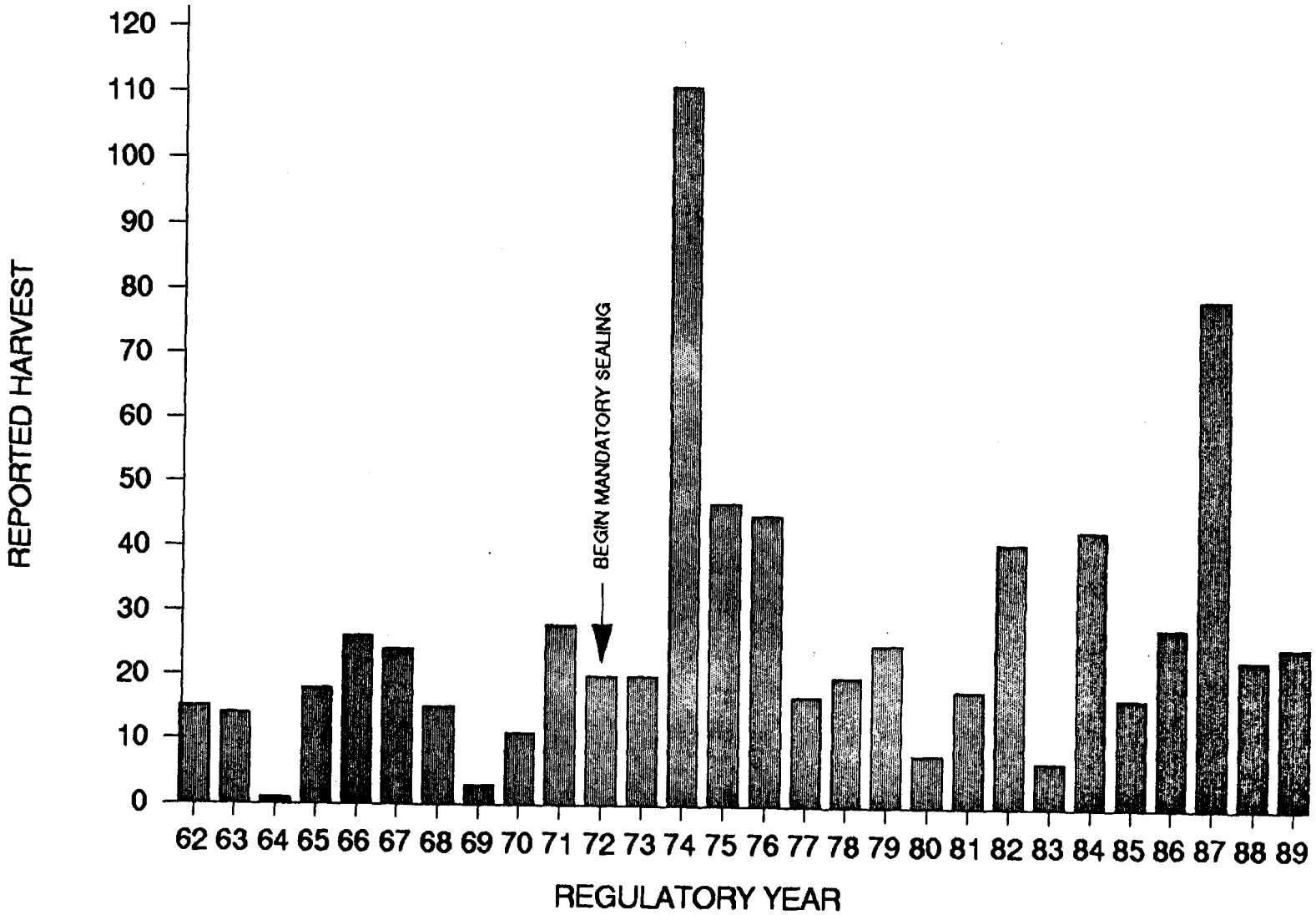

Figure 1. Unit 17 reported wolf harvest, 1962-62 to 1989-90.

Table 1. Unit 17 fall wolf population estimates[a], 1985 - 1989.

Year	Population estimate	Number of packs	Basis of estimate
1985-86	NO DATA	NO DATA	
1986-87	190-240	22	incidental observations[b]
1987-88	200-250	22	incidental observations[b]
1988-89	177-245	24-39	trapper questionnaire and incidental observation[b]
1989-90	150-200	20-30	incidental observation[b]

[a] Fall estimate = pre-trapping season population.
[b] Incidental observations during moose and caribou surveys, and harvest data.

Table 2. Unit 17 wolf harvest, 1985-89.

Regulatory year	Reported harvest				Method of take (%)			Successful trappers
	Male	Female	Unk	Total	Trap/snare	Shot	Unk	
1985-86	10	3	0	13	5 (38)	8 (62)	0 (--)	5
1986-87	15	11	2	28	4 (14)	24 (86)	0 (--)	11
1987-88	48	31	0	79	1 (1)	75 (95)	3 (4)	11
1988-89	12	10	1	23	2 (9)	21 (91)	0 (--)	11
1989-90	13	8	4	25	0 (--)	25 (100)	0 (--)	9

Table 3. Unit 17 wolf harvest chronology percent by time period, 1985-89.

Regulatory year	Harvest Period						n
	December	January	February	March	April	Unknown	
1985-86	54	38	8	--	--	--	13
1986-87	4	57	21	18	--	--	28
1987-88	1	10	29	47	--	13	79
1988-89	9	52	13	26	--	--	23
1989-90	24	--	--	72	4	--	25

Table 4. Unit 17 wolf harvest percent by transport method, 1985-89.

Regulatory year	Percent of harvest								n
	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snow machine	ORV	Highway vehicle	Unk	
1985-86	92	--	--	--	8	--	--	--	13
1986-87	86	--	--	--	--	--	--	14	28
1987-88	95	--	--	--	3	--	--	3	79
1988-89	83	4	--	--	13	--	--	--	23
1989-90	96	--	--	--	4	--	--	--	25

LOCATION

Game Management Unit: 18 (46,000 mi^2)

Geographical Description: Yukon-Kuskokwim Delta

BACKGROUND

Reported observations from trappers, furbuyers, and agency biologists indicate that wolf numbers are increasing in Unit 18 as their ungulate prey base expands, particularly in the Yukon drainage and in the northern Kilbuck Mountains. The distribution of wolves in Unit 18 appears to reflect the distribution of moose and caribou. The Kilbuck Caribou Herd increased at a 10-15% rate annually to at least 1,220 animals by fall 1990. Several thousand Mulchatna caribou reached the Kuskokwim lowlands between Aniak and Kalskag for the first time in 100 years during winter 1988-89. Substantial numbers of muskoxen have emigrated from Nelson Island to the mainland of the Yukon Kuskokwim Delta in the last few years, although wolf predation on muskoxen has not yet been reported in Unit 18. Although wolf and ungulate numbers are growing in Unit 18, their overall densities remain low. Sealing certificate data indicate that little change occurred in the harvest of wolves in Unit 18, except for 1988-89 when a higher than normal harvest was reported.

MANAGEMENT DIRECTION

The following population management goals and objectives have been established for Unit 18:

- Establish and maintain viable wolf populations in Unit 18.
- Monitor harvests through the sealing program, contacts with the public, and an annual trapper questionnaire.
- Explain and promote compliance with the sealing requirements among local hunters and trappers.
- Monitor the size and population status of wolves and wolf packs in Unit 18.
- Minimize adverse interactions between wolves and the public.

METHODS

No aerial surveys were conducted specifically to determine numbers and distribution of wolves in Unit 18. Wolves were observed occasionally during aerial surveys of moose

and caribou. Wolf sightings were compiled with those received from other agencies, the public, trappers, and furbuyers. Harvest information was obtained from sealing records, from interviews with furbuyers, and the annual trapper questionnaire. Public notices were sent to 43 villages Unit 18 for the second consecutive year informing the public that wolves and some furbearers taken by hunters and trappers need to be sealed.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Several wolf packs ranged along the entire length of the lower Yukon River in Unit 18 during 1989-90. At least 2 other packs resided in the Kilbuck Mountains east of Bethel and in the Goodnews River drainage. A pack of 3 wolves has been reported producing pups for the last 2 years on the delta lowlands west of the mouth of the Kuskokwim River. Other packs remained near the periphery of Unit 18, moving principally between Unit 18 and Subunits 19A, 19B, 17A, 17B, and 21E. Dispersing juvenile wolves have apparently moved from northern and eastern montane and riparian regions of Unit 18 onto the lowlands of the Yukon-Kuskokwim Delta. Trappers reported seeing evidence of wolves in more places in Unit 18 in 1989-90 than at any time since the 1930's. Wolf numbers are reportedly increasing along the entire lower Yukon drainage in Unit 18, and slightly increasing in the Kuskokwim drainage. Previous estimates of population size of 25-50 wolves in Unit 18 may have been low and may actually range from 50-75 wolves (Table 1).

Distribution and Movements: The wolves observed in the delta lowland west of the mouth of the Kuskokwim River between the coastal villages of Kwigillingok and Kipnuk were first reported in 1987-88. A breeding pair of wolves set up residency on the coastal lowlands and produced pups for the second consecutive year in 1989. It is speculated that these wolves were feeding on tundra hares and marine mammal carrion. The 6 wolves reported to have crossed the Kuskokwim in early January 1988 were believed to be juveniles dispersing eastward from this pack. Three of 6 wolves from this group were taken by hunters near the village of Eek in early 1989. The wolf tracks subsequently reported near Eek from January to March 1989 suggested that some wolves remained in the vicinity east of the Kuskokwim.

A pack of 5-7 wolves has ranged in the Kilbuck Mountains, including the Kisaralik, Fog, and Tuluksak drainages since at least 1984. A pack of 15-18 wolves has reportedly ranged between Pilot Station and Russian Mission along the Yukon River during the last 5 years. From January to March 1990, a large pack of wolves was seen periodically along the Yukon River between Pilot Station and Marshall. These wolves apparently came very close to the village feeding at the landfill and/or killing loose dogs. Trappers and residents from the villages of Mountain Village, Sheldon's Point and Alakanuk, near the mouth of the Yukon, reported observing tracks of single wolves or pairs throughout

the winter of 1989-90. Wolves apparently now range along the entire Yukon drainage in Unit 18 from the Subunit 21E border to the mouth of the Yukon.

Trappers from the villages of Akiachak, Akiak, and Kwethluk on the lower Kuskokwim River have also reported observing tracks of single or several wolves on the Gweek River and the Kwethluk River in 1989-90. Wolves had not been seen in the Gweek River drainage since the demise of the reindeer industry over 50 years ago.

USFWS biologists observed wolves during aerial surveys of caribou in the Kilbuck Mountains on several occasions in fall 1989 and along the Goodnews-Kanektok drainages during spring 1990. Two wolves were observed feeding on a caribou and moose kill in fall 1988 along the Kisaralik River.

Mortality

Seasons and Bag Limits: The hunting season for wolves in Unit 18 is currently set from 10 August through 30 April and the bag limit is 4 wolves. The trapping season is set from 10 November through 31 March with no maximum bag limit specified.

Harvest:

Human Induced Mortality: Sealing certificate data indicate that the reported Unit 18 harvest of 4 wolves (2 males and 2 females) was substantially lower in 1990 than in 1989 and 1988. Seventeen wolves were reported harvested in Unit 18 during 1988-89, compared to 11 wolves in 1987-88, 2 in 1986-87, 7 wolves in 1985-86, and 3 wolves in 1984-85 (Table 2). The reported wolf harvest had increased abruptly in 1987-88 and 1988-89. The larger documented 1988-89 wolf harvest was likely related to increased availability of wolves and to an active furbuyer offering good prices. The value of wolf pelts to the trapper in Unit 18 has remained relatively stable during the last several years although their value in other parts of Alaska has declined. This decrease in harvest reflects the overall decrease in trapping activity during 1989-90, and the continuing downtrend in fur prices.

We believe that most wolves caught are not sold, and thus not sealed. Wolf ruffs are highly prized as parka trim, and the domestic demand for wolf pelts is considerable. Local residents prefer stiffer home-tanned wolf pelts for hood ruffs. Knowledgeable furbuyers believe that only about one-third to one-half of the wolves harvested are actually sealed. According to trappers, travel conditions during the winter of 1989-90 season were not very good for tracking wolves, which may also explain the low harvest.

Harvest Chronology: Two wolves were taken in March 1990, 1 in February 1990, and 1 in January 1990 (Table 3).

Transport Methods: All 4 wolves were taken by individuals using snowmachines as transportation (Table 4). Of the 4 wolves harvested, 2 were trapped, 1 was snared, and 1 was ground shot.

Natural Mortality: No new information is available on natural mortality of wolves in Unit 18. The period of extremely cold weather in late January and early February 1990 (windchill to -80 degrees F) may have caused some red fox mortality, but trappers reported no observable effects on wolves.

Habitat

Assessment: As mentioned in previous reports, extensive riparian, upland and montane tundra habitats are available to support much larger populations of moose, caribou, and muskoxen in Unit 18. These ungulate populations could in turn support much larger populations of wolves.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers are increasing in Unit 18, presumably in response to moose, caribou and muskox population growth and dispersal. Trappers and furbuyers report that more wolves were observed in more places in Unit 18 than at any time since the 1930s. Wolf numbers are apparently increasing along the entire lower Yukon drainage in Unit 18, and are increasing slightly in the lower Kuskokwim drainage. Wolves are now reproducing in at least 1 location on the lowlands of the Yukon-Kuskokwim Delta between Nelson Island and the Askinuk Mountains.

The current population estimate is 50-75 wolves and 6-7 packs for the Unit. Four wolves were reported harvested in Unit 18 during 1989-90, compared to 17 during 1988-89, and 11 in 1987-88 (Table 2). The annual harvest has ranged from 1-7 wolves in previous years.

Current management strategies in Unit 18 are to increase ungulate numbers. An indirect result of increasing ungulate populations is an increased prey base available to wolves. Although excessive human harvest appears to have been the principal factor limiting ungulate population growth in Unit 18, wolf densities may need to be maintained at sufficiently low levels to allow for maximum growth in ungulate species.

Changes in wolf seasons and bag limits are not recommended at the present time.

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Table 1. Unit 18 fall wolf population estimates[a], 1985-89.

Year	Population estimate[b]	Number of Packs
1985-86	25-50	5-7
1986-87	25-50	5-7
1987-88	25-50	5-7
1988-89	50-75	6-7
1989-90	50-75	6-7

[a] Fall estimate = pre-trapping season population.

[b] Basis of estimate = incidental observations, reports from public, sealing records and trapper questionnaire.

Table 2. Unit 18 wolf harvest, 1985-89.

Regulatory year	Reported harvest			Method of take			Total Successful trappers/hunters
	M	F	Unk.	Trap/snare	Shot	Unk.	
1985-86	1		6	6	1		2
1986-87	2				2		2
1987-88	4	4	3	5	5	1	6
1988-89	11	6					7
1989-90	2	2					2

Table 3. Unit 18 wolf harvest chronology percent by time period, 1985-89.

Year	Harvest periods					n
	November	December	January	February	March	
1985-86	86	14				7
1986-87		100				2
1987-88		9	46	27	18	11
1988-89		29	6	23	42	17
1989-90			25	25	50	4

Table 4. Unit 18 wolf harvest percent by transport method, 1985-89.

Regulatory year	Percent of harvest			n
	3 or 4-Wheeler	Snowmachine	Unknown	
1985-86		100		7
1986-87		100		2
1987-88	9	87	9	11
1988-89		94	6	17
1989-90		100		4

LOCATION

Game Management Units: 19A, 19B, 19C, 19D, 21A, and 21E (60,523 mi^2)

Geographical Description: All drainages of the Kuskokwim River upstream of the village of Lower Kalskag; the drainages of the Yukon River between Paimiut and to, but not including, the Blackburn Creek drainage; and the drainages of the upper Nowitna River upstream of the confluence of the Little Mud and Nowitna Rivers

BACKGROUND

Wolves have long played multiple roles in the area's history. Historically, they provided pelts for clothing of local residents. More recently, wolf harvest has provided income from pelt sales as well as recreational opportunity. Wolves have also competed with man for use of big game animals as food. Monitoring the effects of wolf predation on moose and caribou herds is expensive and time-consuming, and very little monitoring has been done. However, incidental observations by biologists, reports by members of the public, review of wolf harvest reports, and informal interviews with wolf hunters and trappers have resulted in limited data on area wolves.

