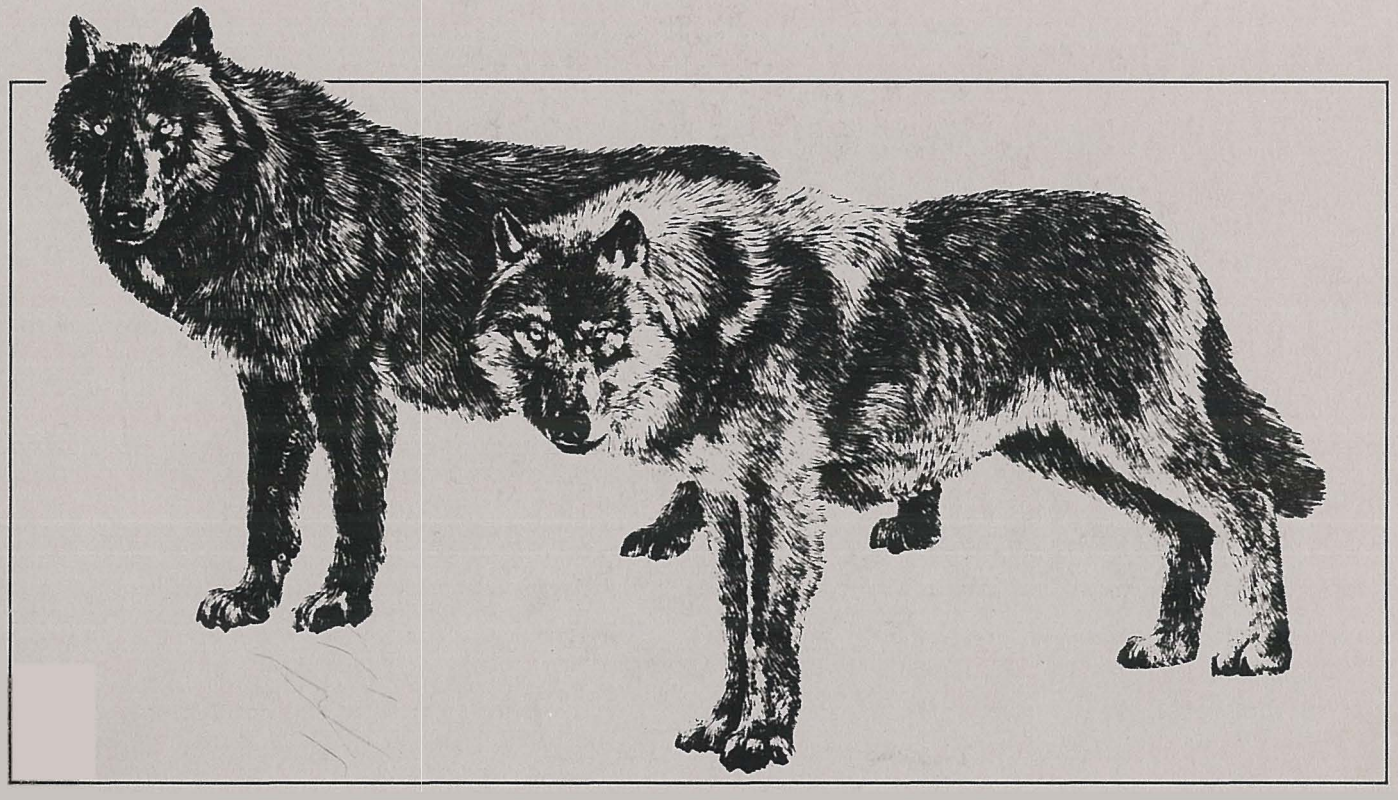
Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Annual Report of Survey-Inventory Activities
1 July 1988-30 June 1989

WOLF



Compiled and edited by
Sid O. Morgan, Publications Technician
Vol. XX, Part XV
Project W-23-2, Study 14.0
September 1990

STATE OF ALASKA
Steve Cowper, Governor

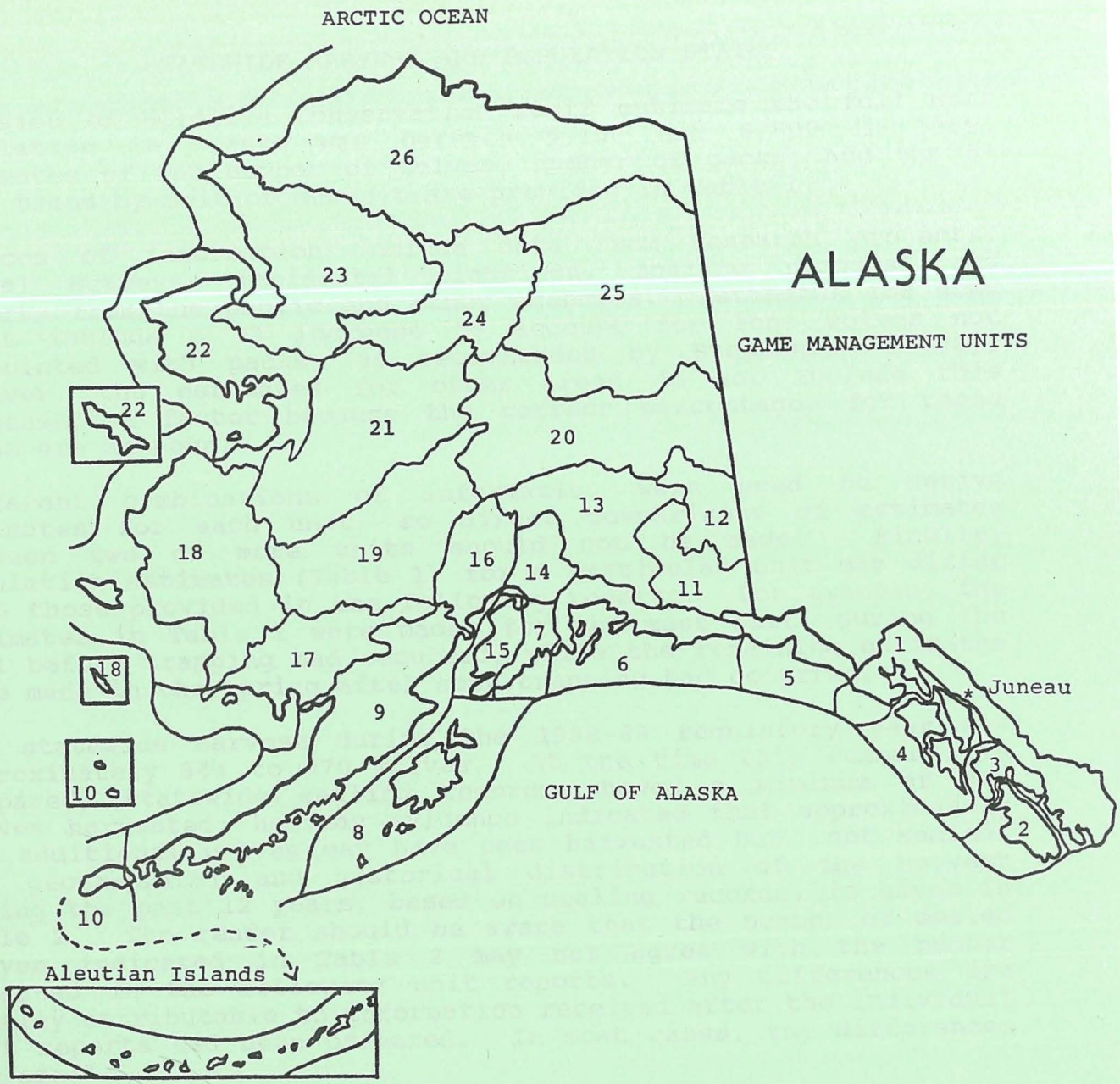
DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF WILDLIFE CONSERVATION
W. Lewis Pamplin, Jr., Director
W. Bruce Dinneford, Acting Planning Chief

Additional copies of this report, or reports on other species covered in this series may be obtained from:

Publications Technician
ADF&G, Wildlife Conservation
P.O. Box 3-2000
Juneau, AK 99802
(907) 465-4190

TABLE OF CONTENTS


ARCTIC OCEAN
ALASKA
GAME MANAGEMENT UNITS
26
23
25
24
22
22
21
20
13
12
18
19
16
14
11
7
15
17
18
6
5
1
9
Juneau
4
3
10
GULF OF ALASKA
8
2
10
Aleutian Islands

STATEWIDE HARVEST AND POPULATION STATUS

Division of Wildlife Conservation staff estimate the fall wolf population in Alaska was between 5,100 and 6,600 in 1989. Estimates of the number of wolves, number of packs, and the 5-year trend by unit or subunit are provided in Table 1.

Sources of information include data from research projects, aerial surveys, incidental sightings, sealing records, and reports from the public and other agencies. Estimates for some areas include a 9% increase to account for lone wolves not associated with packs, as recommended by Stephenson (1978); however, the estimates for other areas do not include this compensation factor because the correct percentages for these areas are unknown.

Different combinations of information were used to derive estimates for each unit, so direct comparisons of estimates between two or more units should not be made. Finally, population estimates (Table 1) for a particular unit may differ from those provided in the following reports. For example, the estimates in Table 1 were made, for the most part, during the fall before trapping had occurred, while the remaining estimates were made in the spring after some trapping had occurred.

The statewide harvest during the 1988-89 regulatory year was approximately 844 to 970 wolves. At the time this summary was prepared, statewide sealing records showed a minimum of 844 wolves harvested; hearsay evidence indicated that approximately 125 additional wolves may have been harvested but not sealed. The geographical and historical distribution of the harvest during the past 12 years, based on sealing records, is given in Table 2. The reader should be aware that the number of sealed wolves indicated in Table 2 may not agree with the number reported in the following unit reports. Any differences are usually attributable to information received after the individual unit reports had been prepared. In most cases, the differences are small.

The documented statewide harvest of wolves during the 1988-89 season was 23% lower than it had been for the previous season and nearly the same as the 12-year mean of 830 wolves. Compared with the previous season, the 1988-89 harvest was higher in 7 units and lower in 17 units.

Weather and changes in regulations affected the wolf harvest in 1988-89. In some areas, light or infrequent snowfalls made it difficult to locate wolf sign or to track wolves. At the November 1987 meeting, the Board of Game adopted several regulatory changes that became effective during the reporting period. Same-day-airborne trapping was prohibited. Although same-day-airborne hunting was allowed, a bag limit of 10 wolves was established; this method of hunting was limited to the following units: 9, 17, 19, 21, 23, 24, 25B, 25C, and 25D.

In Southeast Alaska (Units 1-5) there was a overall 20% decline in the harvest, compared with that for 1987-88. In Southcentral Alaska (Units 6-11 and 13-17) there was an overall 42% decline in the wolf harvest, compared with that for the 1987-88 season. Although the harvest was 57% higher in Unit 9, compared with the previous season, it was lower by 71% in Units 13 and 17; the decline in the Unit 13 harvest was probably due to the changes in regulations, while the decline in the Unit 17 harvest was due to low snowfall that made tracking difficult between mid-February and the end of March.

In Interior Alaska (Units 12, 19-21, 24 and 25) the reported wolf harvest was 21% less in 1988-89 than it had been in 1987-88. The harvest declined in 5 of the 6 Interior units by as little as 9.5% (Unit 12) to as much as 45% (Unit 25). The harvest was higher only in Unit 24, where it was 13% greater than that for the previous year. The smallest decline in harvest occurred in Units 12 and 20, where same-day-airborne hunting was prohibited, whereas the larger declines occurred in the units where it was permitted. Because one might expect individuals who employ the same-day-airborne method of hunting to shift from prohibited to permitted areas, the declines in harvest in permitted units was unexpected. Because this method of hunting requires good flying and tracking conditions, less-than-ideal weather conditions could have accounted for the reduction in harvest.

In Arctic/Western Alaska (Units 18, 22, 23, and 26) there was a slight overall increase (5%) in the harvest of wolves, compared with the harvest for 1987-88. The harvests in Units 18 and 26 were higher and Units 22 and 23 were lower than respective harvests during the previous season. These differences do not appear to be related to any specific factors; also, the harvests probably exceeded the numbers sealed by a greater percentage than the year-to-year differences. For example, in Subunit 26A only 12 (22%) of 55 wolves harvested were sealed.

The demand for quality wolf pelts in this area of Alaska, primarily for use in parka ruffs, often exceeds the supply. In addition, people often assume, incorrectly, that if they are going to retain the pelt for personal use, it is not necessary to seal it. Finally, the Department has found it difficult to hire sealing agents in many communities without an ADF&G office.

All of the factors contribute to a lower rate of compliance with the sealing requirement in Arctic/Western Alaska than in other regions of the state. To overcome this problem, it will be necessary for us to make people aware of the importance of the harvest information to our wolf management program. It will also be necessary to make it easier for individuals to comply with the sealing requirement.

LITERATURE CITED

Stephenson, R. O. 1978. Characteristics of exploited wolf populations. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Report. Proj. W-17-3 through W-17-8. Juneau. 21pp.

PREPARED BY:

Herbert R. Melchior
Statewide Furbearer Coordinator

Table 1. Estimated statewide wolf population status (fall/winter 1988).

GMU/Subunit	Wolf population	Number of packs	5-year trend
Region I			
1A	205	25	Stable
1B	40	6	Stable
1C	80	12	Stable
1D	25	4	Decreasing
2	175	20	Increasing
3	55	11	Increasing
4	0	0	--
5A	50-60	6	Increasing
5B	15	2	Stable
Subtotal	645-655	86	--
Region II			
6	65-95	13+	Increasing
7	40-45	7	Stable
8	0	0	--
9	135-165	14	Stable
10	15-25	2	Unknown
11	70-90	12-15	Stable
13	175-225	20-25	Stable
14	30-60	10	Stable
15	190-205	21	Increasing in 15A; stable in 15B & C
16	60-75	7	Slightly increasing
17	145-240	16-29	Stable
Subtotal	925-1,225	122-143	--
Region III			
12	135-140	25-27	Decreasing
19A & B	225-260	22-26	Stable
19C	100-110	11-13	Stable
19D	140-160	20-24	Increasing
20A	150-175	20-24	Stable
20B	140-180	21-27	Increasing
20C	180-220	15-25	Stable
20D	60-80	10-12	Stable
20E	170-175	31-34	Decreasing
20F	80-120	10-15	Stable
21A	155-175	19-23	Stable
21B	95-100	13-16	Increasing

Table 1. Continued.

GMU/Subunit	Wolf population	Number of packs	5-Year trend
21C	35-40	4-6	Stable
21D	175-190	25-30	Increasing
21E	90-110	10-12	Increasing
24	420-450	55-60	Increasing
25A	220-270	30-40	Stable
25B	100-120	15-20	Stable
25C	60-100	8-10	Stable
25D	150-180	20-25	Stable
26B	25-35	5-6	Increasing
26C	25-30	5-6	Stable
Subtotal	2,930-3,420	394-481	--
Region V			
18	25-50	5	Increasing
22	50-150	7-20	Increasing
23	350-720	65-130	Increasing
26A	145-310	14-30	Increasing
Subtotal	570-1,230	91-185	--
Total	5,070-6,530	693-895	--

Table 2. Counts of original wolf sealing data from mandatory sealing certificates, Alaska, 1977-89.

Unit	Year											
	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89
1	41	48	35	42	29	37	55	38	47	49	50	35
2	23	10	11	34	19	15	27	43	18	39	55	45
3	10	16	16	10	14	17	17	7	10	10	9	10
4[a]	--	--	--	--	--	--	--	--	--	--	--	--
5	1	12	10	2	6	11	10	16	5	14	8	7
6	3	6	0	2	1	1	2	3	1	3	10	4
7	19	12	6	10	12	4	11	5	13	19	3	2
8	0	0	0	0	0	0	0	0	0	0	0	0
9	26	17	20	22	22	13	18	54	24	34	37	58
10	9	0	0	0	1	0	0	0	6	4	2	5
11	51	40	7	18	8	26	33	38	9	15	27	25
12	34	35	35	23	33	34	23	22	45	37	21	19
13	132	69	54	48	55	91	118	127	70	84	110	32
14	24	4	4	3	7	17	13	6	10	3	3	1
15	20	44	38	32	50	42	45	42	53	29	22	16
16	11	31	44	23	20	13	12	19	2	9	6	7
17	17	20	25	8	17	45	7	43	13	28	79	23
18	2	1	0	1	1	5	0	3	7	4	11	17
19	53	81	40	48	53	34	41	110	39	75	142	110
20[b]	185	145	85	123	144	156	110	103	134	95	122	109
21	47	86	82	78	38	96	54	158	45	101	129	80
22	3	5	4	4	4	4	5	12	5	8	22	14
23	64	50	18	50	17	48	46	65	18	33	93	83
24	58	100	51	72	31	44	44	56	29	38	67	76
25[b]	45	37	74	56	68	63	47	71	51	57	49	27
26	39	36	15	42	39	9	4	13	21	10	20	39
Total	917	905	674	751	689	825	742	1,054	675	798	1,097	844

[a] No animals sealed in this unit.