Because no detailed wolf study has been conducted in this area, no statistically bounded estimates of current population levels or trends are available. Recent harvests were apparently higher than ever, yet wolf numbers appear to have remained stable or increased slightly. Prey densities throughout most of the area are relatively high, leading to good annual production and wolf survival.

Beginning with the 1988 season, several of the most popular wolf hunting areas were closed to aircraft use. This effectively displaced many wolf hunters from previously used areas to Units 19 or 21, and the harvest there increased dramatically. Reinstigation of wolf hunting in some of those previously used units beginning in 1990-91 may lead to reduced harvests in Units 19 and 21.

MANAGEMENT DIRECTION

Management Objectives

- Maintain a harvestable wolf population to sustain an annual harvest of at least 100 wolves, assuming a continuation of current harvest regulations and bag limits.

- Attempt to redirect harvest efforts to those areas where wolf predation significantly affects ungulate populations through calf or adult mortality.
- Refine annual area wolf population estimates based on incidental sightings, hunter interviews, and sealing documents.
- Delineate wolf survey area boundaries in each of the 6 subunits and survey these respective areas beginning in March 1991.

METHODS

Harvest statistics were gathered largely from sealing documents, although Fur Acquisition Reports and Fur Export Reports were also used. Because of the statewide sealing requirement, I assume that more than 95% of the annual wolf harvest from Units 19 and 21 is reported on sealing documents. Conversations with several wolf hunters and trappers contributed further information on wolf pack sizes and territory boundaries. To arrive at population estimates for the various subunits, I listed packs of known size (minimum estimates), plotted harvest locations, and estimated territory boundaries. Based on hunter and trapper interviews and sealing documents, I then estimated mean pack size and mean territory size for each subunit.

We sent questionnaires to 132 active trappers and hunters in Units 19 and 21. Recipients were asked to rate the current year's wolf abundance in their respective areas as either abundant, moderate, or low, and to indicate whether the population was increasing, stable, or declining. Responses were assigned a numeric index value (high or increasing = 9, moderate or stable = 5, low or declining = 1), and a mean index was obtained for both current abundance and trend.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: From analyses of sealing documents, trapper interviews, and incidental observations throughout Unit 19, Subunits 21A, and 21E, I estimated the fall 1989 wolf population at 720-940 individuals in 72-91 packs (Table 1). This, although statistically questionable, represents a 16% increase over the previous year's estimate.

During the past 3 seasons, wolf harvests remained high, although wolf populations did not seem to decline. I assume that annual pup production and survival also remained high, countering the relatively high mortality rate. With prey populations apparently healthy, sustaining the annual harvest at over 100 wolves per year did not decrease wolf numbers.

In an attempt to distribute wolf harvests throughout the area, especially where historic harvests have been low or where substantial ungulate predation is suspected or documented, I remained in contact with hunters and trappers to help redirect their harvest efforts.

Seventy people responded to the Units 19 and 21 trapper questionnaire. A mean wolf abundance index of 5.3 (n = 53) and a mean trend index of 6.2 (n = 43) were calculated from the responses. Overall, this means that respondents feel that wolves were moderately abundant compared to the previous year. These data, coupled with the relatively high wolf harvests in the 1989 regulatory year, suggest that wolf numbers were probably moderately high this report period.

Population Composition: Sex composition was only available from data for harvested wolves. Sex ratios in the harvest did not differ significantly from 1:1 (108 males, 89 females, and 11 wolves of unknown sex). I suspect the population at large also contains nearly equal sex ratios. No information is available on the wolf population's age structure.

Distribution and Movements: Limited information is available on wolf distribution in Unit 19 and Subunits 21A, and 21E. The harvest was well distributed, as were wolf tracks and incidental sightings. Because reasonably good habitat and at least moderate densities of potential ungulate prey exist throughout the area, I suspect wolves are present throughout.

Mortality

Harvest:

Season and Bag Limit.

Method of Harvest	Open Dates	Bag Limits
Trapping	Nov. 1-Mar. 31	No limit
Hunting	Aug. 10-Apr. 30	10 wolves

Human-induced Mortality. Reported harvests from Unit 19 and combined Subunits 21A and 21E were 137 and 71, respectively (Table 2). I have calculated a mean harvest rate of 26-32% for Unit 19 and 16-22% for Subunits 21A and 21E, based on estimated wolf numbers for the area. These relatively high harvest rates were probably because of good flying and tracking conditions, slightly improved pelt prices, and increased hunter effort. However, the high apparent harvest rates could also be because of a lower than actual population estimate. The prohibition of SDA wolf hunting in most of southcentral Alaska diverted many hunters to Interior units.

Although the trend in Unit 19 harvest declined from 1971 to 1983, harvests rebounded over the next 6 years. I suspect that SDA wolf hunting regulations will become more restrictive and will probably cause the harvest to decrease in years to come.

The sex of wolves harvested, method of take, and average take per trapper are shown in Table 3.

Hunter Residency. In Unit 19 and Subunits 21A and 21E, 63 wolves (30%) were reported harvested by local residents, 138 (66%) by nonlocal Alaskans, and 7 (3%) by nonresident hunters. The majority of the harvest by nonresidents was incidental take while hunting for other big game species. At least 1 guided hunt specifically for wolves occurred in winter 1989.

Harvest Chronology. As in previous years, the majority of the wolf harvest occurred in late winter (Table 4). During the 1989 regulatory year, only 37 of 208 wolves (18%) were taken between August and December. The highest reported harvests occurred in March (54%), January (14%), and February (12%).

Transport and Harvest Methods. No significant differences were noted when comparing the 1989 harvest and transport methods with previous years. In 1989, 81% of the harvest was taken by shooting from the ground. However, aircraft were used to access 82% of the wolves harvested.

Other Mortality: No information is available regarding natural wolf mortality in the area, but it is suspected as quite low.

CONCLUSIONS AND RECOMMENDATIONS

Although reported wolf harvests in the area remained at historically high levels, indications were that wolf harvest rates were not high enough to cause long-term declines in the population. Close contact with area hunters and trappers will continue. Apparently, rumors regarding SDA hunting restrictions and increased enforcement of the Federal Airborne Hunting Act have spread, causing a decline in the number of hunters participating in that type of hunting. This may decrease wolf harvest during the 1990-91 seasons.

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Management Coordinator

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Table 1. Unit 19, 21A, and 21E fall wolf population combined estimates[a], 1985-89.

Regulatory year	Population estimate[b]	Number of packs	Wolves/pack
1985	660-780	110-129	5.4
1986	670-780	107-136	5.4
1987	665-770	76-95	7.6
1988	710-815	72-88	8.6
1989	720-940	72-91	9.2

[a] Fall estimate = pre-trapping season population based on incidental observations, reports from public, sealing records, and trapper questionnaire.
[b] Includes wolves in packs plus lone wolves (approx. 10% of estimated population).

Table 2. Unit 19, 21A, and 21E wolf harvest by subunit, 1985-89.

Regulatory	Unit 19					Subunits 21A & E			
year	A	B	C	D	Subtotal	A	E	Subtotal	Total
1985	2	2	5	31	40	12	3	15	55
1986	8	16	22	29	75	17	0	17	92
1987	60	52	12	14	142[a]	34	31	65	207
1988	6	32	40	32	110	31	40	71	181
1989	28	46	41	22	137	66	5	71	208
5-yr mean	21	30	24	26	101	32	16	48	149

[a] Includes 4 wolves not identified to subunit.

Table 3. Unit 19, 21A, and 21E wolf harvest by sex, method of take, and average per trapper, 1985-89.

Regulatory year	Sex			Method of take			Total	Wolves/trapper
	M	F	Unk	Trap	Shot	Unk		
1985	26	29	0	24	31	0	55	2.2
1986	50	38	4	24	68	0	92	4.2
1987	110	92	5	27	178	2	207	3.8
1988	82	61	38	14	167	0	181	3.6
1989	108	89	11	38	169	0	208	3.4

Table 4. Unit 19, 21A, and 21E wolf harvest chronology, 1985-89.

Regulatory year	Harvest Periods									Total
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
1985	0	2	0	2	11	14	21	5	0	55
1986	0	1	0	8	5	5	38	34	1	92
1987	1	5	0	4	9	27	51	92	18	207
1988	2	3	1	5	7	16	12	121	2	169[a]
1989	1	8	0	7	23	30	25	111	3	208
5-year average[b]	0.8	4.8	0.2	5.2	11.0	18.4	29.4	72.6	4.8	146
Mean as % of total[c]	0.5	3.3	0.1	3.5	7.5	12.5	20.0	49.3	3.3	--

[a] Does not include 12 wolves for which month of harvest was unknown.
[b] Rounded to nearest whole number.
[c] Average monthly harvest as % of total harvest for which month of harvest was known.

LOCATION

Game Management Units: 20A, 20B, 20C, 20F, and 25C (39,231 mi^2)

Geographical Description: Lower Tanana Valley, Middle Yukon Valley

BACKGROUND

Public perceptions of wolves in interior Alaska vary. Wolves are an important furbearing resource to trappers. They are viewed as competitors by some big game hunters, and they represent wilderness to people who otherwise express little interest in wildlife or wildlife management.

Since 1915 when Alaska's first territorial legislature established a bounty on wolves, government management of wolves has varied almost as dramatically as public opinion. From 1948 to 1959, the federal government used poison, aerial shooting, and trapping to reduce wolf numbers. Before 1960 there were no public restrictions on taking wolves.

State management of wildlife began in 1959 and wolves were classified as furbearers in 1960. The use of poisons to control wolves was discontinued in 1960. The Board of Game additionally classified wolves as big game animals in 1963, but did not dismantle the bounty system until 1968.

Recently, wolf management in interior Alaska has been increasingly conservative, but since 1967 the Board of Game has authorized periodic wolf control programs to benefit specific prey populations. Successful programs (Table 1) conducted in these subunits in the mid-1970s and early 1980s resulted in increased moose and caribou populations (Gasaway et al. 1983).

Currently, only the wolf predation control program for Subunit 20B is in effect. Wolf removals for this area last occurred in winter 1985-86. Board approval would be required to remove additional wolves. There are no plans to request such action. The program was retained because it contained long-term management objectives which were not completely met. We are monitoring moose population growth and wolf population recovery. The program expires on 24 April 1991 unless renewed.

In November 1987 the Board of Game eliminated SDA wolf hunting in Subunits 20A, 20B, 20C, and 20F. Subunit 25C remained open to SDA hunting, but a bag limit of 10 wolves was imposed on hunters.

MANAGEMENT DIRECTION

In October 1990, a 12-member citizen's advisory committee on wolf management (the Alaska Wolf Management Planning Team) was appointed by the Director of the Division of Wildlife Conservation to provide ADF&G with recommendations on wolf management throughout the state. A broad spectrum of wolf management philosophies is represented. The planning team held several public meetings in 1990 and 1991 and will present its final recommendations to the Board of Game in November 1991. Future management actions will be guided by the planning team's recommendations. Therefore, management goals and objectives for these subunits may change.

Management Goals

To maintain populations of wolves and their prey at levels that will allow opportunities for both consumptive and nonconsumptive uses of wolves and their prey by humans.

Management Objectives

Establish estimates of population size based on aerial surveys for wolves in all subunits of the management area by 1993.

Use wolf and ungulate population estimates, combined with literature and survey data on predation rates, to derive models of potential impacts wolf predation has on ungulates in each subunit in the management area by 1993.

Determine wolf population objectives which will reasonably meet public needs for consumptive and nonconsumptive uses of wolves and their prey in all subunits of the study area by 1993.

METHODS

Sealing certificates provided wolf harvest documentation and estimates of pack sizes and locations from which wolves were harvested. In Subunit 20C, the National Park Service conducted intensive wolf studies within Denali National Park and Preserve (DNPP). Density estimates from those studies were used to estimate wolf numbers in Subunit 20C.

No aerial surveys were completed in the management area in spring 1990. In March and April 1991, 2 different census techniques were applied to western Subunit 20B. The first was the standard track count survey where wolf numbers were estimated from wolves seen or tracks encountered during 5 days of searching by up to 3 aircraft per day (Stephenson 1978). The second technique was based on 7 systematic samples, each consisting of 5 line transects (Becker and Gardner 1990). Three aircraft completed the sampling of line transects in 1 day.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: In March 1989, the Subunit 20A wolf population was estimated at 149 wolves in 21 packs. Among 13 packs monitored in the DNPP wolf study in 1989 in Subunit 20C, pup production and survival to fall averaged 4.0 pups per pack. If that rate of pup production was also realized by wolf packs in adjacent Subunit 20A, the fall 1990 Subunit 20A population may have contained 233 wolves. However, there are no data documenting Subunit 20A pup recruitment during 1989 and, despite significant growth potential, the Subunit 20A wolf population did not increase in the previous 4 years, 1985-88 (McNay 1990a).

In their Denali study area in Subunit 20C, Mech et al. (1989) estimated a fall 1989 population of 137 wolves at a density of 1 wolf per 39 mi^2 (10.0 wolves/1,000 km^2). The 1988 density estimate was 1 wolf per 44 mi^2 (8.7 wolves/1,000 km^2), suggesting a 17% increase in wolf densities between fall 1988 and fall 1989 in the Denali study area.

Fall 1989 wolf population estimates for Subunits 20B, 20C, 20F, and 25C are unchanged from those of 1988 (Table 2). The most recent estimate of fall wolf numbers in Subunit 20B was 143-163 wolves for fall 1987. Haggstrom (1987) based that estimate on trapper reports, radio-collared wolves in western Subunit 20B, and aerial surveys conducted as part of a wolf control program in 1985 and 1986. He believed the 1984 precontrol population was 180-220 wolves.

A thorough census of wolves in a 3,412 mi^2 (8,840 km^2) area of western Subunit 20B was completed on 1 April 1991. Preliminary analysis of those results suggested density was 1 wolf per 55-64mi^2 (6-7 wolves/1,000 km^2). Applying that density estimate to the entire subunit resulted in an estimated spring population of 141-165 wolves in Subunit 20B. Because the harvest records for regulatory year 1990 were incomplete when this report was written, a fall 1990 estimate was unavailable. However, if the 1990 harvest in Subunit 20B is similar to harvests during the previous 2 years, then the fall 1990 wolf population would have been 175-200 wolves.

Mortality

Harvest:

Season and Bag Limit. The 1989 regulatory year hunting season extended from 10 August through 30 April. The trapping season extended from 1 November through 31 March. There was no limit on the number of wolves that could be taken, except in Subunit 25C where the bag limit under a hunting license was 10 wolves. Wolves could

not be taken SDA under a hunting license and could not be taken SDA with a firearm under a trapping license.

Board of Game Actions and Emergency Orders. In November 1989, the Board of Game reauthorized SDA wolf hunting in Unit 20, effective 1 July 1990. A registration and tagging system will be required to track SDA wolf harvest and the number of SDA hunters more accurately. However, SDA wolf hunting will be prohibited in National Park Preserves. Therefore, that portion of Subunit 20C within DNPP will remain closed to SDA wolf hunting.

Hunter/Trapper Harvest. During the 1989 regulatory year, hunters and trappers reported a combined harvest of 104 wolves from Subunits 20A, 20B, 20C, 20F, and 25C (Table 3). This is higher than the 1988 harvest (83) and the 1983-88 mean annual harvest (60). However, the increasing harvest trend for the combined area (Table 4) was largely the effect of ADF&G's predator control program on wolf availability in Subunit 20B during and immediately following removal efforts in 1985 and 1986 (Table 1). Wolf harvest in Subunit 20A, where predation control ceased in 1982, appears to have stabilized in the low 30s since 1985 (Table 4). A similar situation may be developing in Subunit 20B.

The proportion of the wolves harvested by shooting has increased despite prohibition of SDA hunting of wolves in Unit 20 during regulatory years 1988 and 1989. The proportion of the harvest attributed to trapping and snaring declined from 83% and 81% for regulatory years 1987 and 1988, respectively, to 68% during regulatory year 1989 (Table 3).

Harvest Chronology. The harvest distribution among the August-October, November-January, and February-April time periods was 15%, 42%, and 42%, respectively, for regulatory year 1989 (Table 4). This 1989 distribution compares with a 1983-88 mean annual distribution of 7%, 54%, and 39% among the respective periods. Wolves taken by ADF&G personnel under predator control programs from 1983 to 1985 were not included in this comparison.

Transport Methods. Transport methods were not reported on fur sealing certificates before 1985. Since 1985, snowmachines were consistently reported as the most common transport method. From 1985 to 1988, 59% of the harvest was taken with the aid of snowmachines, 24% with airplane transport, 9% by dog team or on foot, and 8% by other means. In regulatory year 1989, hunters/trappers used snowmachines and airplanes in taking 46% and 27% of the harvest, respectively (Table 5).

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers appear to be stable or increasing in all subunits of the management area. Wolf harvests in the 1990 regulatory year are expected to be higher than during recent

years because SDA hunting of wolves was reauthorized. In western Subunit 20B, where 58 wolves were killed in a predator control program in 1984 and 1985, a census of wolves was completed in April 1991. Preliminary estimates from that census suggest wolves had recovered to precontrol numbers by fall 1990.

Intensive monitoring of 13 wolf packs in DNPP (Mech et al. 1989) documented a 17% increase in wolf densities in that portion of Subunit 20C between fall 1989 and fall 1990. Aerial surveys were not completed in Subunits 20A, 20F, or 25C since the last report. Therefore, fall 1988 wolf population estimates for those subunits remain unchanged (McNay 1990a).

Management objectives, as outlined in the previous report (McNay 1990a) were met. In Subunit 20A, wolf population size was estimated in March 1989, and the impact of wolf predation upon the Subunit 20A moose population was analyzed and presented in a report (McNay 1990b). A population size estimate in Subunit 20B was made in March and April 1991. Potential impacts of wolf predation on moose in Subunit 20B will be presented in the moose management report scheduled for spring 1992.

I recommend an aerial survey to estimate wolf numbers be completed in Subunit 20A in regulatory year 1991. Wolf surveys are also planned in the Steese/White Mountains National Recreation Area (Subunit 25C) in cooperation with the Bureau of Land Management.

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Table 1. Wolves killed during control programs in Subunits 20A and 20B, 1975-89.

	Subunit 20A				Subunit 20B			
Regulatory year	Public general[a]	Public permit[b]	Dept. staff[c]	Total	Public general[a]	Public permit[b]	Dept. staff[c]	Total
1975	78	--[d]	67	145	36	--[e]	--[e]	36[f]
1976	26	--[d]	27	53	11	--[e]	--[e]	11[f]
1977	4	--[d]	39	43	18	--[e]	--[e]	18[f]
1978	12	--[d]	18	30	14	--[e]	--[e]	14[f]
1979	11	0	3	14	14	3	--[g]	17
1980	11	2	0	13	15	17	15	47
1981	12	7	20	39	26	4	2	32
1982	10	4	--[g]	14	22	9	32	63
1983	24	--[e]	--[e]	24	15	--[d]	3	18
1984	23	--[e]	--[e]	23	14	--[d]	26	40
1985	24	--[e]	--[e]	24	25	--[d]	32	57
1986	37	--[e]	--[e]	37	6	--[d]	--[h]	6
1987	36	--[e]	--[e]	36	18	--[d]	--[h]	18
1988	32	--[e]	--[e]	32	34	--[d]	--[h]	34
1989	31	--[e]	--[e]	31	35	--[d]	--[h]	35
Total	371	13	174	558	303	33	110	446

[a] Public hunting/trapping other than under aerial shooting permit.
[b] Public permit to take wolves by aerial shooting from fixed-wing aircraft.
[c] Trapping/snaring and aerial shooting.
[d] Control authorized, but not open to public aerial shooting.
[e] Control not authorized.
[f] Harvest does not include wolves harvested in adjacent areas that became part of Subunit 20B during regulatory year 1981 as a result of subunit boundary changes by the Board of Game.
[g] Control authorized, but ADF&G personnel not involved.
[h] Monitoring program remains in effect, but additional control of wolves not authorized.

Table 2. Subunits 20A, 20B, 20C, 20F, and 25C fall wolf population estimates, 1985-89.

Subunit	Year	Population estimate[a]	Number of packs	Basis of estimate
20A	1985	195	26	Aerial survey, trapper interviews
	1986	220-240	25-30	Extrapolation from previous year
	1987	200-230	25-30	Extrapolation from previous year
	1988	183	21	Aerial survey, trapper reports, radio collars
	1989	180-220	20-25	Extrapolation from previous year
20B	1985	168	25	Aerial survey, radio collars
	1986	140-180	21-27	Extrapolation from previous year
	1987	140-180	21-27	Extrapolation from previous year
	1988	140-180	21-27	Extrapolation from previous year
	1989	150-225	20-25	Extrapolation from previous year
20C	1985	120-140	20-25	Density extrapolation from 20B
	1986	120-140	20-25	National Park Service study and extrapolation
	1987	100-120	20-25	National Park Service study and extrapolation
	1988	180-220	20-25	National Park Service study and extrapolation
	1989	175-225	20-25	National Park Service study and extrapolation
20F	1985	60-100	10-15	Density extrapolation from 20B
	1986	60-100	10-15	Density extrapolation from 20B
	1987	60-100	10-15	Density extrapolation from 20B
	1988	80-120	15-30	Density extrapolation from 20C
	1989	75-110	15-30	Density extrapolation from 20C
25C	1985	--	--	
	1986	50-60	8-10	Density extrapolation from 20B
	1987	50-60	8-10	Density extrapolation from 20C
	1988	60-100	15-30	Density extrapolation from 20C
	1989	75-110	15-30	Density extrapolation from 20C

[a] Includes an additional 10% to account for wolves not in packs.

Table 3. Subunits 20A, 20B, 20C, 20F, and 25C wolf harvest, 1985-89.

Subunit	Regulatory year	Reported harvest			Method of take			Wolf control	Successful
		M	F	Unk	Trap/ snare	Shot	Unk		Total trappers/hunters
20A	1985	--	--	--	17	7	0	0	--
	1986	--	--	--	33	3	1	0	--
	1987	19	13	4	30	5	1	0	20
	1988	17	11	4	23	9	0	0	19
	1989	20	10	1	21	9	1	0	17
20B	1985	--	--	--	20	5	0	32	--
	1986	--	--	--	5	1	0	0	--
	1987	8	10	0	17	1	0	0	12
	1988	20	13	1	31	3	0	0	17
	1989	18	16	1	28	6	1	0	21
20C	1985	--	--	--	6	0	0	0	--
	1986	--	--	--	1	2	0	0	--
	1987	7	5	1	8	3	2	0	9
	1988	5	4	0	8	1	0	0	5
	1989	8	8	1	11	5	1	0	10
20F	1985	--	--	--	2	0	0	0	--
	1986	--	--	--	2	0	0	0	--
	1987	1	1	3	1	4	0	0	3
	1988	2	3	0	5	0	0	0	4
	1989	10	2	2	11	2	1	0	8
25C	1985	--	--	--	2	0	0	0	--
	1986	--	--	--	0	1	1	0	--
	1987	5	5	0	10	0	0	0	4
	1988	2	1	0	0	3	0	0	2
	1989	3	4	0	0	7	0	0	2

Table 4. Subunits 20A, 20B, 20C, 20F, and 25C wolf harvest chronology, 1985–89.

Subunit	Regulatory year	Harvest periods			n
		Aug-Oct	Nov-Jan	Feb-Apr	
20A	1985	2	11	11	24
	1986	0	24	9	33
	1987	3	22	11	36
	1988	4	11	17	32
	1989	8	13	10	31
20B	1985	1	9	15	25
	1986	0	5	1	6
	1987	0	9	9	18
	1988	2	27	5	34
	1989	4	18	13	35
20C	1985	0	3	3	6
	1986	0	3	0	3
	1987	2	8	2	12
	1988	1	10	0	11
	1989	0	8	9	17
20F	1985	0	1	1	2
	1986	0	1	1	2
	1987	0	2	3	5
	1988	0	1	3	4
	1989	2	5	7	14
25C	1985	0	1	1	2
	1986	0	0	1	1
	1987	0	9	1	10
	1988	0	1	2	3
	1989	2	0	5	7

Table 5. Subunits 20A, 20B, 20C, 20F, and 25C wolf harvest by transport method, 1985-89.

Subunit	Regulatory year	Airplane	Dogsled, skis, snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	Horse	n
20A	1985	7	8	0	0	5	0	0	4	0	24
	1986	5	0	0	2	28	0	0	0	0	35[a]
	1987	9	1	0	1	24	0	1	0	0	36
	1988	14	0	0	0	17	1	0	0	0	32
	1989	4	0	0	1	17	0	3	5	1	31
20B	1985	5	1	0	0	14	0	2	3	0	25[b]
	1986	2	0	0	0	4	0	0	0	0	6
	1987	2	0	0	0	16	0	0	0	0	18
	1988	5	0	1	1	26	0	1	0	0	34
	1989	9	0	1	0	15	1	5	0	4	35
20C	1985	0	3	0	0	2	0	1	0	0	6
	1986	0	2	0	0	1	0	0	0	0	3[c]
	1987	3	0	0	3	5	0	1	1	0	13
	1988	3	0	1	2	2	0	1	0	0	9[c]
	1989	9	0	0	0	7	0	0	0	1	17
20F	1985	0	0	0	0	0	0	0	0	0	0
	1986	0	2	0	0	0	0	0	0	0	2
	1987	3	1	0	0	1	0	0	0	0	5
	1988	0	0	0	0	4	0	1	0	0	5
	1989	0	0	2	0	7	0	0	0	5	14
25C	1985	0	1	0	0	0	0	0	1	0	2
	1986	0	0	0	0	0	0	1	0	0	1
	1987	0	4	0	0	6	0	0	0	0	10
	1988	2	1	0	0	0	0	0	0	0	3
	1989	5	0	0	2	0	0	0	0	0	7

[a] Excludes 1 Denali National Park wolf.
[b] Excludes 28 wolves taken by ADF&G.
[c] Excludes 2 Denali National Park wolves.

LOCATION

Game Management Unit: 20D (5,720 mi^2)

Geographical Description: Central Tanana Valley near Delta Junction

BACKGROUND

Wolves are present throughout Subunit 20D, where their primary prey species are moose and caribou. The current population size is unknown. However, wolf numbers are probably increasing (Table 1).

Wolf and prey numbers were high in Subunit 20D during the 1960s. The wolf population was estimated at 200-250 at that time. Moose populations began declining in the mid-1960s and a wolf reduction program was authorized in 1979 to increase moose numbers (ADF&G 1984). This program included issuing aerial shooting permits to the public. From fall 1979 to spring 1983, trappers, ADF&G staff, and hunters with permits for aerial shooting eliminated 105 wolves from Subunit 20D. Most wolves were taken in southern and eastern Subunit 20D (ADF&G 1983).

MANAGEMENT DIRECTION

Management Goals

The primary and secondary wolf management goals are to provide an optimum wolf harvest and to provide the greatest opportunity to participate in hunting and trapping wolves (ADF&G 1976).

Management Objectives

Manage the number of wolves to sustain a prey:wolf ratio of at least 30 moose-equivalents per wolf going into winter.

METHODS

Spring wolf surveys were flown with a Piper PA-18 Super Cub at altitudes of 300-500 feet above ground. When wolf tracks were located and followed. When possible, the pack was located to determine the number and color of its members. Observations of wolves and their tracks were recorded on topographic maps to determine pack territory boundaries. Wolf observations by trappers and local pilots were also plotted to

corroborate survey information. Wolves harvested by trappers and hunters were sealed at ADF&G. These wolves, as well as wolves killed by other means, were then added to the number of wolves seen during spring surveys to calculate population estimates for the previous fall.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Aerial surveys were flown for 14.7 hours on 19-21 March 1990. The survey was not completed because of poor weather, inadequate snow conditions, and lack of aircraft. This amount of survey effort was not sufficient to adequately estimate the wolf population size.

Southern Subunit 20D. Surveys were flown for 11.8 hours in Subunit 20D south of the Alaska Highway on 20-21 March. Twenty—three wolves were observed in the Robertson River, Independent Ridge, Macomb, and Jarvis packs (Table 2). In addition, interviews with local trappers and pilots indicated that 5 wolves (Barley pack) occupied territory between the Alaska Highway and the Tanana River in March 1990. These data, plus a 9% correction factor for lone wolves, resulted in an estimate of 31 wolves in southern Subunit 20D for March 1990. Adding wolves trapped in southern Subunit 20D in winter 1989-90 resulted in a fall 1989 estimate of 34 wolves for southern Subunit 20D.

An additional pack of 10 or more wolves was tracked along the Delta River from Unit 13 into southern Subunit 20D on 21 March 1990. This pack was too large to be either the Jarvis Creek pack from southwest Subunit 20D or the 100 Mile pack from southeast Subunit 20A. Two reliable reports in fall 1990 suggested that this pack remained in the Granite Mountains area and contained approximately 15 wolves. Because these wolves were not observed in Subunit 20D before spring 1990, they were not included in the fall 1989 population estimate.

Northern Subunit 20D. The Black Mountain pack (7-8 wolves) was observed during 2.9 hours of survey in Subunit 20D north of the Tanana River on 19 March 1990. Other sources suggested that 2 additional packs totaling 8 wolves existed in the Billy Creek and Shaw Creek drainages (Table 2).

Because 1990 survey data were inadequate, I derived a fall 1990 population estimate of 59-75 wolves by extrapolating the fall 1989 estimate of 54-68 wolves. This extrapolation assumed that wolves in northern Subunit 20D increased at the same 10% rate as wolves in adjacent and similar Subunit 20E.

Distribution and Movements: One black male pup was radio—collared on 25 April 1990 as part of a research project conducted on the Macomb Plateau. This pup was with 1

additional black and 4 gray wolves. The radio–collared wolf was found between Plateau Lake and the head of the Little Gerstle River during 11 monitoring flights in May and June 1990 and during 1 flight on 9 October 1990. Four of the May and June sightings were near a den site 2.5 miles southwest of Plateau Lake.

Mortality

Harvest:

Season and Bag Limit. The wolf hunting season was open from 10 August to 30 April. The wolf trapping season was open from 1 November to 31 March. There was no limit on the number of wolves that could be taken by either method.

Human-induced Mortality: The reported kill from 1 July 1989 to 30 June 1990 consisted of 2 male and 4 female wolves. This was a significant decrease from the 21 wolves harvested in the 1988-89 season (Table 3) and the 1984-88 mean annual harvest of 20 wolves. The lower harvests 1987 and 1989 were largely because of the absence of 2 of Subunit 20D's more effective wolf trappers. Snares were used to take 4 of the 6 wolves. The remaining 2 were shot by hunters.

Harvest Chronology and Transport Methods. Most of the harvested wolves were taken in December and March (Table 4). Snowmachines continued as the most common transportation mode used by trappers and hunters who harvested wolves (Table 5).

CONCLUSIONS AND RECOMMENDATIONS

The wolf population appears to be increasing in southern Subunit 20D, based on comparative pack size information for the Jarvis Creek, Macomb, and Robertson River packs and the appearance of a new pack near the Delta River. An increase in wolves in northern Subunit 20D is also inferred from its similarity to adjacent Subunit 20E, where a 10% increase has been observed. Wolf harvests have been light in both portions of Subunit 20D and presumably had no negative effect on population growth.

Without precise estimates of wolf or moose numbers, it is difficult to determine whether the management objective of maintaining at least 1 wolf:30 moose equivalents is being met. I feel that the objective is probably being met in southern Subunit 20D; however, it is probably not being met in northern Subunit 20D where moose are less numerous. A reduction in both wolf and bear numbers is probably necessary to accomplish both wolf and moose management objectives in northern Subunit 20D. We will try to improve the area's data quality.

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Table 1. Subunit 20D fall wolf population estimates[a], 1985-89.