[b] The common boundary dividing Game Management Units 20 and 25 was moved southward in 1981. See Alaska Game Management Unit Maps.

STUDY AREA

GAME MANAGEMENT UNITS: 1A and 2 (8,400 mi^2)

GEOGRAPHICAL DESCRIPTION: GMU 1A - Ketchikan area, including mainland areas draining into Behm and Portland Canals.

GMU 2 - Prince of Wales and adjacent islands south of Sumner Strait and west of Kashevarof Passage and Clarence Strait.

BACKGROUND

Biological and harvest information has been collected for wolves through bounty payments (1961-1971) and the mandatory sealing program (1971-1989). Wolves are found throughout Subunit 1A and Unit 2. Their occurrence on some of the smaller islands is sporadic, ranging from zero to high-density populations. Wolves are excellent swimmers, and they are able to cross up to a mile of water with some regularity.

The primary prey species on the islands and the lower Cleveland Peninsula is deer, while on most of the mainland it is mountain goat. Significant numbers of beaver are taken by some packs, and all wolves rely heavily on spawning salmon during July, August, and September; in some systems they eat fish as late as November.

Pack sizes are normally smaller than those of the Interior, ranging from three to seven. In years having high deer densities, pack sizes of eight to 12 have been reported.

Southeast wolves cover a wide color spectrum; the brown/gray color phase has been the most common. Over the past 20 years, white or near-white wolves have composed less than 1% of the harvest, while the "normal" black phase has accounted about 23% in Subunit 1A and 17% in Unit 2.

The weights of adult males very seldom reach 100 pounds. The average weight of 11 adult males was 87 pounds, while 18 male pups averaged 74.4 pounds. Females weigh about 15 pounds lighter than the males. Nine adult females averaged 69.4 pounds, while 30 female pups averaged 60.9 pounds (ADF&G files).

The quality of the wolf furs from this area is poor; furs are shorter, coarser, and less dense than those of Interior wolves. Additionally, they have a tendency to mat badly along the back.

Trapping is generally conducted from December through mid-April, and typical wolf sets are made in tide pools at the heads of the larger bays. Success is generally better in March and April than in the earlier months.

POPULATION OBJECTIVES

To measure the economic value of all uses of wolves and subsequently develop a planned management system using measurable objectives.

METHODS

Harvest data were collected during the hide-sealing process. Data routinely collected included number and sex of harvested wolves, date and location of harvest, method of take, transportation used, and pelt color.

Limited survey data is available for Revillagigedo Island. Surveys were made from a Super-Cub, following fresh snowfall sufficient to show tracks. A research program conducted in the mid-1980's provided data on movements, pack size, food habits, and population density.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf populations in both units were very high until the early 1970's, when extreme winters decimated the deer herds. Following this population crash, both wolves and deer remained at low levels until the early 1980's in Unit 2 and the mid-1980's in Subunit 1A, when deer populations began to increase. An increase in wolf numbers occurred with that for deer, and they are steadily increasing.

Population Size:

In the late 1960's to early 1970's the density in Subunit 1A and Unit 2 was 1 wolf/10 mi^2. During the low-cycle years, population estimates for Revillagigedo Island indicated a density of 1 wolf/22-44 mi^2, or a population of 25 to 50 for the island. The density in Unit 2 was similar. Mainland densities, where mountain goats are the primary prey species, were lower than those for the islands, where deer are the main prey.

Distribution and Movements:

Wolves are present throughout Subunit 1A and Unit 2, although they may not be year-round residents of some of the smaller islands. Observations and tracking of radio-collared wolves indicated they readily cross bodies of water in excess of 1/2 mile to reach smaller islands.

Mortality

Hunting Season and Bag Limit:

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.

Human-induced Mortality:

Table 1 presents harvest data for the past 5 years. Accidental and illegal harvests occur infrequently, negligibly affecting the overall harvest. Annual harvest figures may not be representative of wolf populations, because individual trappers, total number of trappers, and trapper effort changes from year to year. The long-term harvest for Unit 2 is expected to increase, because of an increasing wolf population, road access, and human activity. Less of an increase in harvest is expected in Subunit 1A because of poorer access. The differences in road access and human activity between the 2 units are reflected in the high percentage of wolves taken by shooting and the methods of transportation used in Unit 2 (Table 2). These differences can be expected to lessen as the road systems on Revillagigedo Island and the Cleveland Peninsula develop and access similar to Unit 2 is created. During this reporting period 4 wolves were taken from the Ketchikan road system, reflecting the general overall increase in wolf numbers.

The winter period (December through March) is generally the time of heaviest harvest, because most trapping occurs during these months. This is particularly true for Subunit 1A, where there are fewer roads and traffic and therefore less incidental take by shooting; however, the harvest during this reporting period was distributed more evenly throughout the year for both Subunit 1A and Unit 2 (Table 3). Many of the wolves killed in the fall and spring harvests were taken incidentally by deer and bear hunters.

Habitat

While the expanding road systems and increasing human population throughout most of Subunit 1A and Unit 2 will have a direct impact on wolves, mainly due to hunting and trapping, the real long-term permanent loss of wolf habitat comes indirectly through loss of deer habitat. Logging of the uneven-aged old-growth forest reduces the carrying capacity of the area for deer, particularly during the more severe winters, and over-all lowered deer numbers will result. Wolf populations supported by fewer deer will be lower than at present. Population fluctuations will always occur, but the potential to support wolves will steadily decline.

Game Board Actions and Emergency Orders

Essentially no changes have been made in regulations regarding wolves since the bounty was discontinued in the late 1970's. It is virtually impossible to reduce wolf populations in these units by hunting and trapping, and seasons and bag limits reflect this. Trapping seasons encompass the pelt-primeness period; they are closed during the time bears are active. The year-round hunting season allows hunters to harvest wolves incidentally while seeking other species. Little specific hunting for wolves is done within Subunit 1A and Unit 2. No changes in seasons or bag limits are recommended.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population in Subunit 1A and Unit 2 has not been affected by hunting and trapping efforts. Population fluctuations seem to follow changes in deer numbers. Availability of alternate food sources, primarily salmon and beaver, also significantly impact wolf populations during periods of low deer densities.

In Unit 2 where road access and human settlement are so extensive, a large increase in hunting and trapping efforts could alter wolf numbers, particularly following a crash in both deer and wolf populations. However, with the current low value of wolf pelts, it is unlikely this will occur in the near future.

The future of wolves in southern Southeast appears relatively secure, particularly in Subunit 1A; however, the extensive roading, logging, and development-related activities in Unit 2 could cause problems for wolves on Prince of Wales Island. The current potential to support wolves in both units will decline because of the loss in deer habitat brought about by logging.

PREPARED BY:

Robert E. Wood
Wildlife Biologist III

SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Annual wolf harvest in Subunit 1A and Unit 2, 1984-85 to 1988-89.

Year	No. males	No. females	No. unknown	Total	No. shot	No. trapped	White	Grey	Black
Subunit 1A									
1984-85	6	9	0	15	3	12	1	12	2
1985-86	6	5	0	11	1	10		7	4
1986-87	11	10	0	21	3	18		16	5
1987-88	14	7	0	21	7	14		14	7
1988-89	13	8	0	21	10	11		14	7
Totals	50	39	0	89	24	65	1	63	25
Unit 2									
1984-85	26	16	1	43	21	22		29	14
1985-86	7	11	0	18	9	9	1	13	3
1986-87	22	16	1	39	16	23		32	6
1987-88	27	24	4	55	26	28	1	39	15
1988-89	27	16	2	45	31	14		41	4
Totals	109	83	8	200	103	96	2	154	42

Table 2. Transport methods in Subunit 1A and Unit 2, 1985-86 to 1988-89.

Year	Air	Boat	Highway vehicle
Subunit 1A			
1985-86	0	5	3
1986-87	10	11	0
1987-88	0	21	0
1988-89	0	16	5
Totals	10	53	8
Unit 2			
1985-86	0	4	5
1986-87	0	14	25
1987-88	0	31	20
1988-89	3	25	14
Totals	3	74	64

Table 3. Harvest chronology in Subunit 1A and Unit 2, 1984-85 to 1988-89

Year	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	1
1988-89	0	1	2	1	3	2	4	0	3	4	1	0
Totals	0	2	5	2	4	10	21	21	11	8	4	1
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
Totals	0	3	13	19	18	39	26	39	18	12	9	4

STUDY AREA

GAME MANAGEMENT UNIT: 1B and 3 (6900 mi^2)

GEOGRAPHICAL DESCRIPTION: Southeast Mainland from Cape Fanshaw to Lemesurier Point and adjacent Islands

BACKGROUND

Wolves are endemic to the Alexander Archipelago south of Frederick Sound and to the mainland. Wolves immigrated after the postglacial establishment of the deer populations. Because the terrain is heavily forested in Subunit 1B and Unit 3, wolves are infrequently seen; hence, opportunities for viewing wolves are very limited.

Trapping of wolves is a well-established, long-time use, around which much of the current management program is centered. From a historical perspective, the interest in wolf trapping is relatively low because of the effort involved, expense of larger traps, and low pelt values. In the Petersburg-Wrangell area, wolves contribute less to the income of trappers than other furbearers. Furthermore, trapping of wolves and other furbearers is a secondary source of income for most trappers, many of whom have seasonal occupations such as logging or fishing.

Wolf population reduction to benefit deer populations was frequently the main emphasis of both federal and state management efforts. Currently, public controversy over various aspects of wolf population manipulation has effectively eliminated it as a management option; however, continuing criticism from the public concerning the Department's perceived unwillingness to address the issue of wolf-prey imbalances through direct intervention and others opposed to any intervention at all may require the systematic development of a public-consent solution to this dilemma.

POPULATION OBJECTIVES

To measure the economic value of all uses of wolves and subsequently develop a planned management system using measurable objectives.

METHODS

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

wolves. Observations or signs of wolves by the public were used to indicate the presence or absence of wolves in areas and the gross differences in densities between areas.

RESULTS AND DISCUSSION

Population Status and Trend

Existing data are insufficient to make a determination of wolf population trend in Subunit 1B or Unit 3. Incidental observations by Department staff, trappers, hunters, and other members of the public suggested the continuing presence of wolves throughout their historic range and increasing numbers in some areas.

Mortality

Season and Bag Limit:

Hunting. There are no closed seasons or bag limits in Subunit 1B and Unit 3.

Trapping. The open season in Subunit 1B and Unit 3 is from 10 November to 30 April. There is no bag limit.

Human-induced Mortality:

The average annual harvests from 1984-85 to 1988-89 for Subunit 1B and Unit 3 were 9 and 11 wolves, respectively. The previous average annual harvests for Unit 3 in 5-year increments (i.e., 1968-69 to 1973-74, 1974-75 to 1978-79, 1979-80 to 1983-84) were 44, 21, and 20, respectively. The harvest pattern in Subunit 1B has been much more stable, fluctuating from 4 to 16 wolves. Although the decreasing trend in the harvest is indisputable, the explanation is less than clear. It may be the result of decreasing trapping efforts or fewer available wolves than 15 to 20 years ago, when deer had been at very high levels. Although deer populations may have stabilized in some areas in Unit 3, the populations north of there are increasing, especially on Mitkof Island. It is therefore reasonable to anticipate a notable increase in the wolf population in the next few years. There is already circumstantial evidence that an increase has begun. Whether or not the harvest will also increase commensurate with an increase in the number of wolves will depend largely on the degree of economic motivation to trappers. The harvest methods (Table 2) in 1988-89 reflected the past trend: trapping, 11 wolves; shooting, 8 wolves.

Harvest Chronology. Normally, February is the month during which most of the wolf harvest occurs in Subunit 1B and Unit 3. In 1988-89, 5 wolves were taken in February, four in December, and the remainder distributed throughout the year.

Transport Methods. Boats are the most commonly used method of transportation by hunters and trappers in the Petersburg-Wrangell area (Table 4); i.e., 14 of the 19 wolves harvested in both units.

CONCLUSIONS AND RECOMMENDATIONS

Wolf populations, as reflected by the harvest, appear to be generally stable in Subunit 1B and Unit 3, and there may be some local increases. Fluctuations in harvest numbers are associated with changes in the trapping effort. Trappers in Southeast Alaska usually do not depend on trapping for a livelihood. No changes in regulations are needed at this time.

PREPARED BY:

Charles Land
Wildlife Biologist I

David James
Wildlife Biologist III

SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Reported harvest of wolves by sex in Subunit 1B and Unit 3, 1984-1988.

Year	Subunit 1B				Unit 3			
	M	F	U	Total	M	F	U	Total
1984-85	4	6	0	10	3	5	1	9
1985-86	6	3	0	9	5	4	0	9
1986-87	7	4	0	11	6	3	1	10
1987-88	8	6	0	14	6	3	0	9
1988-89	4	5	0	9	5	5	0	10

Table 2. Harvest methods for wolves in Subunit 1B and Unit 3, 1984-1988.

Year	Unit	Ground shooting	Trapping	Snaring	Other
1984-85	1B	1	8	1	0
	3	2	6	1	0
1985-86	1B	3	6	0	0
	3	2	1	6	0
1986-87	1B	1	8	2	0
	3	1	7	1	1
1987-88	1B	3	10	1	0
	3	4	5	0	0
1988-89	1B	3	6	0	0
	3	5	5	0	0

Table 3. Harvest chronology for Subunit 1B and Unit 3, 1984-1988.

Year	Subunit/ unit	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1984-85	1B	0	0	0	0	0	3	0	2	4	1	0	0
	3	0	0	0	1	0	4	0	2	2	0	0	0
1985-86	1B	0	0	0	3	0	0	6	0	0	0	0	0
	3	0	0	0	0	0	0	3	1	2	0	1	0
1986-87	1B	0	0	1	0	1	1	2	1	3	2	0	0
	3	0	0	1	1	0	0	0	7	1	0	0	0
1987-88	1B	0	0	1	1	7	0	0	4	0	0	0	1
	3	0	0	0	1	0	2	0	1	0	2	1	2
1988-89	1B	0	1	0	1	1	5	1	0	0	0	0	0
	3	1	0	1	0	0	0	0	5	0	2	1	0

Table 4. Transport methods used by wolf hunters and trappers in Subunit 1B and Unit 3, 1986-87 to 1988-89.

Year	Aircraft	Horse or dog team	Boat	3 or 4-wheeler	Snowmachine	Off-road vehicle	Highway vehicle	Foot	Other
Subunit 1B									
1986-87	0	0	9	2	0	0	0	0	0
1987-88	0	1	13	0	0	0	0	0	0
1988-89	1	0	7	0	1	0	0	0	0
Unit 3									
1986-87	0	0	6	0	0	0	1	0	3
1987-88	0	0	8	0	0	0	1	0	0
1988-89	1	0	7	0	0	0	2	0	0

STUDY AREA

GAME MANAGEMENT UNIT: 1C (6,500 mi^2)
1D (2,600 mi^2)

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

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

BACKGROUND

Wolves are distributed throughout the mainland portion of both subunits. They may be numerous in Glacier Bay National Park. No wolves have been reported from Douglas, Shelter, and Lincoln Islands or the smaller islands adjacent to the mainland.

The most recent wolf population estimates for these subunits were made in 1985, when 50-60 wolves in 8-10 packs were thought to inhabit the area. These estimates were based on sightings, hunter and trapper interviews, and sealing data. It is impractical to make aerial counts of wolves or their tracks because of heavy timber.

Although both moose and mountain goats inhabit the subunits and their numbers are influenced or limited by predation, no intensive wolf-prey investigations have been conducted to date. Trapping and hunting of wolves in both subunits remain a customary use of this resource. Pelt prices and availability of other species seem to play a role in trapper effort applied to wolf.

POPULATION OBJECTIVES

To measure the economic value of wolves for subsequent development of a planned management system using measurable objectives.