Year	Population estimate	Number of packs	Basis of estimate[b]
~~1985~~	39 - 65	12	1, 2, 4, 6
1986	60 - 80	10 - 13	2, 6
1987	60 - 80	10 - 12	2, 4, 6
1988	85 - 105	12 - 15	1, 2, 4, 6
1989	94 - 113	13 - 15	1, 2, 3, 4, 5, 6

[a] Fall estimate = pre-trapping season population.
[b] 1 = aerial surveys, 2 = trapper/hunter reports, 3 = radio telemetry, 4 = sealing certificates, 5 = density extrapolation, 6 = miscellaneous observations.

Table 2. Wolf packs, locations, estimated size, and source of information for Subunit 20D, March 1990.

Pack name	Location	Pack size	Source
Southern Subunit 20D			
Jarvis	Jarvis Creek	6	1990 aerial survey
Macomb	Macomb Plateau	6	1990 aerial survey
Robertson River[a]	Robertson River	9	1990 aerial survey
Independent Ridge	Independent Ridge	2	1990 aerial survey
Barley	Delta Agricultural Project	5	1990 interviews
100 mile[b]	Upper 100 mile Creek, Donnelly Dome	10-15	
Northern Subunit 20D			
Billy Creek[a]	Billy Creek	6	1990 aerial survey
Healy River	Healy River	10+	1989 aerial survey
Volkmar	South Fork Goodpaster, Volkmar River	13	1989 aerial survey
Shaw Creek	Shaw Creek Flats	2	1990 interview
Central Creek	Central Creek	5-6	1989 aerial survey
Black Mountain	Eisenmenger Fork, Upper Central Creek	7-8	1990 aerial survey
Eisenmenger[a]	Upper Eisenmenger Fork	3	1989 aerial survey
Indian Creek[b]	Indian Creek	5-6	1989 interview

[a] Packs with the majority of their territories inside Subunit 20D, but with territories that extend outside Subunit 20D.
[b] Packs with the majority of their territories outside Subunit 20D, but with territories that extend inside Subunit 20D.

Table 3. Subunit 20D wolf harvest, 1985-89.

Regulatory year	Reported harvest			Estimated harvest		Method of take				
	M	F	Unk	Unreported	Illegal	Trap/snare	Shot	L&S[a]	Unk	Total
1985	17	10	1	0	0	19	0	9	0	28
1986	11	7	0	0	0	18	0	0	0	18
1987	5	7	0	0	0	11	1	0	0	12
1988	5	12	4	0	0	20	1	0	0	21
1989	2	4	0	0	0	4	2	0	0	6

[a] L&S (Land and Shoot) refers to animals taken by hunters the same day hunters were airborne.

Table 4. Subunit 20D wolf harvest chronology, 1985-89.

Regulatory year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	n
1985	0	0	0	4	3	4	5	8	2	2	28
1986	0	0	0	0	2	8	2	6	0	0	18
1987	1	0	0	4	0	1	6	0	0	0	12
1988	0	0	0	0	5	5	10	0	1	0	21
1989	0	1	0	0	3	0	0	2	0	0	6

LOCATION

Game Management Unit: 20E (11,000 mi^2)

Geographical Description: Fortymile, Ladue, and Charley River drainages

BACKGROUND

For purposes of wildlife management, land status in Subunit 20E is relatively simple. The Yukon-Charley Rivers National Park and Preserve, established in 1980, occupies the entire Charley River drainage and many smaller drainages into the south bank of the Yukon River downstream from Eagle. The Bureau of Land Management manages the Fortymile Wild and Scenic River corridor also created in 1980. The remainder of Subunit 20E is largely unreserved federal land, Native corporation land selections, and state land.

Wolf numbers have fluctuated widely in Subunit 20E in response to both significant changes in ungulate prey abundance and to federal and state wolf control programs (Boertje et al. 1987). According to long-time area residents wolves were relatively abundant in the late 1940s even though the Fortymile Caribou Herd (FCH) reportedly declined to only 10,000 from a high of several hundred thousand in the 1920s (Valkenburg and Davis 1987). Moose were also uncommon by the late 1940s.

The federal government initiated an intensive wolf control effort in 1948 which continued with minor interruptions until 1959. This control effort, involving the use of poison, killing pups at dens, year-round trapping, and aerial shooting by federal predator control agents, reduced wolf numbers to low levels. This program resulted in dramatic increases in numbers of caribou and moose to which the wolves responded by rapidly increasing in numbers during the 1960s (Fig. 1).

In the mid-1960s, caribou and moose populations began to decline steadily. The caribou decline continued into the mid-1970s and the moose decline into the 1980s, greatly reducing prey biomass available to wolves (Fig. 2). By 1974, prey biomass/wolf had declined to about 5% of its former availability (Table 1), and the estimated population of about 600 wolves declined precipitously (Figs. 1 and 2). The FCH began to increase when wolf numbers declined (Valkenburg and Davis 1987). However, the effects of grizzly bear and wolf predation on moose are believed to have maintained the moose population decline into the 1980s (Boertje et al. 1987).

Several incidences of interpack strife and cannibalism among wolves were noted and reported by area trappers in the early 1970s. This supports the hypothesis that food stress caused the dramatic wolf population decline. Within 2 years (1974-76), the wolf

population plummeted to one-third or less of its pre-1974 level (W. Gasaway, unpubl. data).

Wolf numbers then remained stable until late winter 1981-82 when an (ADF&G) wolf control program began in a 3,000 mi^2 area in southern Subunit 20E. Gasaway et al. (1986) summarized the effects of this program. During 1981-82, wolves in Subunit 20E had an estimated 6,900 kg (15,212 lbs) of prey biomass available per wolf, but after the wolf population reductions the estimated prey biomass available per wolf increased 43% by fall 1982 (Table 1). According to W. Gasaway and R. Boertje (unpubl. data), ovarian activity among female wolves compared before and after the control program suggested greater fertility after the ADF&G wolf control effort.

Caribou censuses after the wolf reduction indicate the FCH increased its growth rate coincident with the 1981-83 wolf control effort in southern Subunit 20E (Valkenburg and Davis 1987). Moose numbers in the control area stopped declining after wolf reduction but have increased only about 5% annually between 1981 and 1988 (Fig. 1). Wolf numbers in the control area increased to 90% of the precontrol level by fall 1987 despite heavy annual harvests. Across Subunit 20E estimates of wolf numbers were greater in fall 1986 than before wolf control, presumably because of the increased available caribou biomass.

Subunit 20E is increasingly popular as a moose and caribou hunting area once again despite the moose shortage. Local hunters have traditionally hunted in this area. Statewide loss of hunting opportunity as a result of the Alaska National Interest Lands Conservation Act of 1980 has raised the profile of Subunit 20E for nonlocal hunters as well. Despite increasing interest in Subunit 20E, low ungulate densities and predation by grizzly bears and wolves necessitate conservative ungulate hunting regulations which restrict human-use and contribute to allocation controversies between local and nonlocal hunters.

Furthermore, depleted big game populations in Subunit 20E are aggravating to thousands of Alaskan visitors traveling the Taylor Highway each year hoping to view wildlife. With the exception of the concentrated road crossing of FCH caribou in October and November when virtually no tourists are present, viewing opportunities for nonconsumptive enjoyment of big game species are extremely limited in Subunit 20E.

MANAGEMENT DIRECTION

Management Goals

- Provide for an optimum harvest of wolves
- Provide the greatest opportunity to participate in hunting and trapping wolves.

Management Objectives

- Monitor wolf numbers and population characteristics, through aerial surveys and radio-telemetry, and monitor harvests through sealing records and trapper questionnaires.
- Manage to temporarily reduce wolf numbers to less than 100 by 1993.
- Manage wolves thereafter to maintain ungulate population size and sustained yield objectives. Ungulate habitat limitations will ultimately determine desired ungulate population sizes which can be managed through regulation of the wolf population and annual ungulate harvests.

METHODS

Estimating Wolf Population Size

Extensive aerial wolf surveys were flown annually in March and April to estimate late winter population size on the basis of wolves and wolf tracks observed (Stephenson 1978, Gasaway et al. 1983). The number, size, and location of individual wolf packs were also noted and mapped (Fig. 3). Estimates of wolf numbers were corrected upward by 10% to account for lone wolves present but not found (Mech 1973). All wolf packs having territories wholly or partially in Subunit 20E were included in the estimate. Previous attempts to adjust the estimate for "border" packs resulted in greater accuracy but confused some people.

Population size estimates for the preceding fall were calculated by correcting the late winter estimate upward by adding the number of wolves harvested in the earlier trapping season (pre-March), observed fall pack sizes, and reliable pilot and trapper reports.

Determining Wolf Population Characteristics

For the past 8 years, wolves in Subunit 20E were captured by aerial darting, trapping, or live-snaring, and fitted with radio collars. Radio-collared wolves were located incidental to other work throughout the year. Observations allowed more accurate determinations of seasonal pack size, territory and location, and pup survival. No wolf packs in Subunit 20E had radio-collared members this report period.

Harvest Monitoring

An official ADF&G seal must be attached to all wolves taken in Alaska. During the sealing process, information is obtained on specific location of take, sex, color of pelt, estimated size of the wolf pack, methods of take, and transportation used. While Fur Export Reports are required for wolves shipped out of Alaska, most wolf pelts are

marketed within Alaska. For that reason Fur Export Reports provide unreliable estimates of harvest for this species.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Twenty-one hours of intensive aerial wolf surveys were split between Unit 12 and Subunit 20E in March and April 1990. Wolf and wolf track observations were made incidental to caribou and moose surveys in fall 1989. Numerous reports were received from reliable pilots and trappers throughout winter 1989-90.

Wolf numbers apparently increased in Subunit 20E since the last report period (Table 2). The fall 1989 and spring 1990 estimates were 205 and 157, respectively. During fall 1989, wolf numbers in the control area (southern Subunit 20E and northern Unit 12) was estimated at 125. This was the highest population estimate ($\underline{n}$ = 116) since the control effort began in 1981. The moose population is now over 50% larger, although density remains low (<0.4/mi^2), and the caribou herd is 120% larger than in 1981. I expect wolf reproduction/survival to improve at some higher prey density and result in more rapid wolf population growth.

Mortality

Harvest:

Season and Bag Limit.

Hunting:	
Units 11-13, 20, 22, 25(A), and 26	Aug. 10-Apr. 30
No limit. No hunting same day airborne in Subunit 20E.	
Trapping:	
Units 12 and 20(E)*	Oct. 1-Apr. 30
No limit	

* Only 3x or larger snares may be used during October, March, and April. Steel traps and smaller snares are not permitted during these months.

Hunter/Trapper Harvest. Fifteen wolves were taken in Subunit 20E during the 1989-90 season (Table 3). Wolf harvests have declined substantially since 1988-89 ban on land-and-shoot taking. The 15 wolves taken represented a harvest of 7% of the estimated fall 1989 population of 205 wolves. Human-caused mortality is believed insignificant to this wolf population.

Harvest Chronology. A meaningful percentage of the harvest over the past 5 years has occurred during October, March, and April, particularly when land-and-shoot harvest was allowed before the 1988-89 season (Table 4).

Transport Methods. Snowmachines were used by most successful wolf trappers (Table 5). Aircraft use to harvest wolves has decreased since the ban on land-and-shoot taking.

Habitat

Assessment: Nearly all of Subunit 20E constitutes wolf habitat with the possible exception of the very highest mountain peaks in the area's western portion. Good wolf habitat is determined by the distribution and abundance of ungulates rather than vegetative characteristics.

Better wolf habitat occurs where there are more ungulates year-round. Because of the FCH's seasonal distribution, this better habitat occurs in the unit's northern portion. The FCH seldom spends much of the year in southern Subunit 20E. Even though moose densities are believed to be slightly greater in southern Subunit 20E, the FCH provides most of the prey biomass available to wolves in the subunit (Fig. 2).

Subunit 20E could constitute better wolf habitat, particularly if the FCH continues to grow and extend its year-round range in the area. Greater moose densities throughout the unit would also improve wolf habitat. Human developments are not currently a problem for wolves in the area; however, over 30 years of intensive suppression of wildfires have probably lowered the habitat carrying capacities for prey species such as moose and beaver. Food is currently not a limiting factor for any ungulate prey species; however, predation by wolves and grizzly bears is.

It is possible that vegetative changes resulting from fires could affect the vulnerability of moose to predation in ways other than nutrition. Fires in Subunit 20E can be quite extensive as shown by the 225,000-acre 1966 Chicken fire and the 125,000-acre 1969 Ladue fire. In these areas, the availability of moose food plants is great and they are evenly distributed. Likewise, moose tend to be evenly distributed throughout these burned areas. In unburned areas, seasonal moose foods tend to concentrate along riparian and subalpine zones, where wolves may more efficiently take prey.

Enhancement: Subunit 20E is included in the Alaska Interagency Fire Management Plan: Fortymile Area, and at least 60% of it is classified in Limited Suppression status which should assure a near-natural wildfire regime. This, in turn, should increase habitat diversity to benefit wolf prey species and ultimately wolves, if the present predation limiting factor can be addressed.

CONCLUSIONS AND RECOMMENDATIONS

Wolves and associated species of scavengers in Subunit 20E are believed to be limited by low densities of moose and caribou prey. Conversely, present rates of wolf predation are controlling rates of moose and caribou population growth. As a result, strategic human-use goals are not being met for moose, caribou, or wolf populations in this area. I recommend that the wolf population in Subunit 20E be reduced substantially, but only temporarily, to allow attainment of population objectives for moose and caribou within a reasonable time frame. This will probably require an ADF&G control program even if land-and-shoot taking of wolves is reauthorized for the 1990-91 season. Experience has shown that wolf harvests by the public in most areas of Subunit 20E are incapable of effecting and maintaining a significant year-to-year reduction in the wolf population.

Coordinated management of big game species in Subunit 20E will require the following actions:

- Maintain conservative harvests of moose and caribou populations (i.e., ≤3% of estimated populations).
- Maintain liberal bear hunting regulations to reduce the influence of bear predation on moose and caribou populations.
- Restore maximum opportunities for the public to harvest wolves by reinstating land-and-shoot taking.
- Supplement annual harvests of wolves by the public with an ADF&G wolf control program to effect and maintain desired reductions in wolf numbers and, hence, wolf predation on moose and caribou populations.
- After moose and caribou population objectives are achieved, regulate man-caused predator and prey mortality to assure that human-use goals are met in the future and to allow wolf numbers to increase to their precontrol levels.
- Encourage a near-natural wildfire regime in the area while making recommendations to alleviate or avoid unnecessary adverse impacts upon wildlife habitat as a result of human developments.

A wolf-bear-ungulate management program such as just proposed would be consistent with guidelines established by the International Union for the Conservation of Nature and Natural Resources, Wolf Specialist Group in that organization's Manifesto on Wolf Conservation. Guidelines state, "It is recognized that occasionally there may be a scientifically established need to reduce nonendangered wolf populations . . . . 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 ranges."

I believe that the proposed wolf management program for Subunit 20E meets these criteria. Given the present public dissatisfaction with low wildlife densities and associated

controversy over allocation of scarce resources, such a comprehensive game management program in this vast yet accessible area is long overdue.