METHODS

The mandatory sealing of wolf hides provided data on the number and sex of harvested wolves, date and method of harvest, and method of transportation. Discussions with hunters and trappers during the sealing process were used to gain additional information on population status.

RESULTS AND DISCUSSION

Population Status and Trend

Based on harvest data and discussions with trappers and other recreationists, I believe the population is stable throughout Subunits 1C and 1D. Data gathered in the sealing and interviewing process are helping to refine estimates of abundance and identify individual packs.

Mortality

Season and Bag Limit:

Hunting. There is no closed season or bag limit in Subunits 1C and 1D.

Trapping. The trapping season in Subunits 1C and 1D is from 10 November to 30 April. There is no bag limit.

Human-induced Mortality:

Trappers harvested a total of 5 wolves in Subunit 1C (3 males, 1 female) and one (female) in Subunit 1D during the 1988-89 season (Tables 1 and 2). The harvest in both subunits was down substantially from those of the previous year and the 5-year mean.

Harvest Chronology. Of the 5 wolves harvested in Subunit 1C, three were taken in December, one in January, and one in February. The single wolf harvested in Subunit 1D was taken in December.

Harvest Method. All wolves in Subunit 1C were taken in traps, while the one harvested in Subunit 1D was shot.

Transportation Methods. The wolf killed in Subunit 1D and one of the wolves from Subunit 1C were taken by trappers using boats. Two wolves in Subunit 1C were taken by trappers using highway vehicles, and two were taken by trappers using snowmachines.

CONCLUSIONS AND RECOMMENDATIONS

Based on harvest figures and other data, the wolf population was stable in Subunits 1C and 1D. I do not believe changes in seasons and bag limits are needed at this time.

Prior to development of population objectives, it may be prudent to examine the prey base on the coastal mainland and Chilkat Peninsula. Most known packs have access to moose, with the exception of a pack inhabiting the Nugget Creek drainage and the

mountainous areas east of Juneau. Mountain goats in that area may be the only large mammal available to wolves. Mountain goat populations in the area declined dramatically in the early 1980's, and the area was closed to hunting in 1985. Recent surveys suggest that the goat population is increasing slowly. Wolf scats collected near Juneau in the early 1980's frequently contained goat remains (ADF&G files). Within the past 2 years a number of reports have been received regarding wolf packs in the alpine areas during goat kidding. Such reports have come from the Berners Bay, Taku Inlet, and the Chilkat Peninsula. The latter 2 areas remain closed to mountain goat hunting because of low goat numbers. The markedly slow rebound by these populations may suggest a predator-based influence.

Residents of Subunit 1D are concerned that wolves and brown bears are limiting moose and mountain goat populations. Moose hunting in the subunit has been substantially restricted in recent years, and most residents believe that predation by bears and wolves is limiting the herd's ability to rebuild. Mountain goats in the area also provide sport hunting opportunities and meat. Recent surveys suggest that goat populations may also be in a period of decline. Should additional restrictions be placed on goat hunting as well, hunters may advocate predator control aimed at both wolves and bears. A better understanding of the predator-prey dynamics in Subunit 1D would enhance our ability to deal with current and future resource conflicts there.

No progress was made toward the population objective. I recommend it be changed to the following: To maintain habitat and prey populations that will provide for a wolf population that can sustain an annual harvest of at least 4 wolves in each subunit.

PREPARED BY:

Thomas M. McCarthy
Wildlife Biologist II

SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Wolf harvests in Subunit 1C, 1983-84 to 1988-89.

Year	Males	Females	Unknown	Total
1983-84	--	--	8	8
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
Mean	4	4		9

Table 2. Wolf harvests in Subunit 1D, 1983-84 to 1988-89.

Year	Males	Females	Unknown	Total
1983-84	4	2	0	6
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
Mean	4	2	0	6

STUDY AREA

GAME MANAGEMENT UNIT: 5 (A and B) (6235 mi^2)

GEOGRAPHICAL DESCRIPTION: Cape Fairweather to Icy Bay, eastern gulf coast

BACKGROUND

Comments to previous Division of Wildlife Conservation staff received from life-long residents of Yakutat indicate that wolves were present in the Yakutat Forelands area prior to the immigration of moose in the early 1930's (ADF&G files). No reports of wolves exist for the west side of Yakutat Bay (Subunit 5A) prior to 1971 (i.e., well after moose were established), and viable wolf populations were probably established by 1976. Klein (1965) suggested that wolves gained access to the area via the Alsek-Tatshenshini River valley.

Wolves probably subsisted on mountain goats and salmon in the area prior to the coming of moose. Salmon, especially as a late-fall/early winter food source, is considered very important for wolf maintenance.

In the mid-1970's wolves played a roll in the reduction of moose numbers, especially in Subunit 5A. Severe winter weather was the most important factor depressing the moose population then, but predation by wolves, hunting, and reduction of browse quality (i.e., over-browsing caused by moose populations above carrying capacity) contributed to the decline. Wolf-control was tried from 1974 to 1976; a total of 1 wolf was killed from the air after 31 hours of effort. Bad weather, rough terrain, and dense forest prevented a higher take.

POPULATION OBJECTIVES

To measure the economic value of wolves for subsequent development of a planned management system using measurable objectives.

METHODS

Wolves were sealed by Sport Fish and Fish and Wildlife Protection staff in Yakutat as well as Wildlife Conservation staff in Douglas.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size:

An estimated minimum wolf population of 40 to 50 in 5 to 7 different packs occupies the Yakutat and Malaspina Forelands. While there is no quantitative data available, observations and reports from others suggested that wolf numbers are stable in the area. However, because of recent mild winters and conservative quotas on the moose herd in Subunit 5A, moose numbers are increasing across the forelands; and the wolf population in Subunit 5A may be expanding in response to an increased food source. Some anecdotal information suggests that sightings of wolves are on the upswing.

Mortality

Season and Bag Limits:

Hunting. There is no closed season or bag limit in Unit 5.

Trapping. The trapping season in Unit 5 is from 10 November to 30 April. There is no bag limit.

Human-induced Mortality:

A total of 8 wolves were taken in Subunit 5 in 1988-89 (Table 1), compared with the 5-year mean of nine (range = 4-14). Five females and 3 males composed the harvest. All 8 wolves came from east of the Dangerous River in Subunit 5A. Seven grays and 1 black were taken. Four wolves were shot, and four were trapped.

Trapper Residency and Success. Three nonresidents and 1 nonlocal resident harvested 1 wolf each. Two local residents were successful in taking 2 wolves each.

Harvest Chronology. Two wolves were taken in September and one each in October, November, and December. Two and one were taken in February and May, respectively.

Transport Methods. All wolves were taken by trappers using aircraft, and at least one used an off-road vehicle as well.

CONCLUSIONS AND RECOMMENDATIONS

The moose population in Subunit 5A is growing. There has been an increased number of young bulls in the moose harvest, as indicated by cementum annuli counts, and a December 1988 aerial survey resulted in count of 515 moose, the highest one since the late 1960's. This growing moose population appears to have resulted in a similar increase in wolf numbers. Indeed, some

residents of Yakutat claim they have observed more wolves and wolf-induced moose mortalities during the 1988-89 winter than they have for many years. No changes in seasons or bag limits are recommended at this time.

LITERATURE CITED

Klein, David R.. Postglacial Distribution Patterns of Mammals in the Southern Coastal Regions of Alaska. Arctic, Volume 18, Number 1. 14 pp.

PREPARED BY:

Bruce Dinneford
Game Biologist III

SUBMITTED BY:

David Johnson
Regional Management Coordinator

Table 1. Unit 5. Wolf harvests in Unit 5, 1985-86 to 1988-89.

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

STUDY AREA

GAME MANAGEMENT UNIT: 6 (10,140 mi^2)

GEOGRAPHICAL DESCRIPTION: Prince William Sound and north Gulf Coast

BACKGROUND

Historical accounts, apparent population trends, and the role of wolves as predators in Unit 6 were summarized by Griese (1989). Introductions of Sitka black-tailed deer and moose to Unit 6 have supported the expansion and growth of the wolf population. Higher numbers of wolves are responsible for declining mountain goat populations in parts of the unit. Griese also noted that management of wolves in Unit 6 has been passive.

Management goals for wolf populations were first established through the wildlife management plans (Rausch 1977). The primary and secondary goals were to provide an optimal harvest and the greatest opportunity to participate in hunting and trapping wolves, respectively. In 1988 the management objectives for wolves were informally established. These objectives have not been subjected to public review.

POPULATION OBJECTIVES

To 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 provided by the public, noting date, location, pack size, colors of individual pack members, and nature of observation. Similar information is recorded from observations made during other field activities. These incidental observations are compared with reported harvests and then assimilated into population estimates. Wolves harvested by hunters and trappers are checked (i.e., sealed) by staff or appointed sealers.

RESULTS AND DISCUSSION

Population Status and Trend

Wolves are at historically high numbers in Unit 6, exhibiting an increasing trend and expanding their range during this reporting period. The estimate increased from 20-30 wolves in at least 4 packs in 1984 to 106-125 wolves in at least 15 packs (Table 1) in 1988. Much of this increase resulted from improved understanding

of distribution, rather than actual increased numbers. Evidence of wolves expanding their range included direct observations and the continuing decline of mountain goat populations west of the boundary between Subunits 6D and 6C. In the developing shrub habitat on the Copper River Delta, observations and evidence of wolves increased dramatically between 1985 and 1987 (Griese 1989).

Population Size:

The population estimate for the fall of 1988 ranged between 106 and 125 wolves in at least 15 packs (Table 1). The estimate was made in April 1989. Subunit 6D has a disproportionately low density.

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 6 is from 10 August to 30 April. The bag limit is 2 wolves.

Trapping. The trapping season in Unit 6 is from 10 November to 31 March. There is no bag limit.

Human-induced Mortality:

The total harvest during the reporting period was 17 wolves (Table 2); the reported harvest was 6 (Table 2), including two that were not sealed; one had been snared and subsequently consumed by an adjacent pack, leaving no evidence of sex, and the other one was stolen from a snare. A reliable report indicated 11 additional wolves were killed in Unit 6 but sealed in another unit. These wolves were probably killed by the land-and-shoot method, which is prohibited in Unit 6. The total harvest increased substantially between 1984 and 1988 (Table 2), exceeding any previously recorded harvest for Unit 6 (Griese 1989).

Legally harvested wolves were predominantly from Subunit 6C, while the illegal harvest occurred in Subunit 6A (Table 2). Subunit 6A accounted for 41% of the total wolf harvest; while Subunits 6B and 6C accounted for 29% each. Only 4 wolves in the harvest were identified by sex: three were males and one was a female.

Harvest Chronology. The chronology of 6 legally harvested wolves follows: November, 1; December, 2; January, 2; and March, 1. Chronology of combined harvests for the 5 previous years follows: August, 1; October, 3; November, 3; January, 7; February, 1; March, 3; and April, 1.

Transport Methods. All 6 wolves were harvested by individuals using highway vehicles. One wolf was "ground shot". Over the 5

previous years, 9 of 19 wolves have been "ground shot", but only three (3 years of transport data) were killed by individuals using aircraft.

Game Board Actions and Emergency Orders

Regulations pertaining to hunting and trapping seasons and bag limits in Unit 6 have not changed in the last 5 years. In 1988 the Board of Game adopted regulations making it unlawful to shoot wolves that were not in traps or snares until 0300 hours on the day after they had been airborne.

CONCLUSIONS AND RECOMMENDATIONS

Population objectives were attained or exceeded. Pack numbers far exceed the minimum of five. Current population estimates suggest that an annual harvest of 25 to 50 wolves is possible; however, harvest and effort in the unit is far below potential levels. 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 Hawkins and Hinchinbrook Islands. These islands provide a substantial percentage of deer hunting opportunity to residents of Cordova. Wolves reaching these islands would have a dramatic impact on current deer densities. Wolves are also suspected as contributing to the dramatic decline of mountain goats in a major portion of the unit. While the sociopolitical atmosphere is unlikely to allow control measures as a management option, understanding impacts of unmanaged predators is essential to management of prey species.

LITERATURE CITED

Campbell, B. H. and H. J. Griese. 1987. Management options for dusky Canada geese and their predators on the Copper River Delta, Alaska. Alaska Dep. Fish and Game. Juneau. 91pp.

Griese, H. J. 1989. Unit 6 wolf survey-inventory progress report. Pages 21-27 in S. O. Morgan, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XIX. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-1, Study 14.0. Juneau. 149pp.

Rausch, R. 1977. Alaska wildlife management plans, southcentral Alaska. Alaska Dep. Fish and Game. Juneau. 291pp.

PREPARED BY:

Herman Griese
Wildlife Biologist

SUBMITTED BY:

John Trent
Survey-Inventory Coordinator

Table 1. Wolf population estimate by subunit as determined from incidental observations in Unit 6, July 1988-May 1989.

	6A	6B	6C	6D	Total
Wolves observed (packs)	37(3)	16(2)	15(2)[a]	7(1)[a]	75(8)
Estimated population (packs)	49-54 (±6)	19-21 (±2)	18-20 (±2)	20-30 (±5)	106-125 (±15)

[a] Estimated from tracks.

Table 2. Annual wolf harvests (1984-85 to 1988-89) in Unit 6 and by subunit for 1988-89.

Year	Reported harvest			Total	Estimated other[a]	Total
	Male	Female	Unknown			
1984-85	2	1	0	3	1	4
1985-86	0	1	0	1	1	2
1986-87	1	1	1	3	5	8
1987-88	5	5	0	10	1	11
1988-89	3	1	2	6	11[b]	17
Subunits						
A	0	0	0	0	7	7
B	1	0	0	1	4	5
C	2	1	2	5	0	5
D	0	0	0	0	0	0

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

STUDY AREA

GAME MANAGEMENT UNITS: 7 and 15 (10,637 mi^2)

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

Following a half-century absence, wolves recolonized the Kenai Peninsula during the 1960's. The first recent documentation was in 1961 when Jack Didrickson observed a single wolf between Skilak and Tustumena Lakes (ADF&G files). Observations increased throughout the 1960's, with the first pack sighting (10 wolves) in 1968 by Dimitri Bader (ADF&G files).

Severe winters from 1971 through 1975 made moose calves and adults easily available prey. In less than 15 years, wolves repopulated most suitable habitats. Peterson and Woolington (1981) estimated wolves killed 9-15% of the calf moose 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 1970's, 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 composed 37% of the early winter population, reflecting the relative stability of the population in the northern portion of the Kenai Peninsula from 1976 to 1981. Considering the growth rate of the wolf population, natural mortality rates have been low.

Regulated wolf harvests on the Kenai Peninsula began with a permit hunt during the winter of 1973-74; 2 wolves were harvested. During the winter of 1974-75 six were harvested (Table 1). Hunting and trapping were allowed the following season (1975-76), and the harvest increased to 15 (i.e., six by trappers, nine by hunters). Although the 9-month season was liberal, the harvests of wolves 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 has been removed annually since 1978-79; however, the harvests, have not been 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 has occurred from 10 November to 15 March during the trapping season, while most nonconsumptive uses probably occur in the summer and early fall. Almost all wolves have been taken for recreational purposes; the dollar value received for pelts has been a secondary benefit. Most wolves have been killed by trappers and hunters operating from the road

system, although some aircraft were used. In the spring of 1986 the Board of Game prohibited the use of aircraft to locate wolves for the purpose of landing and shooting them. This land-and-shoot method was responsible for only 6% of the annual harvests from 1973 to 1985, occuring in only 5 of the 12 years. The low harvest was attributable to poor tracking and landing conditions; many areas were heavily forested or closed to aircraft (i.e., Kenai National Wildlife Refuge).

An infestation of biting lice was identified from 2 packs of wolves during 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 across the Kenai. Infected wolves are now common, and there appears to be little chance to control the parasite using acceptable means.

POPULATION OBJECTIVES

To maintain 28 wolves in Subunit 15A, with a postseason range of 25-35, excluding the Indian and Quartz Creek/Mystery Creek Packs.

To maintain a moderate but secure spring wolf population at a maximum ratio of 1 wolf:50 moose in Subunits 15B and 15C and Unit 7.