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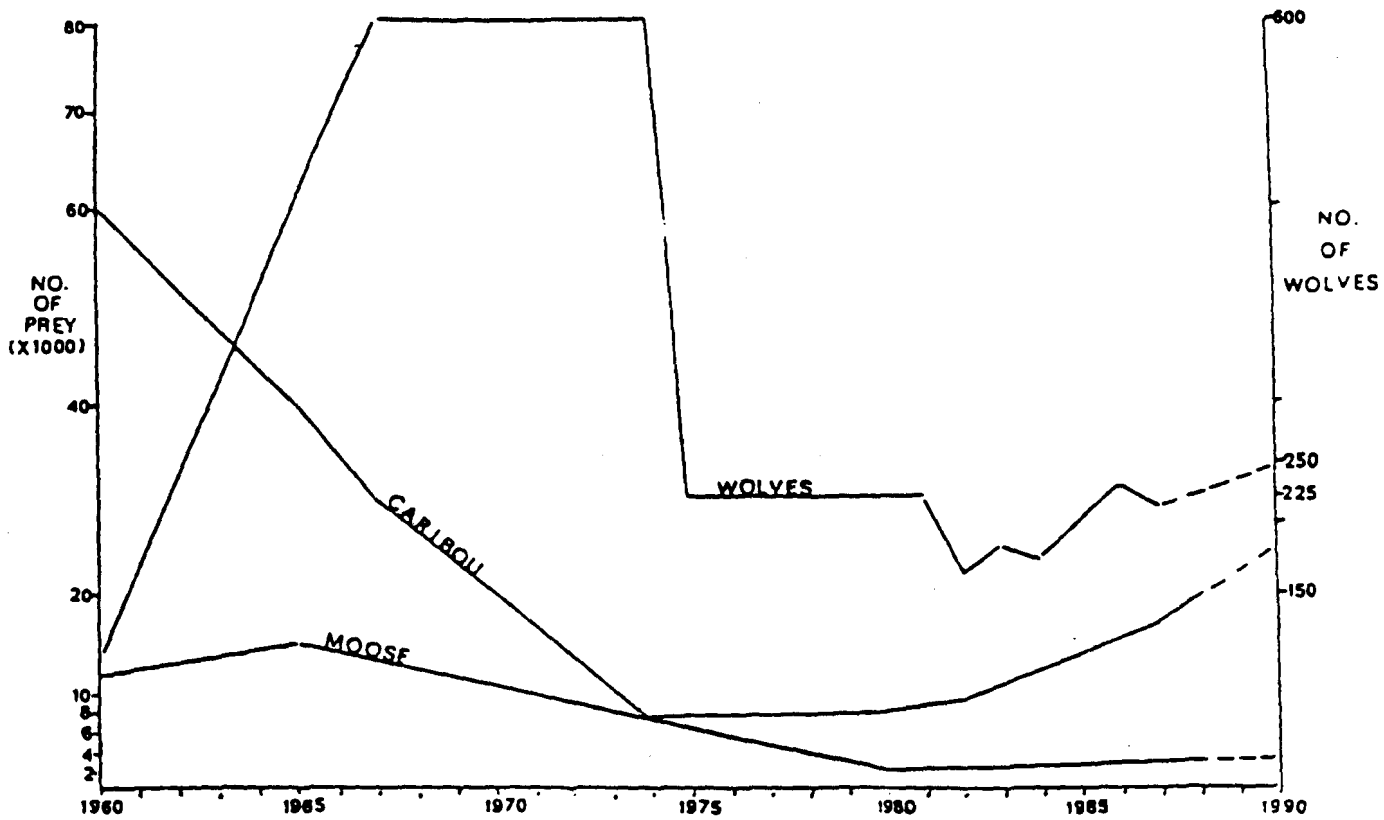

Figure 1. Estimated and projected numbers of wolves, caribou, and moose in Unit 20E, 1960-90.

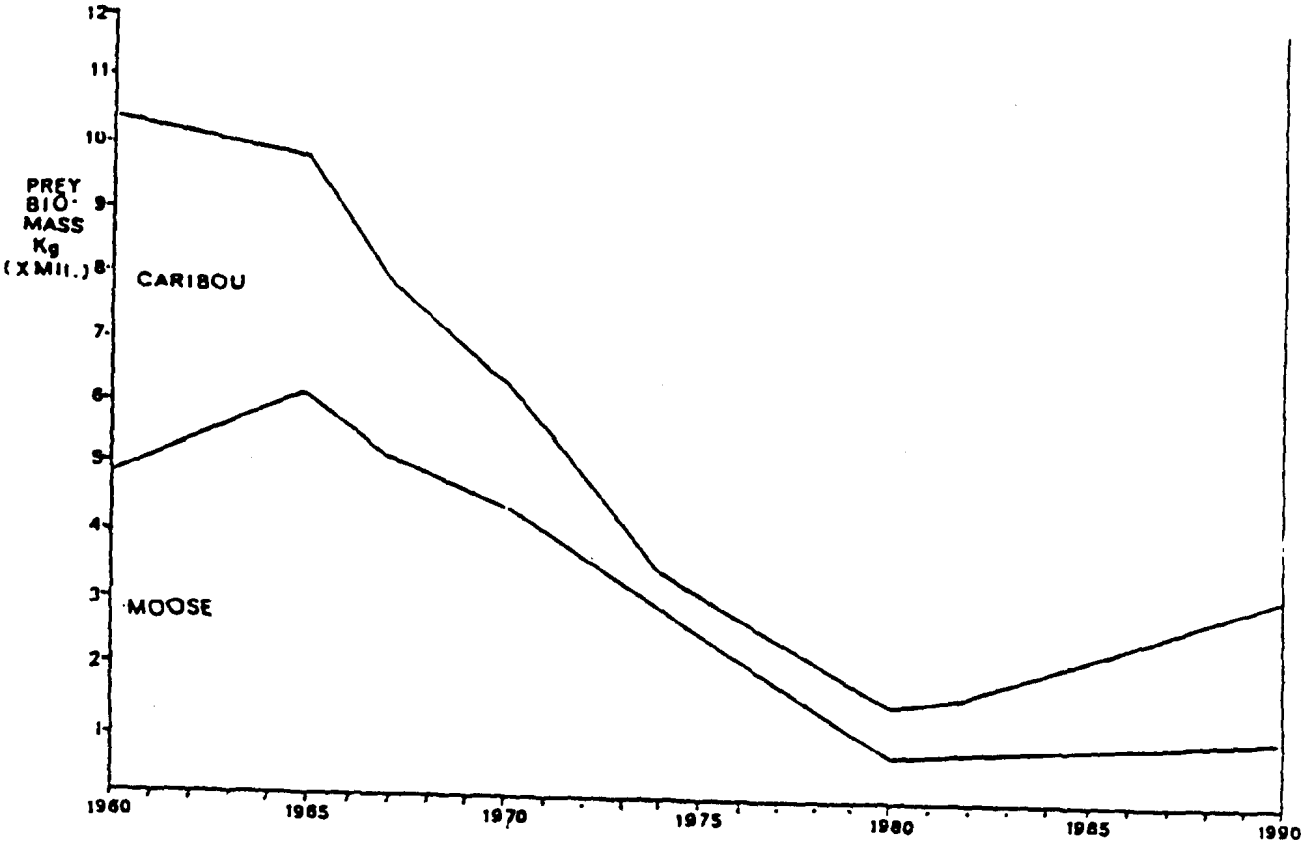

Figure 2. Estimated and projected biomass of caribou and moose available to wolves in Unit 20E, 1960-90.

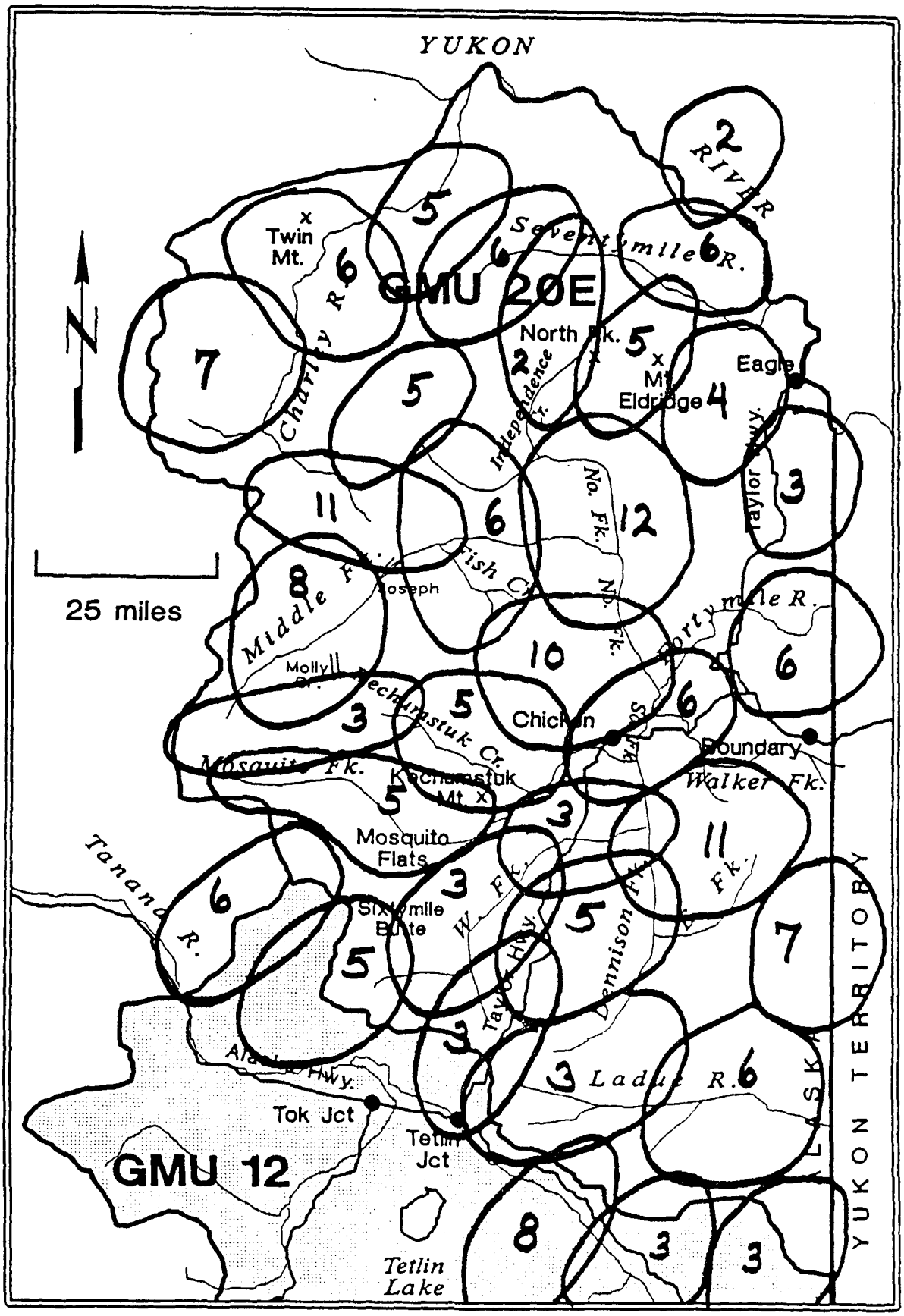

Figure 3. Approximate wolf pack territories and fall 1989 pack sizes in Subunit 20E.

Table 1. Caribou, moose, and wolf population estimates, biomass of prey, and biomass of prey/wolf in Subunit 20E, 1960-90.

Year	No. caribou	No. moose	No. wolves	Prey biomass[a] (kg)	Prey biomass per wolf(kg)
1960	60,000	12,000	100	10,368,000	103,680
1965	40,000	15,000	380	9,775,000	25,724
1967	30,000	12,500	600	7,842,500	13,071
1970	20,000	11,000	600	6,319,000	10,532
1974	6,500	7,100	600	3,495,400	5,826
1975	6,500	7,000	225	3,454,500	15,353
1980	8,000	2,000	225	1,546,000	6,871
1982	9,000	2,000	165	1,637,000	9,921
1986	15,300	2,250	215	2,312,550	10,756
1987	16,800	2,325	217	2,479,725	11,427
1988	20,000	2,400	173	2,801,600	16,194
1990	23,000	2,650	205	3,176,850	15,497

[a] Assumptions: caribou average 91 kg and moose average 409 kg.

Table 2. Subunit 20E fall wolf population estimates[a], 1985-89.

Regulatory year	Population estimate[b]	Number of packs	Mean pack size	Basis of estimate
1985	198	Unknown	Unknown	Extrapolation from portion of unit
1986	215	32	6.7	Aerial survey, observations, reports
1987	217	30-33	6.0-7.2	Aerial survey, observations, reports
1988	173	32	4.9	Aerial survey, observations, reports
1989	205	33	5.6	Aerial survey, observations, reports

[a] Fall estimate = pre-trapping season population.
[b] Includes 10% estimated number of single wolves present.

Table 3. Subunit 20E wolf harvest, 1985-89.

Regulatory year	Reported harvest						Method of take								Total trappers and hunters	Wolves/ person
	M	(%)	F	(%)	Total	% Fall pop.	Trap or snare	(%)	Shot	(%)	L&S	(%)	Unk			
1985	11	(69)	5	(31)	16	8	10	(63)	3	(19)	3	(19)	10		10	1.6
1986	11	(52)	10	(48)	21a	13[a]	19	(90)	1	(5)	1	(5)	7		7	3.0
1987	18	(41)	26	(59)	44	20	23	(52)	5	(11)	16	(36)	21		21	2.1
1988	2	(22)	7	(78)	9	5	7	(78)	2	(22)	-[b]		6		6	1.5
1989	7	(54)	6	(46)	15	7	12	(80)	3	(20)	-[b]		10		10	1.5

[a] An additional 6 wolves were taken for ADF&G research and were included in computation of percent harvest of estimated fall population.
[b] Land-and-Shoot (L&S) taking prohibited during 1988-89 and 1989-90.

Table 4. Subunit 20E wolf harvest chronology, 1985-89.

Regulatory year	Harvest periods																n
	Aug	(%)	Sep	(%)	Oct	(%)	Nov	(%)	Dec	(%)	Jan	(%)	Feb	(%)	Mar	(%)	Apr	(%)	
1985	1	(6)	1	(6)	0	(0)	3	(19)	4	(25)	0	(0)	4	(25)	2	(13)	1	(6)	16
1986	0	(0)	2	(10)	2	(10)	6	(29)	10	(48)	0	(0)	0	(0)	0	(0)	1	(5)	21
1987	0	(0)	4	(9)	3	(7)	2	(5)	6	(14)	9	(20)	3	(7)	10	(23)	7	(16)	44
1988	0	(0)	1	(11)	0	(0)	0	(0)	2	(22)	2	(22)	3	(33)	1	(11)	0	(0)	9
1989	0	(0)	2	(13)	1	(7)	2	(13)	3	(20)	6	(40)	1	(7)	0	(0)	0	(0)	15

Table 5. Subunit 20E wolf harvest by transport method, 1985-89.

Regulatory year	Airplane (%)	Dogsled, skis, or snowshoes (%)	Boat (%)	3- or 4-Wheeler (%)	Snowmachine (%)	ORV (%)	Highway vehicle (%)	Unk[a]	n
1985	5 (33)	0 (0)	0 (0)	0 (0)	9 (60)	0 (0)	1 (7)	1	16
1986	3 (14)	1 (5)	0 (0)	0 (0)	7 (33)	0 (0)	10 (48)	0	21
1987	19 (44)	8 (19)	1 (2)	0 (0)	9 (21)	0 (0)	6 (14)	1	44
1988	1 (11)	1 (11)	0 (0)	1 (11)	6 (67)	0 (0)	0 (0)	0	9
1989	1 (7)	5 (33)	0 (0)	0 (0)	7 (47)	1 (7)	1 (7)	0	15

[a] Unknown transport not used to calculate harvest percent.

LOCATION

Game Management Units: 21B, C, D (20,150 mi^2)

Geographical Description: Yukon River drainage above Paimiut to Tozi River including Koyukuk up to Dulbi Slough

BACKGROUND

Wolves are found throughout the unit in all habitat types and in proximity to human settlements. The number of wolves within the unit varies depending on prey availability. There are more wolves in Subunit 21D and the lowlands of Subunit 21B than in Subunit 21C.

Wolves were present when humans first settled the area and have since become part of the human environment and culture. Wolf populations have fluctuated from very low to very high numbers depending upon prey availability and human wolf-control activities. In Subunit 21D, wolf numbers were probably lower before the early 1940s because moose were absent and caribou availability fluctuated. Wolves did not have a stable prey base. Moose immigration coincident with federal wolf control rapidly increased the moose population. In the mid-1950s the moose population was estimated as dense as it currently is, ranging from 3 to 9 moose/mi^2 in the Koyukuk lowlands near Three-day Slough. When wolf control ceased, wolf numbers increased and are presently higher than past historic levels. In Subunits 21B and 21C, wolf populations may be lower than in the early 1900s because moose densities are lower than they used to be.