METHODS

Aerial surveys with experienced pilots and observers were scheduled during November and December, and surveys were conducted only after suitable snow cover and tracking conditions occurred. Additional information was provided by local trappers concerning wolf pack distribution and size for unsurveyed areas. Harvest was monitored by sealing the pelts of all wolves harvested.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf surveys were not conducted over the entire Kenai Peninsula, because of unfavorable snow conditions during early winter. Harvest data, observations by ADF&G staff, and reports from trappers suggested the number of wolves had not significantly changed from that of the previous year. Subunit 15A was intensively surveyed during the period 15 November to 5 December, to satisfy conditions of an interagency (ADF&G and USFWS) wolf

management plan. The minimum number of wolves found in Subunit 15A during this period was 48. Four additional wolves were located on 25 January, resulting in a new minimum estimate of 52 wolves for Subunit 15A. The estimated population size for Units 7 and 15 is 200 wolves in 21 packs.

Mortality

Season and Bag Limits:

Hunting. The open season in Units 7 and 15 is from 10 August to 30 April. The bag limit in Unit 7 is 2 wolves; the bag limit in Unit 15 is 4 wolves.

Trapping. The open season in Unit 7 is 10 November to 31 March; there is no bag limit. The open season in Unit 15 is 10 November to 15 March; there is also no bag limit.

Human-induced Mortality:

Eighteen wolves were killed during the 1988-89 hunting and trapping seasons in Units 7 and 15. The sex ratio was 9 (50%) males, 8 (44%) females, and 1 (6%) unspecified. The harvest represents 9% of the estimated population. The historical harvest by subunit is summarized in Table 1. Six (33%) wolves were taken by ground shooting, five (28%) by trapping, and seven (39%) by snaring.

Harvest Chronology. The chronology of harvest was as follows: August, zero; September, two (11%); October, one (6%); November, one (6%); December, one (6%); January, five (28%); February, six (33%); March, two (11%). Twelve (67%) of the 18 wolves harvested were classified as either pups or adults; i.e., four (33%) were pups and eight (67%) were adults.

Natural Mortality:

Although wolves commonly die because of natural causes, observations of these events are rare. A radio-collared wolf in Subunit 15A was found dead near Beaver Lake in November 1987; it was a young dispersing male that had been killed by the resident pack. The carcass had not been fed upon by wolves. No other cases of natural mortalilty have been reported.

Game Board Actions and Emergency Orders

The Board of Game adopted an ADF&G proposal during the spring 1987 meeting to reduce wolf trapping seasons to 10 November-28 February. The hunting season was not changed during the fall 1988 Board meeting, but the bag limit was reduced to 1 wolf for Units 7 and 15. The bag limit change was to become effective 1 July 1989.

CONCLUSIONS AND RECOMMENDATIONS

The harvest of 18 wolves represents 9% of the early winter population estimate of 200 for Units 7 and 15. With this low rate of harvest, the wolf population will probably increase over most of the Kenai Peninsula.

Subunit 15A should be monitored closely, because of its potential to increase beyond management objectives, and it should be managed on a quota basis. Hunting and trapping should be regulated by Emergency Order, if the estimated minimum population reaches 28 or exceeds 35 wolves after the season. No changes in seasons or bag limits are recommended.

LITERATURE CITED

Peterson, R. O. and J. D. Woolington. 1981. Wolf and moose studies on the Kenai Peninsula, Alaska. Final Report submitted to U.S.F.W.S. Contract No. 14-16-0008-2104.

PREPARED BY:

Ted H. Spraker
Wildlife Biologist III

SUBMITTED BY:

John Trent
Management Coordinator

Table 1. Known wolf mortality by unit and subunit, 1973-74 to 1987-89.

Year	Unit 7	Subunit 15A	Subunit 15B	Subunit 15C	Total
1984-85	5[a]	32[b]	3	7	47
1985-86	13[a]	23[b]	13	16	65
1986-87	20[a]	8[b]	13	8	49[d]
1987-88	3	8[b]	9	5	25
1988-89	2	6	6	4	18

[a] Trapping season 10 November - 31 March.
[b] Trapping season 10 November - 15 March.
[c] Trapping and hunting closed 15 February 1986 (quota set at 20).
[d] One nonsport harvest in Unit 7 and one nonsport harvest in Subunit 15B.

STUDY AREA

GAME MANAGEMENT UNITS: 9 (45,000 mi^2)
10 (1,500 mi^2)

GEOGRAPHIC DESCRIPTION: Alaska Peninsula and Unimak Island

BACKGROUND

Wolves occur throughout Units 9 (Alaska Peninsula) and 10 (Unimak Island) in low-to-moderate densities. Specific data on historic wolf abundance are lacking, but it is probable the population was reduced during wolf control work during the 1950's. Prey abundance has varied during the past 20 years. Moose densities have decreased in all areas north of Port Moller. The Mulchatna Caribou Herd increased from about 14,000 in 1974 to about 70,000 in 1989. The Northern Alaska Peninsula herd increased from about 13,000 in the mid-1970's 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 has been noted in the past 10 years. The mainland segment of the Southern Alaska Peninsula herd peaked at over 10,000 in 1983, declining to 4,000 in 1989.

POPULATION OBJECTIVES

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

METHODS

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

RESULTS AND DISCUSSION

Population Status and Trend

Wolf numbers appear to be stable at low-to-moderate levels throughout the study area. Seventeen trappers rated the abundance of wolves as low (8), moderate (7), and high (2). Compared with the previous reporting period (1987-88), 2 trappers said there were fewer wolves, four said there were about the same number, and two said there were more wolves.

Population Size:

By piecing together miscellaneous observations of wolf packs and general knowledge of territory size, it has been estimated that Units 9 and 10 contain at least 150 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

Season and Bag Limits:

Hunting. The open 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 two.

Trapping. The trapping season in Unit 9 and 10 is 10 November to 31 March; there is no bag limit.

Human-induced Mortality:

The reported wolf harvest for 1988-89 was 57 (33 males, 21 females, 3 unknowns) in Unit 9, and five (2 males, 3 females) on Unimak Island. Fifty-two wolves were shot, and 10 were trapped or snared.

Harvest Chronology. During the 1988-89 seasons 6 wolves were harvested in October, one in November, 15 in December, 15 in January, 19 in February, 5 in March, and one in April.

Hunter Residency. The 1988-89 harvest was higher than that for the previous year and above the long-term average of 28 for Unit 9. During the past 3 years there has been an average annual harvest of 43 wolves, somewhat below the objective level of 50.

Transport Method. Inaccurate reporting of the method of transportation used for harvesting wolves hampers analysis; however, at least 70% involved the use of aircraft.

Game Board Actions and Emergency Orders

During the 1987 fall meeting, the Board of Game prohibited the harvesting of wolves on the same day a hunter was airborne 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.

CONCLUSIONS AND RECOMMENDATIONS

Although the 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 for this work, the resulting population density estimates could be extrapolated to the remainder of Unit 9. No regulatory changes are recommended.

PREPARED BY:

Richard A. Sellers
Wildlife Biologist

SUBMITTED BY:

Lawrence J. Van Daele
Survey-Inventory Coordinator

Table 1. Historical wolf harvest in Unit 17, 1962-63 to 1988-89.

Year	Males	Females	Unk.	Total	% ground shot	% Trapped	% air shot
1962-63	8	7	0	15	--	--	100
1963-64	9	5	0	14	--	--	100
1964-65	1	0	0	1	100	--	--
1965-66	10	8	0	18	--	--	100
1966-67	9	16	0	26	46	4	50
1967-68	13	11	0	24	4	--	96
1968-69	6	8	0	15	27	7	67
1969-70	3	0	0	3	--	--	100
1970-71	5	6	0	11	--	--	100
1971-72	16	9	3	28	100	0	--
1972-73	10	9	1	20	80	20	--
1973-74	13	7	0	20	50	50	--
1974-75	56	54	1	111	94	6	--
1975-76	18	28	1	47	91	9	--
1976-77	31	12	2	45	89	11	--
1977-78	7	10	0	17	53	47	--
1978-79	13	7	0	20	--	--	--
1979-80	11	12	2	25	--	--	--
1980-81	4	3	1	8	--	--	--
1981-82	12	6	0	18	78	22	--
1982-83	25	13	3	41	65	35	--
1983-84	4	3	0	7	100	0	--
1984-85	18	21	4	43	67	33	--
1985-86	8	3	0	17	71	29	--
1986-87	15	11	2	28	85	14	--
1987-88	48	31	0	79	95	1	--
1988-89	12	10	1	23	91	9	--

STUDY AREA

GAME MANAGEMENT UNIT: 11 (13,257 mi^2)

GEOGRAPHICAL DESCRIPTION: Wrangell Mountains

BACKGROUND

While wolf numbers were low in Unit 11 from 1900 to 1930, they increased thereafter until a wolf control program was initiated in the late 1940's (Skoog 1968). After wolf control stopped, the number of wolves again increased. In the early 1970's they were abundant (McIlroy 1974); i.e., 1 wolf/80 mi^2 or a unitwide population of 100-125 wolves.

Although the size of wolf harvests prior to mandatory sealing are unknown, they were probably substantial, because the seasons were long and there were no bag limits. Wolf harvests since 1972 have averaged 25 wolves per year, ranging widely from 6 to 51 wolves/year.

POPULATION OBJECTIVES

To maintain the posthunting population at a minimum of 50 wolves.

METHODS

The harvest were monitored by sealing the hides of all wolves harvested in the unit; aerial surveys were not conducted. Population estimates were derived from information acquired through 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

Wolf numbers appeared to decline in 1988, following a period of increase from the fall of 1985 until the fall of 1987. Historically, wolf numbers have fluctuated from year to year, apparently in response to harvest rates; however, the overall the wolf population has been relatively stable.

Population Size:

The fall 1988 population estimate for Unit 11 was 70-90, representing about two thirds of the 1987 estimate.

Distribution and Movements:

Wolf densities were higher in the northern portions of the unit, especially from the Dadina River northeast to the Copper River. Caribou are available to wolves in this area, and moose are more abundant than in the southern portions of the unit. Although, wolf numbers in the lower Chitina River Valley increased slightly this past year, they remained at low densities; because caribou are absent and moose numbers are low in this area, sheep and mountain goat are more heavily utilized.

Movements of individual wolves and wolf packs in the unit are largely unknown, because wolves have not been radio-collared. Occasionally movements of wolves are documented when animals radio-collared elsewhere are tracked or harvested in Unit 11. During the reporting period a radio-collared male that had been collared on the Teklanika River in Denali National Park in March 1986 was trapped near Tanada Lake. Wolves collared in Unit 12 have also been tracked and located in Unit 11 (Dave Kellyhouse, pers. commun.)

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 11 is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Unit 11 is from 10 November to 31 March; there is no bag limit.

Human-induced Mortality:

Hunters and trappers sealed 25 wolves from Unit 11 during the 1988-89 season (Table 1). This is similar to both the previous year's harvest of 27 and the 5-year (1984-88) average of 22 wolves. Males composed 48% of the take in 1988-89. Since 1984 males have composed 56% of the total harvest. The 1988-89 harvest was not distributed evenly through the unit. Hunters and trappers reported taking 21 wolves (84%) from the Dadina River northeast to the Unit 12 border.

The harvest methods reported for wolves killed in Unit 11 over the past 5 years are provided in Table 2. During the 1984-85 and 1987-88 seasons, more wolves were harvested by shooting than by trapping and snaring; whereas, the opposite occurred during the 1985-86, 1986-87, and 1988-89 seasons. During the period 1985 to 1987, when the number of wolves taken by the land-and-shoot method was recorded, ground-shooting and land-and-shoot methods accounted for equal numbers of wolves (Table 2). Over the entire period (1984-1988), trapping and snaring accounted for 61% of the harvest for which the method of take was known.

Hunter and Trapper Residency and Success. During the 1988-89 season 13 individuals sealed one or more wolves from Unit 11, averaging 1.9. During the preceeding 4 seasons, the average harvest was 2.1 wolves per trapper. Resident trappers living in or adjacent to Unit 11 took 20 wolves in 1988-89. Five and zero wolves were harvested by nonlocal Alaskan residents and nonresidents, respectively.

Harvest Chronology. Table 3 presents the harvest chronology for wolves over the past 5 years. The proportion of the harvest by month has varied from year to year, but during the past 2 years more wolves have been taken later in the season. The annual harvest chronology reflects snow and weather conditions, rather than any particular pattern of trapper effort or success.

Transport Methods. The method of transport used in harvesting wolves has only been recorded on sealing certificates since 1985. In Unit 11 most wolves have been taken with the use of snowmachines and aircraft (Table 4). Individuals using aircraft to harvest wolves were primarily big game hunters on fly-in hunting trips. Only a few trappers have reported using aircraft during the period 1984 to 1988. Only 1 trapper reported using an aircraft to trap wolves during the reporting period.

Game Board Actions and Emergency Orders:

In 1986 the Board of Game prohibited the land-and-shoot method of harvesting wolves, unless it had been caught in a trap or snare; however, land-and-shoot hunting was not prohibited for 2 more years (i.e., effective for the 1988-89 season).

CONCLUSIONS AND RECOMMENDATIONS

Wolves are numerous throughout Unit 11. The fall 1988 population estimate was down, following 3 years of increases. High harvests during the past 2 years have probably caused this decline in the population. Some wolves may have dispersed from northern Unit 11 into Unit 13. In recent years estimates of the wolf population has greatly exceeded the postseason management objective of at least 50 wolves. Wolves are numerous from the Dadina River northeast to the unit boundary, but they are less common in the Chitina River Valley, presumably because of low prey densities.

All wolf estimates for Unit 11 are based on field observations by ADF&G staff and reports of sightings by hunters, trappers, and the general public. Track surveys have not been attempted since at least 1978. The lack of a systematic survey method hampers efforts to estimate wolf numbers. I recommend establishment of a survey area northeast of the Dadina River and initiation of track surveys to obtain more dependable population density and trend data.

LITERATURE CITED

McIlroy, C. 1975. Unit 11 wolf survey-inventory progress report. Pages 106-109 in D. E. McKnight, ed. Annual report of survey-inventory activities. Part III. Caribou, Marine Mammals, Mountain Goat, Wolf, and Black Bear. Vol. V. Alaska Dept. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-17-6. Jobs 3, 8, 12, 14, 17 and 22. Juneau. 198pp.

Skoog, R. O. 1968. Ecology of the caribou (Rangifer tarandus granti) in Alaska. Ph.D. Thesis. Univ. California, Berkeley. 699pp.

PREPARED BY:

Robert W. Tobey
Wildlife Biologist III

SUBMITTED BY:

Gregory N. Bos
Management Coordinator

Table 1. Annual wolf harvests in Unit 11, 1984-88.

	1984-85	1985-86	1986-87	1987-88	1988-89
Total harvest:	36	8	14	27	25
Males	24 (67%)	4 (50%)	7 (50%)	15 (56%)	12 (48%)
Females	12 (33%)	4 (50%)	6 (43%)	12 (44%)	13 (52%)
Sex unknown	0	0	1 (7%)	0	0
No. successful trappers	13	4	8	16	13

Table 2. Annual wolf harvest by method of take in Unit 11, 1984-88.

	1984-85		1985-86		1986-87		1987-88		1988-89	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Shooting	20	(56)	--	--	--	--	--	--	4	(16)
Trapping	16	(44)	6	(55)	9	(64)	8	(30)	20	(80)
Snaring	0		0		3	(21)	2	(7)	1	(4)
Ground shooting[a]	--	--	1	(9)	2	(14)	6	(22)	--	--
Land-and-shoot[a]	--	--	4	(36)	0		5	(19)	--	--
Illegal	0		0		0		5	(19)	0	0
Unknown	0		0		0		1	(3)	0	0

[a] Numbers of wolves killed by the land-and-shoot method (wolves shot the same day the hunter/trapper was airborne) were recorded separately from other wolves taken by shooting beginning in 1985/86. The land-and-shoot method was made illegal in 1988/89.

Table 3. Wolf harvest chronology by month in Unit 11, 1984-88.

	1984-85		1985-86		1986-87		1987-88		1988-89	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
August	0		0		0		0		1	(4)
September	0		0		2	(14)	2	(7)	2	(8)
October	0		1	(13)	0		0		1	(4)
November	9	(25)	1	(13)	0		1	(4)	0	
December	1	(3)	1	(13)	0		2	(11)	4	(16)
January	6	(17)	2	(25)	6	(43)	5	(19)	7	(28)
February	12	(33)	0		5	(36)	9	(33)	6	(24)
March	8	(22)	3	(37)	1	(7)	5	(19)	4	(16)
April	0		0		0		2	(7)	0	

Table 4. Annual wolf harvest by transportation method in Unit 11, 1985-88.

Method of Transportation	1985-86	1986-87	1987-88	1988-89
Aircraft	2 (25%)	5 (36%)	9 (33%)	4 (16%)
Dogsled, skis/snowshoes	0	0	0	3 (12%)
Boat	0	0	0	0
3/4-wheeler	0	0	0	1 (4%)
Snowmachine	4 (50%)	8 (57%)	10 (37%)	16 (64%)
Off-road vehicle	0	0	0	1 (4%)
Highway vehicle	0	1 (7%)	2 (8%)	0
Unknown	2 (25%)	0	6 (22%)	0

STUDY AREA

GAME MANAGEMENT UNIT: 12 (10,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Upper Tanana and White River drainages

BACKGROUND

Land ownership patterns and management authorities in Unit 12 are relatively complex. The southeastern quarter of the unit is in the Wrangell-Saint Elias National Park and Preserve managed by the National Park Service (NPS), while the approximately 1,000,000 acres immediately north of the preserve is the Tetlin National Wildlife Refuge 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.

Of the 10,000 mi^2 in Unit 12, only about 7,000 to 8,000 mi^2 are considered normal wolf habitat. Approximately 2,000 to 3,000 mi^2 are characterized by extensive glacial icefields or extremely high rocky terrain in the Wrangell, Mentasta, and Nutzotin Mountains and the eastern Alaska Range. This latter area is seldom, if ever, used by wolves.

Wolves are an important wildlife species in Unit 12, primarily because of the effects of wolf predation on the dynamics of big game prey populations. Few hunters or trappers purposefully hunt or trap wolves because of their relative scarcity (compared with other more prey-rich areas), wariness, limited economic or subsistence value, and time and expense of harvesting them. Conversely, people place high value on moose and caribou populations in the area and expend a great deal of time and money seeking these animals for both consumptive and nonconsumptive uses. Wolf predation has been a significant mortality factor contributing to the maintenance of low-density moose and caribou populations for the past 15 years and, in turn, has substantially reduced opportunities for consumptive and nonconsumptive uses of moose, caribou, and wolves during a period of increasing public demand for such opportunities.

In Unit 12 there has been a great deal of public dissatisfaction with the management of wolves and their prey species, particularly moose, during the past 20 years. 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 prey species of wolves (ADF&G files). Therefore, humans and wolves are competition for moose, and management has failed to provide increases in moose density or harvest levels.

During the past 20 years moose declined from moderate-to-low densities in most of the area. Restoration efforts curtailing consumptive human use of moose have failed to increase moose numbers because of predation by wolves and, to a lesser extent, grizzly bears. There have been complete hunting closures in the Nabesna Road and Little Tok River areas and various combinations of hunting restrictions in the remainder of Unit 12. This scarcity of moose has resulted in failure to provide reasonable opportunity for subsistence harvest, despite the granting of local subsistence priorities for moose hunting in recent years by the Alaska Board of Game. Extremely low rates of local hunter success have characterized the short fall bull seasons. A continuing problem with out-of-season taking of moose for personal use in this economically depressed area has developed concurrently.

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 in the vicinity of the road system during summer months, is important to most visitors, judging from complaints concerning game scarcity received by the Department and local workers in the tourism industry. This was not the case prior to the mid-1970's. At that time, moose and wolf densities in Unit 12 were more comparable 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-1960's and early 1970's, 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 1980's.

In the winter of 1980-81, a limited wolf control program was initiated 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 four wolves were removed, reducing wolf densities by 30-40%. The wolf populations took 3 to 5 years to recover (Boertje et al. 1985). Moose populations in the Unit 12 portion of the control area responded with a 50% increase in the Robertson River drainage and improved yearling recruitment in more accessible areas. These beneficial effects of wolf control have now diminished as the wolf population has continued to recover. 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 depressed moose populations than human exploitation. Annual harvests of wolves 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 on

muskrats, marten, and lynx, species requiring less investment of effort and money for a greater return. 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, Department staff entered into a series of 3 predator-prey research projects to document wolf predation on moose. These were cooperative studies with USFWS personnel in the vicinity of the Tetlin National Wildlife Refuge. In 1984, 15 adult moose were captured and radio-collared. Ages were determined for eight of these moose and five (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 two, and both wolf and grizzly bear tracks were present at the other 3 kill sites. As a continuation of the same study, 22 newborn calf moose were captured and equipped with radio collars to determine the extent and causes of calf mortality. Predators killed eight of the calves; wolf predation was documented as cause of death in five (63%) of the 8 cases and was suspected in one other. It should be noted that 1985 was a year of exceptionally high calf survival, yet 55% of the study calves died within 34 weeks of birth. Wolves were the most important predator on moose during that spring, and predation alone may have prevented moose population growth.

As a result of this moose mortality study, 2 wolf predation rate studies were conducted in Unit 12 by the Department and USFWS. The first of these was conducted during the winter of 1986-87, when personnel radio-monitored 4 wolf packs containing 38 wolves (range = 5-15 wolves/pack) on a daily basis. One lone male was also located daily during the same period (16 Jan-13 Feb) (ADF&G files). The observed time interval between kills ranged from 2.5 days for a pack of 15 wolves to 7 days for a pack of five. 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% (n = 26) were moose; adult caribou (n = 3) accounted 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.

During the period 16 May-15 June 1988, 7 collared members in a pack of 8 wolves were monitored twice daily (ADF&G files). 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.

These studies confirmed that moose are the most important prey species for wolves in Unit 12 and the moose kill rates observed for both winter and summer periods could easily account for maintenance of low-density moose populations in the area. Local residents of Unit 12 contended that this had been the case since the mid-1970's; this series of studies supported their contentions.

MANAGEMENT OBJECTIVES

To provide for an optimum harvest of wolves.

To provide the greatest opportunity to participate in hunting and trapping wolves.

To monitor wolf numbers, population characteristics, and harvests.

To temporarily reduce wolf numbers to less than 100 by 1993.

To maintain sustained yield objectives after population objectives are achieved.

To increase human-use opportunities for wolves and moose by significantly increasing moose numbers and by maintaining a healthy, productive wolf population.

METHODS

Estimating Wolf Population Size

Extensive aerial wolf surveys were conducted during March and April. Late-winter wolf population size was estimated, based upon sightings of wolves and enumeration of wolf tracks observed (Stephenson 1978, Gasaway et al. 1983). The number, size, and location of individual wolf packs were noted and mapped. 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 Unit 12 were included in the estimate.

Fall wolf population estimates were back-calculated by correcting the late-winter estimate upward on the basis of wolves harvested during the trapping season (i.e., 6 months before surveys are conducted), observed fall pack sizes, and reliable pilot and trapper reports. In any given year, many wolf packs enumerated in March and April had also been observed during the previous fall and early winter; therefore, changes in pack size for these packs were known.

Determining Wolf Population Characteristics

During the past 9 years, wolves in Unit 12 were captured by aerial darting, trapping, or live-snaring and fitted with radio collars. Collared wolves were then relocated throughout the year. Observations allowed accurate determinations of seasonal pack size, territory, den site location, and pup survival. Only 3 packs in Unit 12 had members with functioning collars during this reporting period.

Harvest Monitoring

It is a requirement that all wolves taken in Alaska be sealed by a Department 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

Forty-four hours were spent aerially surveying wolves in Unit 12 during the spring of 1989 (12 hours ADF&G, 20 hours USFWS, 12 hours Yukon Renewable Resources), resulting in an estimate of 113 wolves. Computed wolf densities for the fall of 1988 and spring of 1989 were approximately 1 wolf/51 mi^2 and 1 wolf/62 mi^2, respectively, assuming 7,000 mi^2 of suitable wolf habitat. These seasonal wolf densities must be considered low, compared with other areas of Interior Alaska.

Wolf population estimates for the fall of 1988 (136) and spring of 1989 (113) indicated an apparent decline from those made the previous reporting period. The fall estimate represented an approximate 26% decline from that for the previous fall (185), while the spring estimate represented a decline of 20% from that for the previous spring (141). Population estimates for the past 6 years (Table 1) indicate that a population decline has occurred. It is possible that reduced survey efforts in 1989 are partly responsible for the decline. Because the presence of about 10,000 caribou from the Nelchina and Mentasta Caribou Herds in Unit 12 during the winter of 1988-89 reduced sightability of wolf tracks, the population estimates may have been reduced. Additionally, an abnormal movement of the Chisana Caribou Herd northeast into the Yukon Territory during the winter of 1988-89 may also have caused some wolves in eastern Unit 12 to be absent (i.e., following herd) during aerial wolf surveys. Even so, I believe that wolf numbers have actually declined in Unit 12 in recent years.

Availability of vulnerable prey is a likely explanation for a wolf population decline in Unit 12. During the past 5 years there has been a change in the age structure of the moose population in much of eastern Unit 12. Whereas the moose population was heavy with old-age moose in the mid-1980's, a greater proportion of the moose population is now composed of young adult moose, based upon estimated antler size of bulls during annual fall surveys. This means that the number of vulnerable moose in that population may be declining, even though the total moose population is stable to increasing slowly. It is highly unlikely that recent low wolf harvests are responsible for any overall decline in wolf numbers.

Distribution and Movements:

Wolves occur throughout Unit 12, but there are less of them in vast icefields and rugged mountains in southern Unit 12 (Fig. 1). Not all pack sizes as depicted are comparable, because pack size estimates may be from different times during winter. Apparently vacant areas between depicted territories are most likely due to lack of detection of wolves, rather than actual absence of wolves. Figure 1 is presented only as a gross representation of inhabited wolf range and approximate locations of pack territories.

Mortality

Seasons and Bag Limits:

The hunting season in Unit 12 is 10 August through 30 April; there is no bag limit. The trapping season in Unit 12 is 1 October to 30 April; there is no bag limit. During March, April, and October, wolves can only be taken with 3x or larger snares. The taking of wolves by the land-and-shoot method is prohibited.

Human-induced Mortality:

Sixteen wolves (6 males, 9 females, 1 specified) were sealed in Unit 12 during the 1988-89 season. This low harvest represents a 50% decline from the 32 wolves taken the previous year and is 47% below the 5-year mean of 30 wolves (Table 2). Therefore, total human-caused overwinter mortality was only about 12% of the estimated fall (1988) population of 136 wolves.

Harvest Chronology. As in the fall of 1987, only 1 wolf (6%) was reported taken by a sheep hunter in August 1988; none were taken in September or October; three (19%) were taken each month from November to February; one (6%) was taken in March; and two (13%) were taken in April. In previous deep-snow winters, such as the one for 1988-89, much of the harvest occurred in late winter by land-and-shoot hunters.

Transport Methods. Of the 16 wolves sealed, 13 (81%) and two (13%) were taken by trappers using snow machines and highway

vehicles, respectively. The method of access was unknown for one. This indicates that most wolves were taken in areas reasonably accessible from the highway system and wolves in more remote portions of the unit were essentially unharvested. Analysis of harvest location indicates that 4 wolves each were taken from the Nabesna and Tetlin River drainages, three each from the Tok and Tanana River drainages, and two each from the White and Chisana River drainages.

Habitat

Assessment:

Approximately 7,000 mi^2 (70%) of Unit 12 constitutes wolf habitat, while the remainder is typified by icefields and rugged mountains. Good wolf habitat, however, is determined more by ungulate prey abundance than by vegetative characteristics. Using this criterion, 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. 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 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. When significant numbers of Mentasta and Nelchina caribou have wintered in Unit 12, wolves have made use of them.

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:

Unit 12 is addressed in the "Alaska Interagency Fire Management Plan: Fortymile Area." A large percentage of the area has been afforded "limited suppression" status for wildfires, and nearly all of the Wrangell-Saintt Elias National Park and Preserve and most of the Tetlin National Wildlife Refuge in Unit 12 have that classification. Unfortunately, much of the unit is unburnable (i.e., sparse fuels, high moisture, low temperature, and lack of ignition through lightning). Much of the more fire-prone land in the unit was afforded critical, full, or modified suppression status.

To increase winter browse over 1,000 acres of decadent willow stands have been crushed since 1982; 380 acres were treated during this reporting period. Plans exist to conduct prescribed fires in the Little Tok, Tok, and Robertson River drainages in future years.

Game Board Actions and Emergency Orders

As expected, the prohibition against taking wolves by the land-and-shoot method effective during the 1988-89 season reduced the harvest significantly.

CONCLUSIONS AND RECOMMENDATIONS

Wolves in Unit 12 exist at moderately low densities and are well distributed throughout suitable habitat. The population appears to be moderately productive and receives only light trapping pressure each year. Annual harvest is not controlling growth of this population. Social interactions precipitated by a limited prey base are resulting in natural mortality and emigration rates sufficient to reduce wolf numbers. Even so, the relative abundance of wolves to their prey is permitting wolf predation to keep moose at densities far below the carrying capacity of the habitat.

Strategic human-use goals are not being met at sustainable levels for either wolves or moose, because of the low-density equilibrium being maintained in much of Unit 12 at this time. Strategic goals cannot be satisfactorily achieved until numbers of moose are increased.

The Unit 12 wolf population could easily support greater annual harvests, perhaps twice the 5-year average of 31 wolves per year, without causing a sustained decline in the population. Greater wolf harvests by the public could contribute to the management of depressed moose populations; however, these harvests are unlikely to cause growth in the moose population. Additional efforts by the public or the Department will be necessary if wolf numbers are to be reduced sufficiently for moose numbers to increase significantly.

Wolves should be managed in concert with black bears, grizzly bears, and moose in northwestern Unit 12. This area is of great importance to local subsistence and other hunters using the Tetlin, Little Tok (currently closed), Tok, Robertson, and Tanana Rivers. Currently, wolf management is not compatible with management of these other species. Consequently, moose numbers are still being controlled by predation and by humans killing moose outside the legal hunting seasons. At this time, legal moose harvests are being maintained at less than 3% of the populations and are limited to bulls, except for moose taken for funeral potlatches. Because exploitation of wolves by the public

is so light in this area, the Department should implement a wolf reduction program to affect desired growth in moose numbers.

My recommendation to conduct a temporary wolf reduction effort in this area is consistent with both existing strategic goals and population objectives. It is also consistent with guidelines for such programs recognized in the Manifesto on Wolf Conservation adopted by the Wolf Specialist Group, International Union for the Conservation of Nature and Natural Resources (IUCN). These 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 range."

Experience has shown that a 60-80% reduction in fall wolf numbers in this area could be expected to nearly double the recruitment of yearling moose, as it did in the early 1980's. If this degree of wolf population reduction can be effected and maintained for 5 years, significant growth of these moose populations is expected. Afterward, wolf numbers should increase rapidly in response to the expanded prey base. The result would be greatly enhanced consumptive and nonconsumptive human-use opportunities for moose and wolves in the long term.

There is no biological reason why such management should not succeed as predicted. Moose numbers are being limited not by habitat, but by predation; wolves are being limited not by human exploitation, but by a shortage of prey biomass. This is a manageable situation on lands slated for multiple-use resource management.

Failure to resolve this issue will perpetuate hardships being endured by local subsistence hunters and lead to increased tension between local subsistence and nonlocal hunters in this popular, accessible portion of Unit 12. The shortage of moose over the last 15 years has generated local dissatisfaction with current game management practices, which appear to assure continuing low densities of moose instead of restoring abundance within habitat capacity. The prospect of increased local demand for moose as a result of the USAF radar installation only adds to existing dissatisfaction among long-time local hunters.

Finally, hunters in Unit 12 are understandably confused over the role of the State in game management in this area. Millions of acres of public lands were withdrawn from use by hunters and trappers with the passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. This redirected hunting pressure to Unit 12. Manipulation of species populations on ANILCA lands managed by the USFWS and NPS, including substantial acreage in Unit 12, is unlikely because of internal agency

policies. This leaves state and private lands available for restorative game management to meet consumptive demands.

In Unit 12 nonconsumptive users can enjoy wolves in aesthetic surroundings in the Wrangell-Saint Elias Park. An additional strategic goal should be considered for that portion of Unit 12 within the Wrangell-Saint Elias National Park. Such a goal would be to provide opportunity to view and study wolves largely unaffected by humans in a remote, undeveloped environment. Most of the park area has also been designated as wilderness. It is an ideal area in which to attempt to enjoy wolves in solitude. Conversely, management should be used to restore abundance of moose and wolves in northwestern Unit 12, where demands for subsistence use are high and where resources are to be managed for multiple use, including viewing by visitors to Alaska using the highway system in this area.