Harvests ranged from 45 to 130 wolves per year, averaging about 52 per year. The local need for wolf pelts for parka ruffs and potlatch gifts is higher than the harvest. Local residents around Galena and Ruby recognize the predator-prey relationship between moose and wolves and make a conscious effort to increase their wolf harvests when moose numbers appear scarce.

MANAGEMENT DIRECTION

Management Goals

- Protect, maintain, and enhance the wolf population and its habitat in concert with other ecosystem components.

Management Objectives

- In Subunit 21B, manage the wolf population to maintain at least 50 moose per wolf until the moose population objective of 4,000 to 4,500 is attained. Thereafter, maintain a fall wolf density of approximately 1 wolf/50 mi^2 and sustain an 11-32% annual harvest rate of the wolf population.

- In Subunits 21C and 21D, maintain a fall wolf density of approximately 1 wolf/50 mi^2 and sustain an 11-32% annual harvest rate of the wolf population.

METHODS

Wolf pack numbers and distribution were determined by aerial surveys during winter in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the U.S. Bureau of Land Management (BLM) and by interviews with wolf trappers and aircraft pilots. Twenty wolves were radio-collared and relocated in a cooperative USFWS study. Harvests were monitored by pelt sealing requirements. Wolf meat was also collected for Cesium 137 analysis.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: The estimated wolf population size increased slightly during the past 5 years (Table 1). At least 85-100 wolves were in 13-16 packs in Subunit 21B and numbers were increasing. In Subunit 21C at least 38-45 wolves were in 4-6 packs and numbers appear stable. In Subunit 21D at least 175-190 wolves are in 25-30 packs and numbers also appear stable. These packs occupy only 40% of Subunit 21B, 50% of Subunit 21C, and 50% of Subunit 21D. Wolf numbers are unknown in remaining areas. Actual population sizes are higher.

Distribution and Movements: Twelve wolves were radio-collared in 5 packs on the Koyukuk National Wildlife Refuge (NWR) and 8 wolves were radio-collared on the Nowitna NWR. We radio-collared 1 animal in the Dakli pack, 2 animals each in the Upper Dulbi, Nayuka River, and Novi River packs, 3 animals each in the Lower Dulbi, Monzonite Hills, and Ham Island packs, and 4 animals in the Three-day Slough pack. Because part of the purpose of the study was to compare wolf and moose densities, the radio collars were distributed according to moose density: 3 packs were radio-collared in high moose density areas; 3 in medium moose density areas, and 2 in low moose density areas.

Pack size at capture ranged from 1 to 10 and averaged 4.4 animals. Twelve wolves were males and 8 were females. The average weight of females was 84.5 lbs. (range 74-96 lbs.) and the average weight of males was 106 lbs. (range 92-132 lbs.).

Twenty radio-collared wolves were tracked twice a month from March to the end of June. However, data are insufficient at this time to determine home ranges or movements.

Mortality

Harvest: Hunters and trappers reported harvesting 29 wolves (Table 2) this report period. Four were taken in Subunit 21B, 3 were taken in Subunit 21C, and 22 were taken in Subunit 21D. The actual number harvested was probably higher because village residents only seal those wolf pelts sent to a commercial tannery or sold to a fur buyer.

Seasons and Bag Limits. The hunting season was from 10 August to 30 April with a bag limit of 10 wolves. The trapping season was from 1 November to 31 March with no limit on the number that could be taken.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate in Unit 21 will increase in the future because of increasing prey populations and as more information is known about pack distribution. Presently only 50% of the area has been surveyed for wolf distribution. The unit population is probably much higher. Present population levels are stable or increasing throughout the unit.

I recommend that seasons and bag limits remain as liberal as possible. I recommend more radio-telemetry studies and a spring census to determine wolf population sizes more accurately. Within the Nowitna NWR, I recommend initiating a detailed study as follow-up to the present moose calf mortality project to help improve wolf population estimates and knowledge of predation rates.

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Submitted by:

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Reviewed by:

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Table 1. Subunit 21B, 21C, and 21D fall wolf population estimates[a,b], 1985–89.

Regulatory year	Population estimate	Number of packs
1985	274-290	37
1986	325-370	34-46
1987	290-320	42-52
1988	305-330	42-52
1989	295-340	40-55

[a] Fall estimate = pretrapping season population.
[b] Basis of estimates are ADF&G/USFWS aerial surveys, hunter/trapper reports, sealing records, and incidental observations.

Table 2. Subunits 21B, 21C, 21D wolf harvest, 1985-89.

Regulatory year	Reported harvest			Estimated unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk			Trap/snare	Shot	L&S[a]	Unk
1985	12	11	1	24	3	11	0	9	4
1986	18	21	3	42	3	14	3	25	0
1987	26	23	2	51	3	4	3	44	0
1988	5	6	0	11	3	3	2	5	1
1989	14	15	0	29	3	7	3	19	0

[a] L&S (land-and-shoot) refers to animals taken by hunters the same day hunters were airborne.

LOCATION

Game Management Unit: 22A, 22B, 22C, 22D, and 22E (23,000 mi^2)

Geographical Description: Seward Peninsula and that portion of the Nulato Hills draining west into Norton Sound.

BACKGROUND

Long-term residents report that wolves have been scarce or non-existent throughout much of Unit 22 for at least 50 years. Several small packs of wolves were known to inhabit portions of Subunits 22A and 22B, and limited data indicate their numbers started increasing several years ago, especially during the winter months when animals from the Western Arctic Caribou Herd (WACH) were seasonally present. Whether this increase was because of the establishment of new packs or because of migration of packs into the area is unclear.

Reindeer herders, particularly those within Subunits 22A and 22B, contend that wolves are now permanent residents on their ranges and adverse interactions between wolves and reindeer are more numerous than in past years.

MANAGEMENT DIRECTION

The following management goals and objectives for wolves have been established for Unit 22:

- Assess harvest, interview hunter/trappers, and seal all pelts brought in for sealing.
- Establish and maintain license vendors and sealers in all Unit 22 villages.
- Improve compliance with current sealing requirements through public communication and education.
- Cooperate with reindeer herders to evaluate methods for reducing adverse interactions between wolves and reindeer.
- Develop a Unit 22 wolf management plan.

METHODS

Specific population data concerning Unit 22 wolves are not available. Limited information on wolf distribution, densities, harvest, and human use were obtained annually from biologists' incidental observations, visual observations provided by reindeer herders and other local residents, and from sealing certificates.

A study entitled "Demography an Movements of Wolves in Relation to Western Arctic Caribou Herd in Northwest Alaska" was initiated in 1987 within a portion of Unit 23, north and east of Unit 22. Completion of this study may provide insight into distribution, density, and movements of wolves in and out of the unit.

RESULTS AND DISCUSSION

Population Status and Trend: Although wolf numbers remained low throughout the unit, their numbers are increasing in portions of Subunits 22A and 22B and, to a lesser extent, in Subunit 22D. Radio-collared wolves from other locations in Alaska have been observed and/or harvested in Unit 22 during the past 2 years suggesting that movement of wolves into the area does occur. It is presently unknown whether these wolves were attempting to establish themselves within the unit or if they were transient migrants.

Population Size: The size of the Unit 22 wolf population is unknown. Estimates provided by staff in past years indicated that the population size ranged from 50 to 150 animals. However, based on recent information, this range appears to be low, and it is conceivable that the high estimate of 150 wolves may in actuality represent a minimum number.

Mortality

Seasons and Bag Limits:

Trapping:	Nov. 1-Apr. 15	No limit
Hunting:	Aug. 10-Apr. 30	No limit

Harvest:

Human Induced Mortality: Interest and success in harvesting wolves has increased significantly during the past 5 years (Table 1). The reported harvest of wolves in Unit 22 (N=99) increased from a low of 3 in 1985-86 to an unprecedented reported high of 43 in 1989-90. This increase may be a result of increased hunting activity within areas used during winter by caribou from the Western Arctic herd. Sex composition of the reported harvest is as follows: 51% males, 30% females, and 18% sex unknown (N=99). Until 1989-90, all of the reported wolf harvest came from Subunits 22A and 22B (Table 2). Reports of a pack of approximately 10 wolves residing in Subunit 22D were substantiated in spring 1990 when 4 wolves were harvested from that subunit.

Illegal and unreported harvest of wolves remains a problem in Unit 22. Many harvested wolves are probably not sealed because they are used in the local manufacture of parka ruffs and other garments. The magnitude of this unreported harvest is presently unknown.

Hunter Residency and Success: With the exception of a single wolf harvested in 1989-90 by a resident of Fairbanks, sealing certificate data indicate all wolves taken during the 1985-90 period were harvested by residents of Unit 22. Residents of Shaktoolik in Subunit 22A (reportedly spurred on by the local reindeer herder) were credited with the greatest portion of that harvest (61%).

Harvest Chronology: As previously indicated, the wolf harvest in Unit 22 during the past 5 years tends to correspond directly with caribou hunting activities. Winter movements of the Western Arctic Caribou Herd have been such during the past several years that their arrival onto the Seward Peninsula occurred in late November. They arrived at the Nulato Hills area of Subunit 22A in December. Particularly during the past 3 years, a significant portion of the reported wolf harvest occurred during January, February, and March (Table 3).

Harvest Methods: Commercial trapping is not a major activity in Unit 22. In the past 5 years, 84% (N=99) of the wolves were ground shot and only 16% were trapped or snared.

Transport Methods: Hunter/trappers reporting their transport method on sealing certificates indicated that 96% of the harvest during the past 5 years was taken using a snowmachine as transportation.

CONCLUSIONS AND RECOMMENDATIONS

Although quantitative data are not available, wolf densities appear to be increasing within portions of Unit 22. It is presently unclear whether this increase was caused by a seasonal influx of wolves from other areas or whether local populations were increasing in direct relation to prey abundance. Completion of the wolf research study in Unit 23 may provide some insight into the status of wolves in Unit 22.

The following specific goals need to be addressed if we are to manage Seward Peninsula wolves effectively and ensure compliance with our stated objectives for Unit 22 wolves. In order of priority, they are:

1. A long-term management plan is needed. It is currently unclear whether we are managing for high or low wolf numbers in Unit 22.

2. Compliance with our sealing requirements is poor throughout the unit. Some village residents seal only those pelts which will be commercially tanned or sold to furbuyers. Improving the accuracy of our harvest data may be accomplished by a more active information and education program, and more active enforcement of sealing regulations.

3. Quantitative data on wolf populations of Unit 22 are lacking. Research to improve our understanding of wolf population dynamics and the impacts of wolf predation on local ungulate populations of Unit 22 are recommended.

Current hunting and trapping regulations do not limit the total take of wolves in Unit 22. With the exception of Unit 18 which borders a very small portion of Subunit 22A, units surrounding Unit 22 (22D, 21E, and 23) have a hunting bag limit of 10 wolves. I suggest a bag limit of 10 wolves per hunter per year be proposed for Unit 22. Imposing a bag limit of 10 wolves would not only make Unit 22 regulations more consistent with surrounding units, but would also address a perceived problem that some hunters are harvesting wolves in 1 unit and reporting that harvest as coming from another unit.

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Wildlife Biologist III

Submitted by:

Steven Machida
Survey Inventory Coordinator

Table 1. Unit 22 wolf harvest, 1985-90.

Regulatory	Reported harvest				Method of take			Successful
year	M	F	Unk.	Total	Trap/snare	Shot	Unk.	Total trappers/hunters
1985-86	0	1	2	3	0	3		1
1986-87	4	2	2	8	1	7		5
1987-88	8	6	10	24	14	10		8
1988-89	11	6	2	21	1	20		9
1989-90	28	13	2	43	0	43		14

Table 2. Unit 22 wolf harvest by subunit, 1985-90.

Regulatory year	Subunit				
	A	B	C	D	E
1985-86	0	3	0	0	0
1986-87	5	3	0	0	0
1987-88	20	4	0	0	0
1988-89	15	6	0	0	0
1989-90	33	6	0	4	0

Table 3. Unit 22 wolf harvest chronology (percent) by time period, 1985-90.

Year	Harvest periods						n
	November	December	January	February	March	April	
1985-86	0	67	0	0	33	0	3
1986-87	0	75	0	0	25	0	8
1987-88	13	32	21	21	13	0	24
1988-89	0	5	14	52	29	0	21
1989-90	16	5	25	7	42	5	43

LOCATION

Game Management Unit: 23 (43,000 mi^2)

Geographic Description: Kotzebue Sound and Western Brooks Range

BACKGROUND

Wolves are indigenous to northwest Alaska and their numbers have reportedly increased in recent years. Wolves have long been sought by local hunters and trappers for their pelts, and Inupiat in this region have traditionally used wolf hides for fur garments. Currently, their high monetary value and aesthetic appeal have maintained a demand for wolves in Unit 23.

POPULATION OBJECTIVES

The following population management objectives have been established for wolves in Unit 23:

- Maintain existing population levels of wolves in Unit 23.
- Conduct aerial surveys in selected drainages during late winter to assess population trend.
- Maintain the wolf sealing program to monitor the harvest.
- Send out an annual trapper questionnaire to obtain harvest and population assessment information.
- Minimize adverse interactions between wolves and the public.
- Develop updated population management goals in cooperation with the public and other agencies.

METHODS

Harvest information was determined from wolf sealing certificates submitted by hunters and trappers. Standard conventional telemetry techniques and a track count census method were used to determine population size and status of wolves in the southeastern portion of Unit 23 (Ballard et al. 1990).

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: Using telemetry information, Ballard et al. (1990) estimated wolf density within their study area to range from 2.7-6.3 wolves/1000 km^2. Through extrapolation, they estimated the overall Unit 23 wolf population to be approximately 322 wolves in spring 1987, 750 wolves in autumn 1988, and 429 wolves in spring 1989. These estimates assume uniform wolf density throughout Unit 23 and are only rough approximations of the actual population size. However, they are the only available quantitative estimates of wolf abundance in Unit 23, and represent a significant first step towards attaining wolf management objectives in northwest Alaska.

During April 1990, the wolf population was censused in a portion of the study area. The primary objective of this census was to evaluate the feasibility of using a track count technique on wolves as a census method. Although data analysis has not been completed, it appears that under good conditions this technique can provide a quantitative, repeatable method for monitoring wolf population size.

During 1989-90, knowledgeable local residents and hunting guides have repeatedly reported that the wolf population has increased in Unit 23. Opportunistic sightings of wolves and wolf tracks by Department personnel support these observations.

Population Composition: Male wolves have comprised over 50% of the reported annual harvest (excluding wolves of unspecified sex) since 1979, and constitute 61% of the total harvest since that time. Capture data indicate that the sex ratio for pups was skewed toward females while no difference was evident for adults (Ballard et al. 1990). This suggests that male wolves were more susceptible to harvest than females, possibly because they travel more than females. Alternatively, the preponderance of males in harvest data may reflect selectivity by hunters for male wolves because most of the wolves reported taken from Unit 23 have been shot. During 1988-89, 90% of the total harvest was shot rather than trapped; in 1989-90, this percentage was 85%. Therefore, hunter selectivity could explain the preponderance of males in the harvest.

Mortality

Season and Bag Limit: The hunting season in Unit 23 was 10 August-30 April, and the bag limit was 10 wolves. The trapping season was 1 November-15 April with no maximum bag limit specified.

Harvest:

Human Induced Mortality. Fifty-three wolves taken in Unit 23 were sealed during the 1989-90 season (Table 1). Unit 23 residents reported that 15 additional wolves were

taken but not sealed during the 1989-90 season. Therefore, the total harvest for Unit 23 was at least 68 wolves in 1989-90. Because noncompliance with sealing requirements is common in northwest Alaska, this represents a minimum estimate of harvest. The 1989-90 harvest is lower than reported for 1987-88 and 1988-89 (Table 1).

Methods of Transport and Take: Of the 68 wolves reportedly taken in Unit 23 during 1989-90, 11 (16%) were taken using aircraft as transportation, 47 (69%) were taken by snowmachine hunters, and 2 (3%) were taken by hunters using boats. Sixty of the 68 wolves (88%) were shot, and 8 (12%) were trapped.

Harvest Chronology: During 1989-90, 3 wolves were harvested in August, 4 in September, 10 in November, 13 in December, 4 in January, 2 in February, 15 in March, and 2 in April.