LITERATURE CITED

Boertje, R. D., W. C. Gasaway, S. D. DuBois, D. G. Kelleyhouse, D. V. Grangaard, D. J. Preston, and R. O. Stephenson. 1985. Factors limiting moose population growth in Game Management Unit 20E. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-3 and W-22-4. Juneau. 51pp.

Gasaway, W. C., R. O. Stephenson, J. L. Davis, P. E. K. Shepherd, and O. E. Burris. 1983. Interrelationships of wolves, prey and man in interior Alaska. Wildl. Monogr. 84. 50pp.

Halpin, L. 1987. Living off the land: contemporary subsistence in Tetlin, Alaska. Division of Subsistence, Alaska Dep. Fish and Game. Tech. Paper No. 149. Fairbanks.

Haynes, T. L., M. Case, J. A. Fall, L. Halpin, and M. Robert. 1984. The use of Copper River salmon and other wild resources by upper Tanana communities, 1983-84. Division of Subsistence, Alaska Dep. Fish and Game. Tech. Paper No. 115. Fairbanks.

Keith, L. B. 1983. Population dynamics of wolves. Pages 66-77 in L. N. Carbyn, ed. Wolves in Canada and Alaska: Their status, biology, and management. Can. Wildl. Serv. Rep. Ser. 45.

Mech, L. D. 1973. Wolf numbers in the Superior National Forest of Minnesota. U.S. Dep. of Agric. For. Serv. Res. Pap. NC-97, North Cent. For. Exp. Sta., St. Paul, Minn. 10pp.

Stephenson, R. O. 1978. Characteristics of exploited wolf populations. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-17-3 through W-17-8. Juneau. 21pp.

PREPARED BY:

David G. Kelleyhouse
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

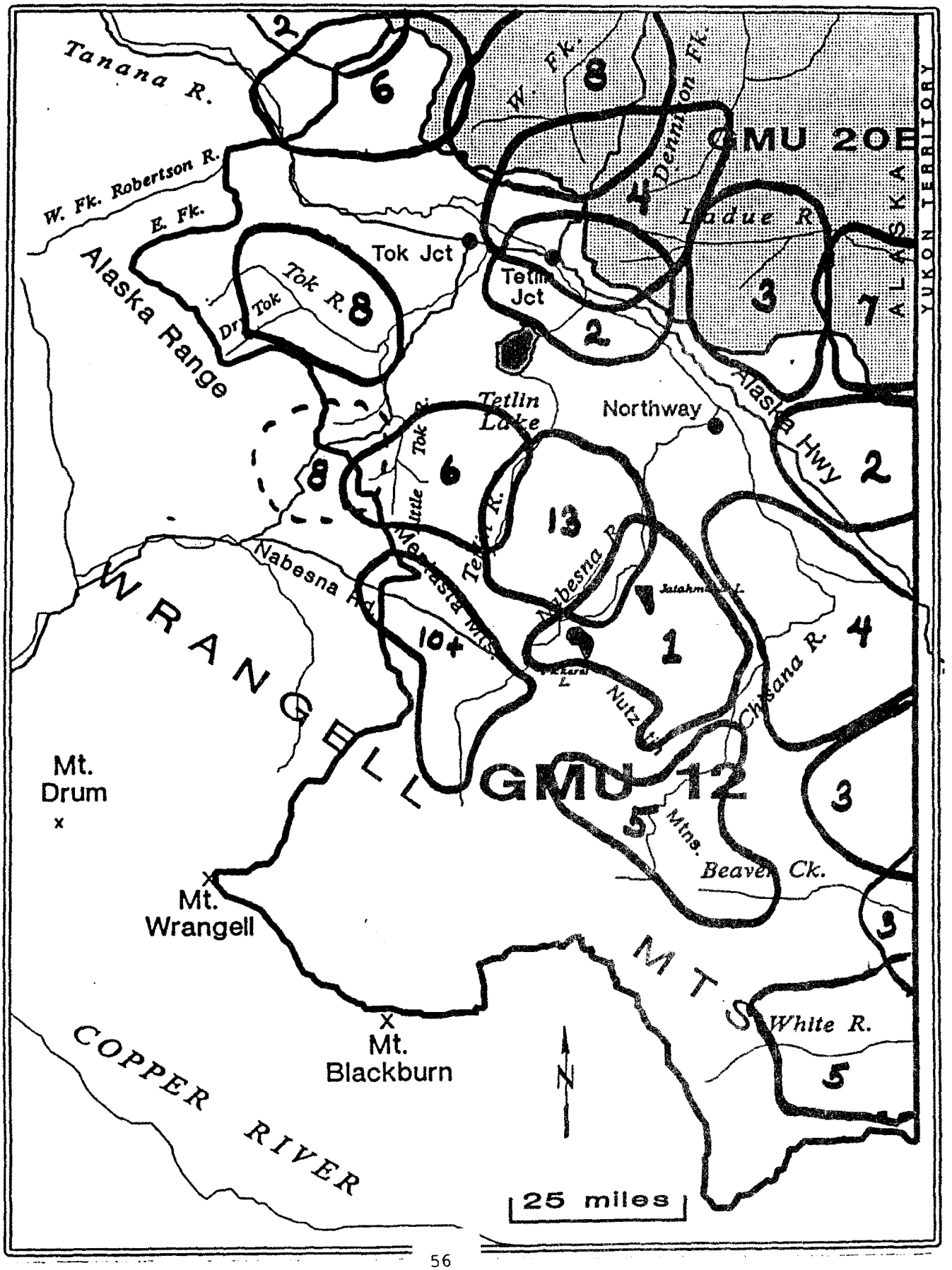


Figure 1. Approximate wolf pack territories and pack sizes during winter 1988-89, Unit 12.

Table 1. Wolf population estimates and reported harvest, Unit 12, 1984-89.

Year	No. of wolves spring	No. of wolves fall	Reported harvest	% of fall population
1984	No est.	170-190[a]	20	11-12
1985	No est.	170-190[a]	45	24-26
1986	No est.	209	37	18
1987	133	185	32	17
1988	141	136	16[b]	12
1989	113	--	--	--
Mean	129	178	30	17

[a] Gross estimate derived by comparing apparent density of wolves in the wolf control area in northwestern Unit 12 and southern Subunit 20E.

[b] First year without land-and-shoot taking of wolves.

Table 2. Wolf harvest characteristics, Unit 12, 1984-88.

Year	Total taken	Hunting		Trapping[a]		Method of take: Ground shoot		Land & shoot[c]		Trap or snare		Unk	Sex: Male		Female		No. unk
		n	%	n	%	n	%	n	%	n	%	n	n	%	n	%	
1984	20	2	10	18	90	2	18	2	18	7	64	9	5	45	6	55	9
1985	45	4	9	41	91	4	9	9	20	31	70	1	23	55	19	45	3
1986[b]	36	3	8	33	92	4	11	2	6	29	83	1	13	39	20	61	3
1987	32	1	3	31	97	1	3	0	0	31	97	0	13	59	9	41	10
1988	16	1	6	15	94	4	25	--	--	12	75	0	6	40	9	60	1
Mean	30	2	7	28	93	3	11	3	11	22	79	2	12	48	13	52	5

[a] Includes take by land and shoot through 1987.

[b] Does not include 1 study-induced mortality (Tetlin Pack female).

[c] Land and shoot taking prohibited in 1988.

STUDY AREA

GAME MANAGEMENT UNIT: 13 (22,857 mi^2)

GEOGRAPHICAL DESCRIPTION: Nelchina and Upper Susitna Rivers

BACKGROUND

Wolf numbers in Unit 13 were low from the late 1900's until the early 1930's, reflecting corresponding low prey densities (Skoog 1968). Wolf numbers increased after this period, and by the mid-1940's wolves were considered common (Ballard et al. 1987). As a result of predator control by the U.S. Fish and Wildlife Service (FWS) between 1948 and 1953, wolf numbers declined dramatically. Based on estimates in 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 high of between 350 and 450 wolves was estimated in 1965, and fall population estimates in subsequent years exceeded 300 wolves through the 1970's (Ballard et al. 1987).

Prior to statehood (i.e., 1959), wolves were harvested under FWS regulations that provided year-round seasons and no bag limits. Denning and aerial shooting were legal, and bounties were paid. Wolf control, including use of poison baits, was conducted by FWS between 1948 and 1953. Beginning with statehood, the wolf season was closed for a 5-year period. In 1965 a short season was held. By the late 1960's 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 average of 86 (range = 46-128) wolves per year have been sealed in the unit.

POPULATION OBJECTIVES

To maintain the posthunting wolf population at a minimum of 150 wolves.

METHODS

To determine pack size and distribution of wolves, aerial surveys are conducted during late February or March in a portion of the unit. A population estimate is derived from the survey data. Additional information on wolf numbers is collected incidentally throughout the unit and combined with the survey area data to extrapolate a unitwide population estimate. For example, trappers are interviewed to obtain additional population and trend information pertaining to wolves in the unit. Harvests are

monitored by requiring the sealing of all wolves taken in the unit.

RESULTS AND DISCUSSION

Population Status and Trend

Ballard et al. (1987) reported that the wolf population declined by 58% between 1975 and 1982. Population estimates between 1983 and 1988 fluctuated between 119 and 200 wolves (Table 1). Population estimates during this period indicated that wolf numbers had been increasing approximately 80% from spring to fall, suggesting rather high yearly recruitments.

Population Size:

Fall and spring wolf population estimates are presented in Table 1. Spring population estimates declined 25% from 1986 to 1987 and 19% from 1987 to 1988, but increased 15% in 1989. The spring 1989 estimate of 150 wolves approached the 5-year (1985-1989) average of 156.

Distribution and Movements:

Wolf distribution and abundance is primarily dependent on the availability of prey. Wolf numbers are typically higher in habitats that support high moose numbers. Wolf packs in Unit 13 have maintained stable territories and do not appear to be migratory, except within their own territory (Ballard et al. 1987). Wolf distribution is also affected by the distribution of escape cover. Historically, wolves in Unit 13 have been more numerous in forested areas where land-and-shoot trapping was not possible. Wolves are vulnerable to land-and-shoot trapping when they frequent open areas, such as large lakes, rivers, or tundra habitats. Wolves were substantially more abundant during the winter of 1988-89 than during the previous 5 years in eastern Subunits 13B and 13C. Generally, wolf packs in this area were larger than those observed during years when harvests were larger.

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 13 is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Unit 13 is from 10 November to 31 March; there is no bag limit.

Human-induced Mortality:

Hunters and trappers sealed 32 wolves in Unit 13 during the 1988-89 season. This was a 71% decline from the previous year's harvest of 109 and 62% below the 5-year (1984-89) mean harvest of 84 (Table 2). Males composed 50% of the 1988-89 harvest, a decline from those of the past 5 years, when males composed 60% of the take.

Table 3 presents the reported harvest methods in Unit 13. Wolves taken by the land-and-shoot method have been recorded since 1985. During the period 1985 to 1989, the land-and-shoot method accounted for 51% of the harvest, compared with 40% for trapping and snaring. During the reporting period trapping and snaring accounted for the most wolves (62%), presumably a result of the elimination of the land-and-shoot method as a legal means of taking wolves.

Illegal harvesting of wolves, mostly by aerial shooting, occurs in Unit 13. Observations of suspected illegal harvest sites by ADF&G personnel and the public suggest the annual number of wolves taken in this manner is not large; however, in the 1987-88 period, reports from the public indicated a substantial illegal wolf harvest had occurred. One report put the possible illegal take by 2 individuals at 30 to 50 wolves. This illegal harvest had a major impact on wolf numbers in Subunits 13B and 13E.

Hunter and Trapper Residency and Success. During the reporting period, 22 trappers sealed one or more wolves from the unit, for an average take of 1.5 wolves/trapper; the average take per trapper over the previous 5 years (1983-88) was 2.2 wolves per year. The most wolves reported taken by any individual was seven. No wolves were sealed by nonresidents, and 4 nonresidents sealed 17 wolves ($\bar{X}$ = 4.3).

Harvest Chronology. Table 4 presents the harvest chronology for wolves taken in Unit 13 over the past 5 years. During the reporting period, the harvest was distributed fairly evenly throughout the trapping season. Substantial snowfall occurred early in October, and the snowpack remained deep throughout the winter, allowing trappers to operate the entire season. In prior years more wolves were taken during January, February, and March.

Transport Methods. The methods of transportation used by trappers to harvest wolves have been recorded only for the past 4 years (Table 5). During the reporting period, the methods of transportation used to take the most wolves were snow machines and highway vehicles. Historically, more wolves have been taken with the use of aircraft, reflecting the remote nature of the unit. Many wolf packs never come near a road or established traplines. Comparisons of reported harvest locations from 1986 to 1989 show that the wolf harvest was distributed throughout the unit over the period 1986 to 1988. In the 1988-89 period, however, few wolves were taken very far from the road system,

leaving more remote, interior portions of the unit virtually unharvested.

Natural 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 drownings. The remaining 80% was attributed to legal and illegal human harvest.

Game Board Actions

In November 1987 the Board of Game prohibited the land-and-shoot method of harvesting wolves, unless it was already in a trap or snare. 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 following the day on which flying occurred.

CONCLUSIONS AND RECOMMENDATIONS

Between 1975 and 1982 wolf population estimates for the entire unit were obtained by extrapolating densities determined for radio-collared packs in a portion of the unit (Ballard et al. 1987). Since 1983 such estimates have been primarily derived by extrapolating the number of wolves determined from track surveys in a portion of the unit. 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 during the spring of 1989. While this method shows promise as a census method, more testing is needed. Research should continue to focus on developing survey or sampling procedures that would allow managers to obtain reasonably accurate population estimates without the need to radio-collar a large number of wolves.

The wolf population recovered in 1988-89 from a suspected overharvest in 1987-88. The overharvest occurred because of a substantial illegal take of wolves by 2 individuals aerial-gunning in Subunits 13B and 13E. The reported legal take in 1987-88 was 109 wolves, well within the allowable harvest for a wolf population estimated to number between 270-310 wolves at the start of the 1987 season.

The current spring estimate of 150 wolves meets the population objective for the unit. Annual recruitment is high and, if the

annual human harvest is below 100 wolves, the wolf population should increase.

Over the past few years the land-and-shoot harvest method has been the most popular and successful method of taking wolves in Unit 13. This method became illegal starting with the 1988-89 trapping season. The effect of this restriction has been a decline in harvest. Since land-and-shoot trappers have taken a large proportion of the harvest in the past, it is unrealistic to expect that ground-based trappers will initially make up the difference. An analysis of harvest locations and the method of transportation used indicates that most wolves in interior portions of the unit were harvested by the land-and-shoot method, while harvest by ground trappers was primarily in close proximity to the road system. This trend was especially evident in 1988-89, when most of the harvest occurred near the road system. Until trapping patterns change in response to the new restriction, substantially fewer wolves will be harvested in the more remote portions of the unit.

The management plan for wolves in Unit 13 that has been in effect since 1976 provides for the maximum opportunity to participate in wolf hunting and trapping. For many years harvests have been limited by the number of wolves available and hunting and trapping conditions, rather than by regulatory controls. Usually when the spring population declined, trapper success also dropped and wolves subsequently increased without regulatory intervention. When wolves increased, so did trapping pressure and harvests. Human harvests limited the upward expansion of the wolf population. The new restriction on methods of trapping will probably reduce the number of wolves harvested. Given the demonstrated reproductive potential of wolves in the unit, the wolf population could increase substantially.

I recommend that increased monitoring of wolf numbers, distribution, and predation rates be initiated as soon as possible to determine the impact, if any, that the new restrictive trapping regulations have on wolf numbers and wolf distribution in the unit. New management plans for wolves and their prey in Unit 13 need to be developed to reflect regulatory changes. Plans should be drafted that set guidelines for both the minimum and maximum number of wolves maintained in the unit. These objectives should be developed so that they are compatible with objectives for important prey species such as moose and caribou. The wolf population should be managed under these new management guidelines and not allowed to increase above or drop below the established population objectives.

LITERATURE CITED

Ballard, W. B., J. S. Whitman, and C. L. Gardner. 1987. Ecology of an exploited wolf population in southcentral Alaska. Wild. Monogr. 98. 54pp.

Harbo, S. J., Jr., and F. C. Dean. 1983. Historical and current perspectives on wolf management in Alaska. Pages 52-64 in L. N. Carbyn, ed. Wolves in Canada and Alaska: their status biology, and management. Proc. of the Wolf Symp., Edmonton, Alberta. Can. Wildl. Serv. Rep. Series No. 45.

Rausch, R. A. 1967. Some aspects of the population ecology of wolves in Alaska. Am. Zool. 7:253-265.

Skoog, R. O. 1968. Ecology of the Caribou (Rangifer tarandus granti) in Alaska. Ph.D. Thesis. Univ. California, Berkeley. 699pp.

PREPARED BY:

Robert W. Tobey
Wildlife Biologist III

SUBMITTED BY:

Gregory N. Bos
Management Coordinator

Table 1. Wolf population estimates in Unit 13, 1975-89.

Year	Spring	Fall
1975	254	426
1976	280	318
1977	174	325
1978	124	261
1979	147	281
1980	135	251
1981	114	199
1982	109	369
1983	193	264
1984	119	275-285
1985	138 (125-150)	245-270
1986	200 (178-223)	245-270
1987	160 (140-180)	270-310
1988	130 (110-150)	175-225
1989	150 (125-175)	N/A

Table 2. Annual wolf harvest by subunit in Unit 13, 1984-88.

Year	13A	13B	13C	13D	13E	Unknown	Total Unit
1984/85	27	25	32	11	31	0	126
1985/86	16	18	8	19	7	1	69
1986/87	27	11	10	18	18	0	84
1987/88	38	29	24	7	11	0	109
1988/89	4	8	8	19	3	0	32
Mean	22	13	16	13	14	0	84

Table 3. Annual wolf harvest by method of take in Unit 13, 1984-85 to 1988-89.

Method of take	1984-85 No. (%)	1985-86 No. (%)	1986-87 No. (%)	1987-88 No. (%)	1988-89 No. (%)
Trapping	34 (27)	22 (32)	31 (37)	32 (29)	17 (53)
Snaring	4 (3)	11 (16)	6 (7)	2 (2)	3 (9)
Ground shooting[a]	85 (68)	8 (12)	7 (8)	6 (6)	12 (28)
Land-and shoot[a]	-- --	28 (40)	37 (44)	69 (63)	-- --
Unknown	3 (2)	0	3 (4)	0	0

[a] Land-and-shoot was not broken out from other forms of ground shooting in sealing records until 1985. In 1988/89 the land-and-shoot method became illegal in Unit 13.

Table 4. Wolf harvest chronology by month in Unit 13, 1984-88.

Month	1984-85 No. (%)	1985-86 No. (%)	1986-87 No. (%)	1987-88 No. (%)	1988-89 No. (%)%
August	1 (1)	0	1 (1)	0	1 (3)
September	1 (1)	4 (6)	5 (6)	2 (2)	4 (12)
October	0	1 (1)	1 (10)	1 (1)	0
November	11 (9)	7 (10)	10 (12)	4 (4)	8 (25)
December	13 (10)	4 (6)	6 (7)	21 (19)	5 (16)
January	4 (3)	8 (12)	27 (32)	24 (22)	3 (9)
February	38 (30)	12 (17)	20 (24)	40 (37)	5 (16)
March	58 (46)	31 (45)	14 (17)	16 (14)	6 (19)
April	0	0	0	1 (1)	0
Unknown	0	2 (3)	0	0	0

Table 5. Annual wolf harvest by transportation method in Unit 13, 1985-88.

Method of transportation	1985-86	1986-87	1987-88	1988-89
Aircraft	29 (42%)	37 (44%)	74 (68%)	1 (3%)
Dogsled/skiis	3 (4%)	2 (2%)	0	3 (9%)
Boat	0	2 (2%)	3 (3%)	0
3/4-Wheeler	0	0	0	0
Snowmachine	27 (39%)	28 (33%)	30 (27%)	19 (59%)
ORV	0	1 (1%)	0	1 (3%)
Highway vehicle	2 (12%)	8 (10%)	2 (2%)	7 (22%)
Unknown	8 (12%)	6 (7%)	0	1 (3%)

STUDY AREA

GAME MANAGEMENT UNIT: 14 (6,871 mi^2)

GEOGRAPHICAL DESCRIPTION: Eastern Upper Cook Inlet

BACKGROUND

Wolf numbers in Unit 14 were low to moderate in the 1950's and early 1960's, primarily because of active predator control efforts by the federal government. Wolf populations increased during the late 1960's and early 1970's, after cessation of predator control activities and bounty payments. Development in the Anchorage area and along the highway system in the Matanuska-Susitna Valley were factors in keeping wolf numbers low near human settlements from the 1970's to the present. Large increases in human population during this period resulted in substantial increases in hunting and trapping pressure; by the mid- to late 1980's, wolves had been reduced to relatively low numbers, even in some of the remote areas of Unit 14.

POPULATION OBJECTIVES

To maintain a postharvest wolf population of at least 35 wolves in Subunits 14A and 14B.

To maintain a postharvest wolf population of 20 wolves in Subunit 14C.

METHODS

No aerial surveys were conducted. Relative numbers and distribution of wolves were determined by (1) noting tracks and other sign while conducting aerial surveys for other big-game species, (2) tabulating sightings and other reports from the public, and (3) sending a questionnaire to all trappers who sealed fur in Subunits 14A and 14B. The annual wolf harvest was determined from sealing records.

RESULTS AND DISCUSSION

Population Size

Wolf population density is low throughout Unit 14. Wolves primarily occur in the least accessible areas of the unit near unit boundaries. Consequently, most of the wolves cross unit boundaries in their movements, and the home ranges of many of them are apparently centered in adjacent units. For example, packs observed at the head of the Talkeetna River most likely

reside in Unit 13. Few wolves occur near human settlements or areas with high human use.

A population census of wolves in Unit 14 has never been conducted; therefore, a precise estimate of population size is not available. However, based on sightings by the staff and public, there are an estimated 30 to 60 wolves within Unit 14. A questionnaire was mailed to 64 trappers who had trapped in Subunits 14A and 14B. Of the 21 trappers who responded to questions regarding wolf abundance, 48% said wolves were scarce, 29% said wolves were not present in their areas, 14% said they were common, and 9% said they were abundant. Sixty-seven percent of the respondents said that the wolf population was stable, the remainder were evenly split between an increasing or decreasing population. These responses were similar to those of the previous year's questionnaire. In summary, most trappers believed that the wolf population in Unit 14 was low but stable.

Mortality

Season and Bag Limits:

Hunting. The open season for Unit 14 is 10 August to 30 April; the bag limit for Subunits 14A and 14B is 4 wolves, while the bag limit for 14C is one.

Trapping. The open seasons for Subunits 14A and 14B combined and 14C singly are 10 November to 31 March and 10 November to 28 February, respectively. There is no bag limit.

Human-induced Mortality:

One wolf was reported harvested in Subunit 14A during the 1988-89 trapping season. No wolves were reported taken in Subunits 14B or 14C. During the period 1979 to 1989, mean annual harvests for Subunits 14A, 14B, and 14C were 3.5, 2.0, and 1.4 wolves, respectively (Table 1). During the same period, reported harvests ranged from zero to 10 in Subunit 14A, zero to 14 in Subunit 14B, and zero to four in Subunit 14C (Table 1).

The high variability in annual harvests was influenced by several factors; the most important was snow depth. Hunting and trapping conditions were generally superior and wolf harvests were generally higher in years with deep snow than in years with below-normal snowfall. Also, some wolf packs became more vulnerable to hunting and trapping when they followed moose to flood plains or valley bottoms where they were more likely to encounter hunters and trappers. The wolf harvest in Unit 14 was distributed relatively evenly over time, because most of the harvest was by hunters and trappers using ground transportation, rather than aircraft.

CONCLUSIONS AND RECOMMENDATIONS

Unit 14 has an estimated population of 30 to 60 wolves. The home ranges of some wolves included in this estimate may occur largely outside Unit 14 boundaries. Therefore, the population probably numbers closer to 30 than 60. Because of the difficulty and expense of censusing wolves in Unit 14, it has not been possible to precisely determine whether the population objective has been achieved; however, even if it were only 30 wolves, harvest levels during the past 5 years would not have exceeded sustained yield. For this reason, no changes in seasons or bag limits are recommended. However, if a 3-year mean annual harvest exceeds 10 wolves, a late-winter census should be considered to determine whether a reduction in season length is warranted.

PREPARED BY:

William B. Collins
Wildlife Biologist

SUBMITTED BY:

Gregory N. Bos
Management Coordinator

Table 1. Reported wolf harvest in Unit 14, 1978-1988.

Subunit	Year	Total	Sex			Harvest chronology						Method of take				
			M	F	Unk	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14A	78-79	4	0	4	0	0	1	0	1	2	0	0	2	1	0	1
	79-80	2	0	0	2	1	1	0	0	0	0	2	0	0	0	0
	80-81	3	1	2	0	0	0	1	1	0	1	2	1	0	0	0
	81-82	4	0	3	1	0	0	1	2	1	0	1	2	1	0	0
	82-83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	83-84	10	2	7	1	1	2	5	2	0	0	1	6	3	0	0
	84-85	4	2	2	0	0	0	1	1	2	0	0	1	3	0	0
	85-86	4	3	1	0	1	1	0	1	1	1	0	3	1	0	0
	86-87	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1
	87-88	2	1	1	0	0	0	0	2	0	0	0	0	2	0	0
	88-89	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0
14B	78-79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	79-80	2	0	0	2	0	2	0	0	0	0	0	2	0	0	0
	80-81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	81-82	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
	82-83	14	8	6	0	0	0	0	0	0	14	10	3	0	0	1
	83-84	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0
	84-85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	85-86	2	0	2	0	1	0	0	0	0	1	1	1	0	0	0
	86-87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	87-88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	88-89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

-continued-

Table 1. Continued

Subunit	Year	Total	Sex			Harvest chronology						Method of take				
			M	F	Unk	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14C	78-79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	79-80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	80-81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	81-82	2	0	0	2	0	0	1	0	1	1	0	1	1	0	0
	82-83	2	1	1	0	0	0	0	0	0	2	0	2	0	0	0
	83-84	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0
	84-85	2	0	2	0	0	0	0	2	0	0	1	1	0	0	0
	85-86	4	3	1	0	0	0	0	1	3	1	4	0	0	0	0
	86-87	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0
	87-88	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0
	88-89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All sub-units of Unit 14 combined totals	78-79	4	0	4	0	0	1	0	1	2	0	0	2	1	0	1
	79-80	4	0	0	4	1	3	0	0	0	0	2	2	0	0	0
	80-81	3	1	2	0	0	0	1	1	0	1	2	1	0	0	0
	81-82	7	0	3	4	0	0	2	2	2	1	2	3	2	0	0
	82-83	16	9	7	0	0	0	0	0	0	16	10	5	0	0	1
	83-84	12	3	8	1	1	2	6	3	0	0	1	8	3	0	0
	84-85	6	2	4	0	0	0	1	3	2	0	1	2	3	0	0
	85-86	10	6	4	0	2	1	0	2	4	1	5	4	1	0	0
	86-87	2	0	1	1	0	0	0	0	2	0	1	0	0	0	1
	87-88	3	1	2	0	0	1	0	2	0	0	0	0	3	0	0
	88-89	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0
Grand total		68	22	36	10	4	8	11	14	12	19	24	28	13	0	3
Mean		6	2	3	1	0	1	1	1	1	2	2	3	1	0	0

STUDY AREA

GAME MANAGEMENT UNIT: 16 (12,445 mi^2)

GEOGRAPHICAL DESCRIPTION: West side of Cook Inlet

BACKGROUND

Greater numbers of wolves once occurred in Unit 16. It appears that their numbers have declined over the past 4 years. The unit's moose population and other wildlife now provide a prey base that could support a higher density of wolves. Wolves are highly sought after by recreational hunters and trappers, and their numbers have been reduced in accessible areas; most packs now occupy remote areas. In recent years harvest has occurred primarily in winter, when snow and weather conditions have favored aircraft use.

POPULATION OBJECTIVES

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

METHODS

Harvest data for wolves are obtained through sealing of pelts. Additionally, incidental observations by staff and input from local residents and trappers provided information on the distribution and numbers of wolves.

RESULTS AND DISCUSSION

Population Status and Trend

The fall population in Unit 16 is estimated to be 60-75 wolves; however, the population is declining. The largest packs occupy the more remote mountainous areas, and some packs range into adjoining units.

Mortality

Seasons and Bag Limits:

Hunting. The open season in Unit 16 is from 10 August to 30 April; the bag limit is 4 wolves.

Trapping. The open season in Unit 16 is from 10 November to 31 March; there is no bag limit.

Human-induced Mortality:

Seven wolves (6 males and 1 female) were harvested during this reporting period from Subunit 16B; aircraft was the predominate method of transportation. Three wolves were trapped, one was snared, and three were shot. All wolves were taken during the winter months. Harvests for previous years were as follows: 1987, 8 wolves; 1986, 8 wolves; 1985, 3 wolves; 1984, 18 wolves.

CONCLUSIONS AND RECOMMENDATIONS

Harvest pressure by airborne hunters and trappers regulates wolf abundance and distribution in Unit 16. Because of the extensive use of aircraft for transportation, wolf packs in areas with recreational cabins are readily located, especially when snowfall causes optimal tracking conditions. Over time, packs have been reduced or eliminated in the eastern and central portions of the unit having the greatest recreational development. Minor conflicts exist between local trappers and others who use aircraft, but requests for restrictions on the use of aircraft to take wolves have not been supported by local advisory committees. Harvests over the past 4 years suggest that there are fewer wolves than the current population estimate. Additional work should be undertaken in order to more accurately determine the number of wolves in the unit. No changes in seasons or bag limits are recommended at this time.

PREPARED BY:

James B. Faro
Game Biologist III

SUBMITTED BY:

Gregory N. Bos
Management Coordinator

STUDY AREA

GAME MANAGEMENT UNIT: 17 (18,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Northern Bristol Bay

BACKGROUND

Wolves occur throughout Unit 17 in areas with suitable habitat and prey densities. No objective data on the population size are available, but harvest records from 1962 to the present give some indication of wolf distribution and relative abundance. Harvest data include bounty records (1962-1971), a mandatory sealing requirement (1972-present), and a Trapper Questionnaire that was implemented in 1988 to collect subjective information on relative abundance of all furbearers, including wolves.

POPULATION OBJECTIVES

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

METHODS

Harvests are monitored from mandatory sealing reports. Results from a Trapper Questionnaire sent to selected trappers in the unit were used to estimate trends in the wolf populations. General observations of wolf sign were noted during moose and caribou surveys, but no systematic surveys of wolf densities have been conducted.

RESULTS AND DISCUSSION

Population Status and Trend

The wolf population was stable during this reporting period, based on trapper reports and general observations. The wolf population probably reached its peak density from 1974 to 1977, but it had declined sharply by 1980. Rabies were reported in wolves in 1981, a contributing factor to the decline. Densities appear to have been increasing since 1980; they are high in the Nushagak Hills area, particularly from the King Salmon River towards Mosquito Creek. High densities are also found in the Koktuli River and Upper Kvichak River drainages, where the Mulchatna Caribou Herd winters.

Population Size:

I estimate the 1988 fall wolf population in Subunit 17A at 7 to 15 wolves in 1 to 3 packs; the Subunit 17B population was 150 to

200 wolves in 20 to 30 packs; and the Subunit 17C population was 20 to 30 wolves in 3 to 6 packs. These estimates are based upon harvest figures, personal contacts with hunters and trappers, and general observations during surveys. No objective wolf population data are available for this unit; consequently, these estimates may not be accurate.

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 17 is 10 August to 30 April. The bag limit is 4 wolves.

Trapping. The open season in Unit 17 is 10 November to 31 March. There is no bag limit.

Human-induced Moratlity:

The reported wolf harvest during the past 5 years has ranged from 17 to 79; the annual mean is 38 (Table 1). During this reporting period, 11 trappers harvested 23 wolves (12 males, 10 females, 1 unknown). Twenty-two were taken in Subunit 17B, and one was killed in Subunit 17C. No wolves were harvested by hunters. Shooting was the most common harvest method, accounting for 22 wolves (91%); trapping accounted for 2 wolves (9%). Record-cold temperatures and deep snow were the primary factors in the reduced wolf harvest for this reporting period. Extreme snow depths throughout the Nushagak River and much of the Mulchatna River drainages concentrated moose along main channels and forced caribou to stay east of the Kvichak River. Consequently, wolves did not move in to the Nushagak Hills and uplands along the Mulchatna River, where trappers typically land to shoot wolves. Additionally, little snow fell from mid-February through March, making tracking difficult.