Board of Game Actions and Emergency Orders: No changes in seasons and bag limits were made by the Board of Game during 1988-89. However, in November 1988, the National Park Service imposed a ban on aerial hunting of wolves in all National Preserves in Alaska including the Noatak National Preserve in Unit 23. This undoubtedly reduced the 1989-90 wolf harvest and may have altered the distribution of harvest in Unit 23 as well.

CONCLUSIONS AND RECOMMENDATIONS

As wolf numbers increase in the Noatak National Preserve, partly as a result of the ban on land and shoot wolf hunting, sheep and moose populations in the Preserve will experience higher rates of predation. This comes at a time of when hunting pressure on moose populations in the upper Noatak River drainage has increased dramatically. In addition, several years of severe winter mortality of both moose and sheep populations has occurred in portions of Unit 23. The Department should continue to work with the National Park Service to ensure that options for sensibly managing wildlife are not eliminated by inflexible, sweeping policies.

The track count census technique for wolves should be applied in portions of Unit 23 other than the study area to monitor wolf abundance. Portions of the Noatak River drainage may be an appropriate area to conduct a census. If possible, this technique should also be further evaluated in an area with a known number of wolves under varying conditions to better assess its limitations, and to determine optimal levels of search effort.

No changes in seasons or bag limits are recommended at this time. However, if sheep and moose populations in Unit 23 continue to decline, the Department should consider and solicit public input on re-establishing same-day-airborne hunting of wolves in at least portions of the Unit.

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Submitted by:

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Table 1. Reported wolf harvest summarized from sealing certificates for Unit 23, 1977-1990.

Year	Males	Females	Unknown	Total
1977-78	--	--	--	64
1978-79	--	--	--	50
1979-80	12	6	0	18
1980-81	33	17	0	50
1981-82	10	7	0	17
1982-83	25	19	4	48
1983-84	30	14	2	46
1984-85	45	20	0	65
1985-86	10	8	0	18
1986-87	23	10	1	34
1987-88	52	33	8	93
1988-89	42	36	5	83[a]
1989-90	27	25	1	53[b]

[a] At least 10 additional wolves were taken but not sealed during 1988-89.
[b] At least 15 additional wolves were taken but not reported during 1989-90.

LOCATION

Game Management Unit: 24 (24,150 mi^2)

Geographical Description: Koyukuk River drainage above Dulbi River

BACKGROUND

Wolves are found throughout the unit in all habitat types and in proximity to human settlements. The number of wolves within the unit varies depending on prey availability. There are more wolves in the south and north than in the central portion of the unit, which has lower moose densities and more sporadic caribou movements.

Wolf abundance in Unit 24 has fluctuated in response to the availability of prey. More recent fluctuations have occurred with human activity. Wolf numbers were low in the Brooks Range in the late 1800s because of the paucity of moose, caribou, and Dall sheep (Campbell 1974). Prey populations increased in the early 1900s, leading to concurrent increases in wolf numbers. Currently, wolves are more numerous than in the 1970s, but are not as abundant as in the 1940s and 1950s (R. Stephenson, pers. commun.)

There were probably fewer wolves in the southern portion of the unit before the 1940s than exist now because no stable prey base existed. At the time, moose populations still expanded into this area, and caribou availability varied widely from year-to-year. Federal wolf control greatly reduced the limiting effect of wolf predation on local moose populations and moose numbers increased. When wolf control ceased, this moose abundance allowed wolf numbers to increase. Wolf numbers are presently as high in southern Unit 24 as at any time in history.

Wolf harvests have ranged from 30 to 100 wolves per year and average about 52 wolves annually. Local demand for wolf pelts used as parka ruffs and potlatch gifts is higher than the harvest. Local residents around Huslia and Hughes recognize the predator-prey relationship between moose and wolves and try to increase wolf harvest when they perceive a moose scarcity.

MANAGEMENT DIRECTION

Management Goals

- Protect, maintain, and enhance the wolf population and its habitat in concert with other components of the ecosystem.

Management Objectives

- In the southern portion Unit 24 (south of Hughes): maintain a stable fall wolf population with a density of approximately 1 wolf per 50 mi^2 with the intent to sustain an annual harvest of 30 wolves.

- In the central portion of Unit 24 (Hughes to Bettles): reduce present wolf density and maintain a stable fall population of 1 wolf per 100 mi^2.

- In the northern portion of Unit 24 (north of Bettles including Gates of the Arctic National Park (GAAR)): maintain a stable fall wolf density of approximately 1 wolf per 50 mi^2, to provide for nonconsumptive uses within GAAR, and sustain an annual harvest of 30 wolves.

METHODS

Wolf pack numbers and distribution were determined by aerial surveys during winter in cooperation with the U.S. Fish and Wildlife Service (USFWS), U.S.National Park Service (USNPS), and by interviews with wolf trappers and aircraft pilots. Thirty wolves were radio-collared and tracked weekly from light aircraft within GAAR (Adams and Stephenson 1988), and 2 wolves were monitored by satellite radio collar in the southwestern part of the unit. Thirteen wolves were radio-collared within the Kanuti National Wildlife Refuge and tracked twice a month. Harvests were monitored by pelt sealing requirements, and carcasses were collected in the northern part of the unit to determine physical condition, stomach contents, and reproductive characteristics. Wolf meat was also collected for Cesium 137 analysis.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: The minimum estimated Unit 24 wolf population was 400-440 in 55—60 packs. The estimate was derived by plotting known pack locations. These packs only occupy 70% of the unit; in the remaining 30% of the area wolf numbers are unknown. The total unit population is probably higher.

Wolf density within GAAR was estimated at a minimum of 1 wolf per 55 mi^2 (R. Stephenson, pers. commun.). Based on observations of radio-marked packs in GAAR the proportion of pups in the winter population was approximately 41% (Adams and Stephenson 1988).

Distribution and Movements: In the Purcell Mountains in the southern part of the unit, the 2 satellite–collared wolves were tracked during the past year and information on their home ranges is in preparation (W. Ballard, pers. commun.).

The 13 radio-collared wolves in the Kanuti area were tracked twice a month from April through June. Presently, data are insufficient to determine home ranges or movements during this report period.

USNPS research efforts within GAAR in 1989-90 concentrated on kill rates of 3 packs in the unit and on abundance, age, sex, and condition of prey within the territories of those packs. Dall sheep, caribou, and moose were available prey. Caribou composed 90% of the kills examined to date (Dale et al. 1989).

Mortality

Harvest: Hunters and trappers reported harvesting 30 wolves (Table 1). Four wolves were harvested in the southern portion, 15 in the central portion, and 11 in the northern portion. Generally, village residents seal only those wolf pelts sent to commercial tanneries or sold to a fur buyer. Thus, the total harvest may be higher.

Season and Bag Limit. The hunting season was from 10 August to 30 April with a bag limit of 10 wolves. The trapping season was from 1 November to 31 March with no bag limit restriction.

CONCLUSIONS AND RECOMMENDATIONS

The current wolf population estimate for Unit 24 was much higher than previous estimates because of increased wolf populations and because the use of radiotelemetry has enabled us to determine wolf population size more accurately. Present population levels are stable or increasing.

I recommend that seasons and bag limits remain as liberal as possible to encourage the harvest of wolves, especially from the central portion of the unit. I also recommend that we continue monitoring radio–collared packs in the Kanuti area to help improve population estimates and provide information on predation rates.

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Table 1. Unit 24 wolf harvest, 1985-89.

Regulatory year	Reported harvest			Estimated unreported harvest	Total estimated harvest	Method of take[a]			
	M	F	Unk			Trap/snare	Shot	L & S	Unk
1985	17	10	1	10	38	14	0	13	1
1986	24	14	0	10	48	20	0	14	4
1987	29	30	1	10	70	9	1	48	2
1988	38	32	6	10	86	16	20	39	1
1989	17	9	4	10	40	5	3	0	2

[a] L & S (Land and shoot) refers to animals taken by hunters the same day the hunters were airborne.

LOCATION

Game Management Unit: 25A, 25B, 25D, 26B, and 26C (75,000 mi^2)

Geographical Description: Eastern Interior, Eastern Brooks Range, and Central and Eastern Arctic Slope

BACKGROUND

Wolves are present throughout the management area. They are well adapted to living in the interior taiga forests, the rugged mountains of the Brooks Range, and the arctic slope tundra. Despite available caribou, moose, Dall sheep, and other prey, wolves are relatively scarce in this area.

Relatively little is known about wolf populations or their influence on ungulate populations in northeastern Alaska. U.S. Fish and Wildlife Service (USFWS) biologists studied the movements and denning of 11 wolf packs in the northern Arctic National Wildlife Refuge (ANWR) in 1984 and 1985 (Garner and Reynolds 1986). Subsequent occasional aerial surveys and incidental observations further documented the presence of wolves within ANWR and to the west in Subunit 26B. However, no systematic surveys were conducted within the area. Nowlin (1985) flew aerial wolf surveys in Subunit 25D (west) in March 1984. Wolf surveys have not been conducted in the remainder of the Yukon Flats.

MANAGEMENT DIRECTION

Management Goals

- Protect, maintain, and enhance the wolf population and its habitat in concert with other components of the ecosystem.
- Provide for continued consumptive use of wolves.
  Provide the greatest sustained opportunity to participate in hunting and trapping wolves.
- Provide for commercial uses of wolves.

Management Objectives

- Establish accurate wolf harvest estimates by 1990.
- Estimate the population size, trend, and distribution of wolves by 1991.

METHODS

Population data were extrapolated from survey estimates made in 1984-85 and from incidental observations. Sealing certificates provided most of the data on harvest.

RESULTS AND DISCUSSION

Population Status and Trend

Few wolves are present relative to adjacent areas. Populations in Subunits 25A, 25B, 25D, and 26C seem stable. Wolf populations appear to be increasing in Subunit 26B.

Population Size: Estimates from surveys, hunter observations, and harvest data indicate that 65-85 packs, including 470-570 wolves, were present in Subunits 25A, 25B, and 25D in fall 1988. Average wolf density was roughly 1 wolf per 85-104 mi^2. Nowlin (1988) believed that the wolf population density was lowest in western Subunit 25D. An estimated 50-65 wolves in 10-12 packs occur in Subunits 26B and 26C, indicating a wolf density of 1 per 400-520 mi^2. These density estimates are similar to those for northern ANWR, excluding the coastal plain where no resident packs were found (Garner and Reynolds 1986).

Distribution and Movements: Radio-collared wolves in northern ANWR were members of packs in the Canning, Sadlerochit, Aichilik, Kongakut, Hulahula, Egaksrak, Drain, and Malcom drainages (Garner and Reynolds 1986). Several lone wolves were also radio-collared. Relocations indicated wolves did not follow caribou to their winter ranges, but generally remained within the same pack territories all year. Wolves preyed primarily on caribou from spring to fall, but switched to Dall sheep, moose, and small game in winter when caribou were not present. However, several wolves dispersed as far as 500 miles away from their home range (Garner and Reynolds 1986).

Mortality

Harvest:

Season and Bag Limit. The wolf hunting season in Units 25 and 26 was open from 10 August through 30 April. There was no limit on the number of wolves which could be taken in Subunit 25A, 26B, and 26C; however, SDA hunting of wolves was prohibited. The bag limit in the remainder of Unit 25 was 10 wolves, with SDA hunting allowed from 10 August through 31 March.

The wolf trapping season in Unit 25 was open from 1 November through 31 March, and in Unit 26 from 1 November through 15 April. There was no limit on the number of wolves that could be taken in either of those seasons.

Human-induced Mortality: The wolf harvest in Unit 25 increased slightly between 1988 and 1989, although it was still lower than harvests recorded from 1984-87 (Table 1). Most of the harvest occurred in Subunit 25A and 25D, with the only major increase recorded in 25D. Harvests in both areas are still moderate compared to historic levels. The Unit 26 harvest declined somewhat from 1988 but was similar to that reported annually from 1984 to 1987 (Table 2). The harvest occurs predominantly in Subunit 26B, probably because of greater access and increased wolf numbers, as suggested by incidental field observations in recent years.

The 31 wolves harvested in Unit 25 were taken in scattered locations. Wolves were reported taken in various parts of the Coleen, Sheenjek, Hodzana, and Chandalar drainages in Subunit 25A, in the Black and Porcupine drainages in Subunit 25B, and in the Birch, Beaver, Hodzana, Porcupine, and Yukon drainages in Subunit 25D. In Subunit 26B, wolves were taken at scattered locations near the pipeline corridor from the Atigun River north to Sagwon. The 1 wolf harvested in Subunit 26C was taken on the Canning River.

Overall, more males than females occurred in the harvest and most wolves taken were gray (Tables 1 and 2). According to trapper and hunter estimates, the average pack sizes of harvested wolves for subunits were: 25A, 2.9; 25B, 6.0; 25D, 4.2; 26B, 4.7; and 26C, 7.

The unreported harvest is relatively high despite the hide sealing requirements. Unreported harvest is probably greatest in Subunits 26B and 26C, where hides are often used in clothing and handicrafts (Whitten 1988).

Harvest Chronology. Most reported wolf harvest occurred from November through March, although a few wolves were taken in Units 25 and 26 in August or September (Tables 3 and 4).

Take and Transport Method. Most wolves harvested in Unit 25 in regulatory year 1989 were taken by snaring with the use of snowmachines for access (Table 5). However, the occurrence of snared and trapped wolves in the harvest and the use of snowmachines for access has changed little over the years. What has changed is the proportion taken by the land-and-shoot method involving aircraft. This was the predominant harvest method before the 1988 prohibition on SDA hunting. This regulatory change has both reduced the total wolf harvest and altered harvest demography.

In Subunits 26B and 26C, wolves were taken primarily by shooting from the ground with 3 being trapped in Subunit 26B (Table 6). Most hunters and trappers used highway vehicles to get to the area which means travel on the Dalton Highway occurred. A few wolves were taken by individuals transported via aircraft or off-road vehicle.

Natural Mortality: The relatively low density of wolves in Subunits 25A, 25B, 25D, 26B, and 26C may, in part, be because of relatively scarce prey. Many moose populations occur at low densities and caribou are only seasonally abundant in some areas because of their wide-ranging migrations. Small pack sizes, small litter sizes, and poor pup survival seem to coincide with areas of relative prey scarcity.

Garner and Reynolds (1986) reported that 8 of 11 packs studied in ANWR had 5 or fewer wolves, which seemed to inhibit pup production and survival. Summer survival rates for packs of 5 or fewer wolves were 23-25%, while larger packs had nearly 100% pup survival.

Predation by other wolves and, in coastal areas such as Subunits 26B and 26C where wolves coexist with rabies-prone arctic fox populations, rabies (Zarnke and Ballard 1987) also are important mortality factors among wolves.

CONCLUSIONS AND RECOMMENDATIONS

The highest priority for wolf management is to acquire better information on the size, trend, and distribution of wolf populations. Populations appear fairly stable, but that assumption is based on scant data. I recommend that ADF&G allocate more funds for cooperative wolf surveys in this area with the USFWS and the National Park Service.

The next priority is to improve wolf harvest documentation of hunters and trappers. People throughout the study area and especially those in Subunits 26B and 26C must be informed of the sealing requirements for harvested wolves. Known harvests of wolves account for 3-15% of the estimated populations. Harvest rates are probably highest in the eastern Brooks Range and on the North Slope.

The status of the SDA taking of wolves relative to federal and state law is being reviewed by state and federal agencies. Changes in regulations governing this method of take are probable and will have some effect on future wolf harvests in Subunits 25B and 25D.

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Table 1. Number, sex, and pelt color of wolves harvested in Unit 25, 1984-89.

Subunit/ Year	Reported harvest	Sex			Color			
		Male	Female	Unk	White	Gray	Black	Unk
25A								
1984	25	14	10	1	3	14	6	2
1985	14	6	8	0	0	10	2	2
1986	9	6	3	0	0	5	3	1
1987	30	14	16	0	1	13	12	4
1988	10	2	6	2	2	5	3	0
1989	14	5	9	0	3	8	3	0
25B								
1984	15	4	4	7	0	0	6	1
1985	20	11	9	0	0	13	6	1
1986	13	5	4	4	0	4	8	1
1987	6	4	1	1	0	2	4	0
1988	12	3	4	4	0	6	6	0
1989	5	3	1	1	0	2	3	0
25D								
1984	24	9	10	5	0	17	5	2
1985	15	8	5	2	0	6	9	0
1986	34	25	5	4	1	23	9	1
1987	6	2	2	2	0	5	0	1
1988	2	0	0	2	0	1	1	0
1989	12	6	5	1	0	10	2	0
Total								
1984	64	27	24	13	3	39	17	5
1985	49	25	22	2	0	29	17	5
1986	56	36	12	8	1	31	20	3
1987	42	20	19	3	1	20	16	5
1988	24	5	10	9	2	12	10	0
1989	31	14	15	2	3	20	8	0

Table 2. Number, sex, and pelt color of wolves harvested in Subunits 26B and 26C, 1984-89.

Subunit/ Year	Reported harvest	Sex			Color			
		Male	Female	Unk	White	Gray	Black	Unk
26B								
1984	2	0	0	2	--	--	--	--
1985	4	3	1	0	--	--	--	--
1986	2	0	2	0	--	--	--	--
1987	3	2	1	0	0	1	2	0
1988	15	12	3	0	0	12	3	0
1989	11	4	7	0	0	4	7	0
26C								
1984	3	0	0	0	--	--	--	--
1985	1	0	0	1	--	--	--	--
1986	2	2	0	0	--	--	--	--
1987	2	1	1	0	0	1	0	1
1988	3	3	0	0	0	2	0	1
1989	1	1	0	0	0	1	0	0
Total								
1984	5	0	0	5	--	--	--	--
1985	5	3	1	1	--	--	--	--
1986	4	2	2	0	--	--	--	--
1987	5	3	2	0	0	2	2	1
1988	18	15	3	0	0	14	3	1
1989	5	7	0	0	5	7	0	--

Table 3. Harvest chronology for wolves taken in Subunits 25 A, 25B, and 25D, 1984-89.

Subunit/ Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	Total
25A											
1984	0	0	0	3	7	0	0	15	0	0	25
1985	0	3	0	0	2	1	1	7	0	0	14
1986	0	0	0	1	3	0	1	3	0	1	9
1987	1	2	0	1	2	2	2	20	0	0	30
1988	0	3	0	1	1	0	1	4	0	0	10
1989	0	3	0	3	2	4	2	0	0	0	14
25B											
1984	0	1	0	1	3	2	3	5	0	0	15
1985	0	0	0	1	6	7	0	1	0	6	21
1986	0	0	0	4	4	1	0	0	0	3	12
1987	0	0	0	1	1	2	1	1	0	0	6
1988	0	0	0	2	6	1	2	1	0	0	12
1989	0	0	0	1	3	0	0	1	0	0	5
25D											
1984	0	0	0	3	4	1	1	14	1	0	24
1985	0	0	0	0	1	0	9	5	0	0	15
1986	0	0	0	6	6	8	1	13	0	0	34
1987	0	0	0	0	3	2	1	0	0	0	6
1988	0	0	0	0	1	0	1	0	0	0	2
1989	0	0	0	0	5	0	3	4	0	0	12
Total											
1984	0	0	0	7	14	3	4	34	1	6	64
1985	0	3	0	1	9	8	10	13	0	0	50
1986	0	0	0	5	13	9	2	16	0	4	55
1987	1	2	0	2	6	6	4	21	0	0	42
1988	0	3	0	3	8	1	4	5	0	0	24
1989	0	3	0	4	10	4	5	5	0	0	31

Table 4. Harvest chronology for wolves taken in Subunits 26B and 26C, 1985-89.

Subunit/ Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	Total
26B											
1985	0	0	0	3	1	0	0	0	0	0	4
1986	0	0	0	0	0	0	0	0	0	2	2
1987	0	0	0	0	0	0	1	1	1	0	3
1988	0	2	0	1	5	0	0	6	1	0	15
1989	2	2	0	3	2	1	0	1	0	0	0
26C											
1985	0	0	0	0	0	0	0	0	0	1	1
1986	0	0	0	0	0	0	0	0	0	2	2
1987	1	0	0	0	0	0	0	0	1	0	2
1988	0	2	0	0	0	0	0	0	1	0	3
1989	1	0	0	0	0	0	0	0	0	0	1
Total											
1985	0	0	0	3	1	0	0	0	0	1	5
1986	0	0	0	0	0	0	0	0	0	4	4
1987	1	0	0	0	0	0	0	1	2	0	5
1988	0	4	0	1	5	0	0	6	2	0	18
1989	3	2	0	3	2	1	0	1	0	0	1

Table 5. Method of take and transportation for wolves harvested in Subunits 25A, 25B, and 25D, 1984-89.

Subunit/ Year	Method of take[a]				Method of transportation[b]							
	1	2	3	4	1	2	3	4	5	6	7	8
25A												
1984	15	7	3	0	--	--	--	--	--	--	--	--
1985	8	3	1	2	6	1	0	0	4	0	0	3
1986	5	2	2	0	2	0	0	0	7	0	0	0
1987	23	3	4	0	22	2	1	0	5	0	0	0
1988	4	3	3	0	1	2	1	0	6	0	0	0
1989	6	5	3	0	3	4	0	0	5	0	2	0
25B												
1984	6	6	3	0	--	--	--	--	--	--	--	--
1985	10	4	6	0	9	6	0	0	5	0	0	0
1986	0	9	3	1	1	0	0	0	11	0	0	0
1987	1	1	4	0	0	1	0	0	4	0	1	0
1988	0	6	6	0	0	2	0	0	10	0	0	0
1989	0	1	4	0	0	3	0	0	2	0	0	0
25D												
1984	15	7	2	0	--	--	--	--	--	--	--	--
1985	11	2	2	0	12	0	0	0	3	0	0	0
1986	11	7	16	0	13	3	0	0	18	0	0	0
1987	0	1	5	0	0	0	0	0	6	0	0	0
1988	0	2	0	0	0	0	0	0	2	0	0	0
1989	3	3	6	0	1	0	0	0	11	0	0	0
Total												
1984	36	20	8	0	--	--	--	--	--	--	--	--
1985	29	9	9	2	27	7	0	0	12	0	0	3
1986	16	18	21	0	16	3	0	0	24	0	0	1
1987	24	5	13	0	22	3	0	0	15	0	1	0
1988	4	11	9	0	1	4	1	0	18	0	0	0
1989	9	9	13	0	4	7	0	2	18	0	2	0

[a] Method of take: 1, ground shooting; 2, trapping; 3 snaring; 4, other.

[b] Method of transportation: 1, airplane; 2, dog sled, skis, or snowshoes; 3, boat; 4, 3- or 4-wheeler; 5, snowmachine; 6, other ORV; 7, highway vehicle; 8 unknown.

Table 6. Method of take and transportation for wolves harvested in Subunits 26B and 26C, 1984-89.

Subunit/	Method of take[a]				Method of transportation[b]							
Year	1	2	3	4	1	2	3	4	5	6	7	8
26B												
1984	2	0	0	0	--	--	--	--	--	--	--	--
1985	3	1	0	0	--	--	--	--	--	--	--	--
1986	2	0	0	0	--	--	--	--	--	--	--	--
1987	3	0	0	0	1	0	0	0	0	0	1	0
1988	7	5	2	1	2	0	0	0	7	0	5	1
1989	7	3	0	1	2	0	0	0	0	0	7	1
26C												
1984	3	0	0	0	--	--	--	--	--	--	--	--
1985	1	0	0	0	--	--	--	--	--	--	--	--
1986	2	0	0	0	--	--	--	--	--	--	--	--
1987	2	0	0	0	1	0	0	0	0	0	0	1
1988	3	0	0	0	2	0	0	0	1	0	0	0
1989	1	0	0	0	1	0	0	0	0	0	0	0
Total												
1984	5	0	0	0	--	--	--	--	--	--	--	--
1985	4	1	0	0	--	--	--	--	--	--	--	--
1986	4	0	0	0	--	--	--	--	--	--	--	--
1987	5	0	0	0	2	0	0	0	0	0	1	1
1988	10	5	2	1	4	0	0	0	8	0	5	1
1989	8	3	0	1	3	0	0	1	0	0	7	1

[a] Method of take: 1, ground shooting; 2, trapping; 3 snaring; 4, other.

[b] Method of transportation: 1, airplane; 2, dog sled, skis, or snowshoes; 3, boat; 4, 3- or 4-wheeler; 5, snowmachine; 6, other ORV; 7, highway vehicle; 8 unknown.

LOCATION

Game Management Unit: 26A (56,000 mi^2)

Geographical Description: Western North Slope

BACKGROUND

The current status of wolf populations in Subunit 26A is not known with certainty. James (1982) and Trent (1988) provided estimates of minimum population size for the subunit using results from spring track surveys. The highest densities occurred in the southern portion of the subunit, south of the coastal plain. Wolf pelts are highly valued by local residents, and hunting pressure in portions of the subunit has been substantial. Because most of Subunit 26A is composed of treeless tundra habitat, wolves are especially vulnerable to hunters during the winter when snowmachines are used for access.

MANAGEMENT DIRECTION

The following population management goals have been established for Subunit 26A:

- Establish and maintain viable wolf populations in Unit 26A.
- Monitor the harvest through the statewide sealing program.
- Interview hunters, guides, and pilots to collect harvest and population status information.
- Record wolf observations during moose counts and compare to observations made during past counts.
- Review information collected in the past to obtain population trend information.

METHODS

No surveys to determine wolf numbers, densities, or population status were conducted during the report period. Harvest data were obtained from sealing certificate records and informal discussions with knowledgeable village residents. Composition data were obtained from wolf carcasses collected at Anaktuvuk Pass.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size: The size of the wolf population for the western North Slope is not presently known. Stephenson and James made the most recent estimate of wolf population size for Subunit 26A at 144-310 wolves for winter 1981-82 (James 1982). They surveyed 10,044 mi^2 in the southeastern corner of the subunit. Using the survey data, they estimated a density of 1 wolf/54-114 mi^2 for 25% of the subunit and 1 wolf/653-1524 mi^2 for the remaining 75% of the subunit.

During 1986, Trent surveyed a 6,480 mi^2 area around Umiat, roughly the same area surveyed by Stephenson in 1982, and observed 2 packs of 9 wolves. Wolf track observations were also made and, when combined with actual sightings, 9 packs estimated to contain 44 wolves were tentatively identified. The estimated density for the 1986 survey area was 1 wolf/147 mi^2 (Trent 1986).

Trent surveyed the same drainages in 1987 and observed 4-5 packs of 37 wolves inhabiting 8,226 mi^2. When wolf track observations were included, 11-12 packs estimated at 57-69 individuals were thought to be in the area. The calculated density for the 1987 survey area was 1 wolf/119-144 mi^2.

Population Composition: Stephenson and Adams (unpublished data) have collected necropsy data on wolves harvested at Anaktuvuk Pass since winter 1985-86. Fifty-seven carcasses from wolves harvested in, or immediately adjacent to, Subunit 26A were examined during 1989-90. Thirty-two (56%) were males, 23 (40%) were females, and 2 (4%) were unknown. Of 53 carcasses that were aged, 31 (58%) were pups and 22 (42%) were adults. Forty-one (75%) of the wolves were gray, 13 (24%) were black, and 1 was white.

Thirty-four carcasses were examined during 1988-89. Twenty-one (62%) were males and 13 (38%) were females. Twenty-two (65%) were pups and 12 (35%) were adults. One animal was black and the remainder were gray.

Of the 27 carcasses examined at Anaktuvuk Pass during 1987-88, 15 (56%) were males and 12 (44%) were females. Fourteen (52%) were pups and 13 (48%) were adults. One wolf was white and the remainder were gray.

Of the 14 animals that were sealed in Subunit 26A during 1989-90, 9 (69%) were males, 4 were females (31%), and 1 was unknown.

Composition of the harvest probably does not reflect population composition because pups are more susceptible to harvest than adults. Composition data from sources other than hunter harvest are not available at this time.

Distribution and Movements: Most wolves are found in the southern portion of Subunit 26A near the Brooks Range and along the Colville River. Although wolves exist at lower densities on the coastal plain, residents of Atqasuk and Wainwright have reported that wolf numbers have been increasing during the last 2 years.

Mortality

Season and Bag Limits: The hunting season opens on 10 August and closes on 30 April. The trapping season opens on 1 November and closes on 15 April. No maximum bag limit has been specified for either season.

Harvest:

Human Induced Mortality: During the 1989-90 season, 14 wolves taken from Subunit 26A were sealed. Stephenson and Adams (unpublished data) estimated that at least 36 wolves harvested by Anaktuvuk Pass residents came from Subunit 26A. Discussions with knowledgeable village residents indicate that Atqasuk hunters took at least 4 wolves; Wainwright, 7 wolves; Nuiqsut, 12 wolves; and Barrow, 3 wolves. Therefore, a minimum of 62 wolves, 14 of which were sealed, were harvested in Subunit 26A during 1989-90.

During 1988-89, Stephenson and Adams reported that a minimum of 41 wolves were harvested from Subunit 26A by Anaktuvuk Pass hunters, and a total of 60 wolves were harvested from Subunit 26A. During 1987-88, Stephenson and Adams reported that at least 26 wolves were harvested from Subunit 26A by Anaktuvuk Pass hunters, but reliable data were not available on harvest from other villages. During 1986-87, Stephenson and Adams reported at least 23 wolves were harvested by Anaktuvuk Pass residents, and the estimated total harvest in Subunit 26A was 51 wolves (Trent 1987). A minimum of 51 wolves was also taken in Subunit 26A during 1985-86, of which 37 were reported by Stephenson and Adams as taken by Anaktuvuk Pass hunters.

Method of Take, Transportation, and Chronology: Of the 14 wolves sealed in Subunit 26A during 1989-90, 5 (38%) were ground shot and 8 (62%) were trapped. Two (15%) animals were reported taken using aircraft for transportation and 11 (85%) were taken using snowmachines. The chronology of the harvest was: September - 2, November - 1, December - 2, January - 2, February - 2, and March - 5.

Habitat

Assessment: Subunit 26A contains an extensive prey base available to wolves. The Western Arctic Caribou Herd, which numbers over 340,000 animals, seasonally occupies the subunit and a portion of this herd remains through the winter. The Teshekpuk Lake Caribou Herd numbers over 16,000 and most of this herd remains in the subunit throughout the year. In addition, over 1,500 moose reside in the Colville River drainage. This prey base could support many more wolves than currently exist in the subunit.

CONCLUSIONS AND RECOMMENDATIONS

The greatest management need in Subunit 26A is for more current population assessment data. An extensive survey will be required to determine densities in various areas and make a population estimate for the entire area. The results of survey conducted by Trent (1986 and 1987) are quite useful but cannot be applied to the entire subunit. An overall population estimate has not been made since 1982 and current, accurate information is needed to properly manage the resource.

More accurate harvest information is needed as well. However, it appears that the only practical way to learn how many wolves are harvested is to hire individuals in each village to collect harvest information.

The public needs to be consulted in order to establish clear management goals. If the moose population on the Colville River declines in number, a study should be conducted to determine what impact wolves are having as predators. This information could be used to determine whether it is desirable for wolf densities to increase, decrease, or remain stable.

Because "land and shoot" or same-day-airborne hunting for wolves is no longer permitted, extensive areas in Subunit 26A receive little impact from hunters. Except for the area within 50-70 miles of Anaktuvuk Pass, much of the wolf population inhabiting the foothills of the Brooks Range probably will not be heavily used. On the coastal plain, wolves will continue to be vulnerable to hunters on snowmachines and probably will not become plentiful in number.

No changes in bag limits or seasons are recommended at this time.

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Table 1. Composition of the annual wolf harvest from Subunit 26A and Anaktuvuk Pass, 1985-1990.

Year	Subunit 26A	Anaktuvuk Pass	Composition (percent)			
			Males	Females	Pups	Adults
1985-86	51	37	33	67	75	25
1986-87	51	23	52	48	64	36
1987-88		26	56	44	52	48
1988-89	55	41	62	38	65	35
1989-90	62	36	58	42	56	44

Alaska Game Management Units

WILDLIFE RESTORATION