Harvest Chronology. During the 1988-89 season, 2 wolves were harvested in December, 11 in January, three in February, and seven in March. The harvest chronology generally reflects the suitability of snow conditions for tracking and landing, rather than the availability of wolves.

CONCLUSIONS AND RECOMMENDATIONS

Few data are available to interpret the status of the wolf population in Unit 17. Subjective information suggests that the wolf population is healthy and stable at a relatively high density (1 wolf/73 mi^2). Prey densities have been increasing steadily in most of this unit since the early 1980's, and it is logical to expect the predator densities to do so also. Wolf abundance appears to be greatest in Subunit 17B, and aerial surveys should be conducted to better quantify population density. Nearly constant winds cause fresh snow to drift

rapidly, and good survey conditions seldom last more than 1 day. Survey efforts should be coordinated with Unit 19 and Lake Clark National Park staff to maximize the area surveyed while good conditions last.

PREPARED BY:

Kenton P. Taylor
Wildlife Biologist III

SUBMITTED BY:

Lawrence J. Van Daele
Survey-Inventory Coordinator

Table 1. Historical wolf harvest in Unit 17, 1962-63 to 1988-89.

Year	Males	Females	Unk.	Total	% ground shot	% Trapped	% air shot
1962-63	8	7	0	15	--	--	100
1963-64	9	5	0	14	--	--	100
1964-65	1	0	0	1	100	--	--
1965-66	10	8	0	18	--	--	100
1966-67	9	16	0	26	46	4	50
1967-68	13	11	0	24	4	--	96
1968-69	6	8	0	15	27	7	67
1969-70	3	0	0	3	--	--	100
1970-71	5	6	0	11	--	--	100
1971-72	16	9	3	28	100	0	--
1972-73	10	9	1	20	80	20	--
1973-74	13	7	0	20	50	50	--
1974-75	56	54	1	111	94	6	--
1975-76	18	28	1	47	91	9	--
1976-77	31	12	2	45	89	11	--
1977-78	7	10	0	17	53	47	--
1978-79	13	7	0	20	--	--	--
1979-80	11	12	2	25	--	--	--
1980-81	4	3	1	8	--	--	--
1981-82	12	6	0	18	78	22	--
1982-83	25	13	3	41	65	35	--
1983-84	4	3	0	7	100	0	--
1984-85	18	21	4	43	67	33	--
1985-86	8	3	0	17	71	29	--
1986-87	15	11	2	28	85	14	--
1987-88	48	31	0	79	95	1	--
1988-89	12	10	1	23	91	9	--

STUDY AREA

GAME MANAGEMENT UNIT: 18 (46,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim Delta

BACKGROUND

Sealing-certificate data and reported observations from trappers, fur buyers, and agency biologists indicated wolf numbers are increasing in Unit 18. The distribution and density of wolves in Unit 18 reflect those of moose and caribou. Moose densities in Unit 18 are growing in the Yukon drainage and in the northern Kilbuck Mountains, and the Kilbuck caribou herd has increased at an annual rate of 10-15% since 1985. Several thousand Mulchatna caribou reached the Kuskokwim lowlands between Aniak and Kalskag for the first time in 100 years during the winter of 1988-89. Substantial numbers of muskoxen have radiated from Nelson Island to the mainland of the Yukon-Kuskokwim (Y-K) Delta in recent years, although wolf predation on muskoxen has not yet been documented in Unit 18. Although wolf and ungulate numbers are growing in Unit 18, their overall densities remained low.

POPULATION OBJECTIVES

Current management strategies in Unit 18 are designed 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 should be maintained at sufficiently low levels to allow for maximum growth of ungulate species.

METHODS

No aerial surveys were conducted to determine the number and distribution of wolves in Unit 18. Wolves were observed occasionally during aerial surveys for moose and caribou. Wolf sightings by Department staff were compiled with those received from other agencies, the public, trappers, and fur buyers. Harvest information was obtained from sealing-certificate records and interviews with fur buyers.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf numbers that are reportedly increasing along the entire lower Yukon drainage in Unit 18 may be slightly increasing in the Kuskokwim River drainage. Trappers and fur buyers reported more

observations of wolves in Unit 18 during 1988-89 than at any time since the 1930's. Previous estimates of 25-50 wolves in Unit 18 are probably low, requiring upward revisions to 50-75 wolves.

Wolves were first observed in the delta lowlands west of the mouth of the Kuskokwim River between the coastal villages of Kwigillingok and Kipnuk 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. These wolves apparently fed on arctic hares and marine mammal carrion. The 6 wolves reported crossing the Kuskokwim River in early January 1988 are 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. Wolf tracks subsequently reported near Eek from January to March 1989 suggested that some wolves remained in the vicinity east of the Kuskokwim River.

Trappers and residents from the Yukon River villages of Marshall, Mountain Village, Sheldons Point, and Alakanuk reported observing tracks of single wolves or pairs throughout the winter of 1988-89. We believe that wolves now range at least seasonally along the entire Yukon River drainage in Unit 18 from the Subunit 21E border to the mouth of the Yukon River.

Trappers from the villages of Akiachak and Akiak in the lowlands west of the Kuskokwim River also reported tracks of single or several wolves in the Gweek River drainage during 1988-89. A trapper complained that a wolf ate a fox out of a cubby trap along the Gweek River in March 1989. Wolves had not been reported on the Gweek River since the demise of the reindeer industry over 50 years ago.

Biologists from the U.S. Fish and Wildlife Service (USFWS) observed wolves during aerial surveys of caribou in the Kilbuck Mountains on several occasions in the fall of 1988; 2 wolves were observed feeding on a caribou kill. A pilot reported 2 wolves chasing 40 caribou near Whitefish Lake (i.e., north of the Kilbuck Mountains) in November 1988. A pack of 5-7 wolves has reportedly ranged in the Kilbuck Mountains, including the Kisaralik, Fog, and Tuluksak drainages, since at least 1984.

Mortality

Seasons and Bag Limits:

Hunting. The open season in Unit 18 is 10 August to 30 April; the bag limit is 4 wolves.

Trapping. The open season in Unit 18 is from 10 November to 31 March; there is no bag limit.

Human-induced Mortality:

Sealing-certificate data indicated a substantial increase in the reported harvest in Unit 18 over the last 2 years. Seventeen wolves were harvested in Unit 18 in 1989, compared with 10 in 1988, two in 1987, one in 1986, and three in 1985. The larger documented harvest for 1988-89 is related to increased availability of wolves and to an active fur buyer offering good prices. Dollar value of wolf pelts to the trapper in Unit 18 has remained relatively stable during the last several years.

We believe that many harvested wolves 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 stiff, home-tanned wolf pelts for hood ruffs. Fur buyers suggest that only about a third to a half of the wolves caught are actually sealed. If so, the 1988-89 wolf harvest in Unit 18 was substantial, given a population estimate of 50-75 wolves.

Fifteen of the 17 wolves reported taken in Unit 18 in the 1988-89 season were from the Yukon drainage. Twelve of these wolves were harvested in the main river corridor from Marshall to Mountain Village. One wolf was reported taken from the Kisaralik River drainage, a tributary of the Kuskokwim River. The specific harvest location was not indicated for 1 wolf.

Sixteen of the 17 wolves sealed in Unit 18 in 1988-89 were taken by ground shooting, and one was trapped. Fourteen wolves were grey, two were black, and pelt color was not indicated for one. Eleven were males, and six were females. Reported pack sizes ranged from 1 to 8 wolves; seven was the pack size most frequently reported.

Harvest Chronology. Five wolves were reported harvested in December, one in January, four in February, and seven in March.

Transport Methods. Sixteen wolves were reported harvested in Unit 18 using snowmachines.

Natural Mortality:

Little information is available on the natural mortality of wolves in Unit 18. Extremely cold weather during late January and early February 1989 may have caused substantial mortality among other species, but no observable effects were reported for wolves.

Habitat Assessment

As indicated in previous progress 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 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 fur buyers reported more wolves in more places in Unit 18 than at any time since the 1930's. Seasonal wolf numbers are increasing along the entire lower Yukon River drainage in Unit 18, and the wolf population may be slightly increasing in the Kuskokwim River drainage. Wolves are now reproducing in at least one location on the lowlands of the Y-K Delta.

The current population estimate is 50-75 wolves. Seventeen wolves were reported harvested in Unit 18 in 1989-89, compared with 10 in 1987-88, and 1-3 wolves in previous years. Although this represents a substantial removal from a population estimated to number approximately 50-75 wolves, the harvest is considered acceptable, given the larger management goal of ungulate population growth.

No changes in seasons and bag limits are recommended at the present time.

PREPARED BY:

Samuel M. Patten, Jr.
Wildlife Biologist III

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

STUDY AREA

GAME MANAGEMENT UNIT: 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 history of the area by providing pelts for subsistence-based residents and recreation (sport harvesting) and income from sale of their pelts. Wolves have also competed with humans for big game animals. Monitoring the effects of wolf predation on moose and caribou herds is expensive and time-consuming, and very little research has been conducted in this area. Data have been collected through incidental observations by biologists, review of sealing documents, and informal interviews with wolf hunters and trappers.

MANAGEMENT OBJECTIVES

To maintain an average wolf:moose ratio of 1:40 on important winter and calving ranges.

To determine distribution, abundance, and population trends of wolves in selected areas.

To maintain a harvestable population of wolves capable of continuing to sustain an annual harvest of at least 100 wolves.

To reduce wolf numbers in areas where wolf predation is thought to be significantly affecting ungulate populations through calf or adult mortality.

To refine annual wolf population estimates in the area based on incidental sightings, hunter interviews, and sealing documents.

To delineate wolf survey area boundaries in each of the 6 subunits and attempt to survey these respective areas beginning in March 1990.

METHODS

Harvest statistics were gathered from sealing documents. Letters were sent to individual wolf trappers and hunters, asking them to gather additional information about harvest locations and pack territory boundaries. Packs of known sizes were listed (minimum estimates), harvest locations plotted, and territory boundaries estimated. Based on trapper and hunter interviews and sealing documents, the number of wolves and mean pack and territory sizes for each subunit were estimated (Table 1).

A Trapper Questionnaire was sent to 133 trappers in Units 19 and 21; responses were received from 64. Trappers rated the occurrence of wolves in their respective areas as abundant, moderate, or low, determining whether the trend was increasing, stable, or declining. Responses were assigned a numeric index value (i.e., high or increasing = 9.0, moderate or stable = 5.0, low or declining = 1.0), and mean index values were calculated for the entire area.

RESULTS AND DISCUSSION

Population Status and Trend

According to the Trapper Questionnaire, the mean wolf abundance index was 5.91 (n = 57), suggesting higher wolf abundance relative to historic impressions. Forty-four responses provided a mean trend index of 6.18, indicating an increasing trend over that of the previous year. These data, coupled with the high reported harvest, indicated that wolf numbers were probably high during this reporting period.

Although no formal wolf surveys or telemetry investigations were conducted in the area during the 1988 regulatory year, an estimated 710-815 wolves probably occur in 82 to 98 packs in Unit 19 and Subunits 21A and 21E (Table 1). In comparing these figures with earlier estimates of wolf numbers in the same area, the trend appears to have increased about 6.3%.

Despite near-record wolf harvests, independent estimates of wolf abundance and trends have all indicated an increase. The wolf population increased from 665-770 in 1987-88 to 710-815 in 1988-89, an increase of 5.8-6.8%. The number of packs increased from 76-95 to 82-98 during the same period, an increase of 3.2-7.9%. Independent data from the Trapper Questionnaires have shown increases of 15% and 1% in the abundance and trend indexes, resectively.

Population Composition:

Other than sex ratios reported in the harvested segment of the population, no data were available concerning composition of the

wolf populations in Unit 19 and Subunits 21A and 21E. Harvest and area-wide sex ratios were 1:1.

Distribution and Movements:

Only limited information is available on wolf distribution in Unit 19 and Subunits 21A and 21E. The harvest was well distributed where overstory vegetation was conducive to aerial tracking and landing; wolf tracks and incidental sightings were also well distrubuted. The lack of notable harvest throughout most of Subunits 19A and 19D probably reflects poor landing conditions, rather than low wolf densities.

Mortality

Seasons and Bag Limits:

The trapping season is 1 November-31 March; there is no bag limit. The hunting season is 10 August-30 April; however, the land-and-shoot harvest method is permitted from 1 November to 31 March only; the bag limit is 10 wolves.

Human-induced Mortality:

During the reporting period in Unit 19, 110 wolves were harvested, representing the third-highest reported harvest since inception of the sealing program (i.e., 1971-72). Because several of the adjoining units had restrictions on same-day-airborne wolf hunting, I suspect that several Anchorage-area hunters moved to Unit 19, thus the higher harvest. Incidental observations and discussions with trappers and hunters following the season indicated relatively high wolf abundance.

In Subunits 21A and 21E the harvests were 31 and 40 wolves, respectively, significantly higher than the 10-year mean. Wolf populations are also apparently high. Some combination of the following 3 factors undoubtedly contributed to the high harvests: (1) good flying and tracking conditions existed sporadically throughout late winter and early spring. (2) prices for pelts stayed relatively high (i.e., average of $142 on the Canadian fur sales markets); and (3) the regulation changes in the Southcentral Alaska units may have prompted hunters and trappers who use aircraft to harvest wolves in Units 19 and 21.

Although the trend in Unit 19 harvests declined during the period 1971 to 1984 (Fig. 1), harvests largely rebounded during the next 5 years (1984-1988). With hunting and trapping regulations in Southcentral Alaska becoming more restrictive, additional effort will occur in Units 19 and 21 during the next few years.

In Unit 19 the harvest (i.e., 110) represented from 21% to 24% of the prehunting population. The combined harvests for Subunits 21A and 21E (i.e., 71) represented from 25% to 29% of the prehunting population.

Hunter Residency. Eighty-nine (49%) wolves were harvested by residents of Unit 19 or 21. Eighty-seven (48%) wolves were taken by residents of other Alaskan locations, notably hunters from Anchorage and the Matanuska-Susitna Valley. Only 5 wolves were reported taken by nonresidents of Alaska, and these were incidentally harvested during hunts for other big game species.

Harvest Chronology. The majority of the wolf harvest occurred during spring. During the reporting period, only 18 of 169 wolves (10.7%) were taken during the August-December period. March harvests for both units combined were 122 wolves (67% of total), followed by 15 in January (8%), and 12 in February (7%).

Transport and Harvest Methods. Again, no significant differences were noted in wolf hunter transport or harvest methods used in Unit 19 or Subunits 21A and 21E between the 1988-89 season and those for previous years. One hundred sixty-seven wolves were taken by shooting (92%), 12 were taken by trapping (7%), and two by snaring (1%). Eighty-five percent of the harvest was facilitated through aircraft transportation, while 9% (n = 17) were taken utilizing snow machines.

Game Board Actions and Emergency Orders

Recent changes have been enacted for Unit 19, Subunits 21A and 21E, and adjacent areas that have affected the harvest. Throughout most of the state, prohibitions on same-day-airborne (land-and-shoot) hunting-trapping practices undoubtedly influenced the harvest of wolves in the areas, where it is allowed. Hunters and trappers who had traditionally used the now-closed areas redirected their efforts to Units 19 and 21. Beginning with the 1988-89 season, a bag limit of 10 wolves was established for hunters; there are no limits for trappers.

CONCLUSIONS AND RECOMMENDATIONS

Although reported wolf harvests in Unit 19 and Subunits 21A and 21E were at relatively high levels during the 1988-89 season, they were not high enough to cause declines in the population. Close contact with area hunters and trappers will continue, and redistribution of harvest effort in lightly hunted areas will be encouraged. Moose populations in the Upper Kuskokwim Controlled Use Area of Subunit 19D as well as throughout Subunit 19A have been significantly affected by high wolf predation. In addition, caribou herds throughout the area apparently suffer high predation mortality. Management strategies designed to maintain wolf harvests at a minimum of 100 wolves per season will be maintained, but success depends largely on spring flying and tracking conditions. Additional regulatory restrictions will certainly hamper efforts to manipulate wolf numbers in the area.

PREPARED BY:

Jackson S. Whitman
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale Haggstrom
Wildlife Biologist II

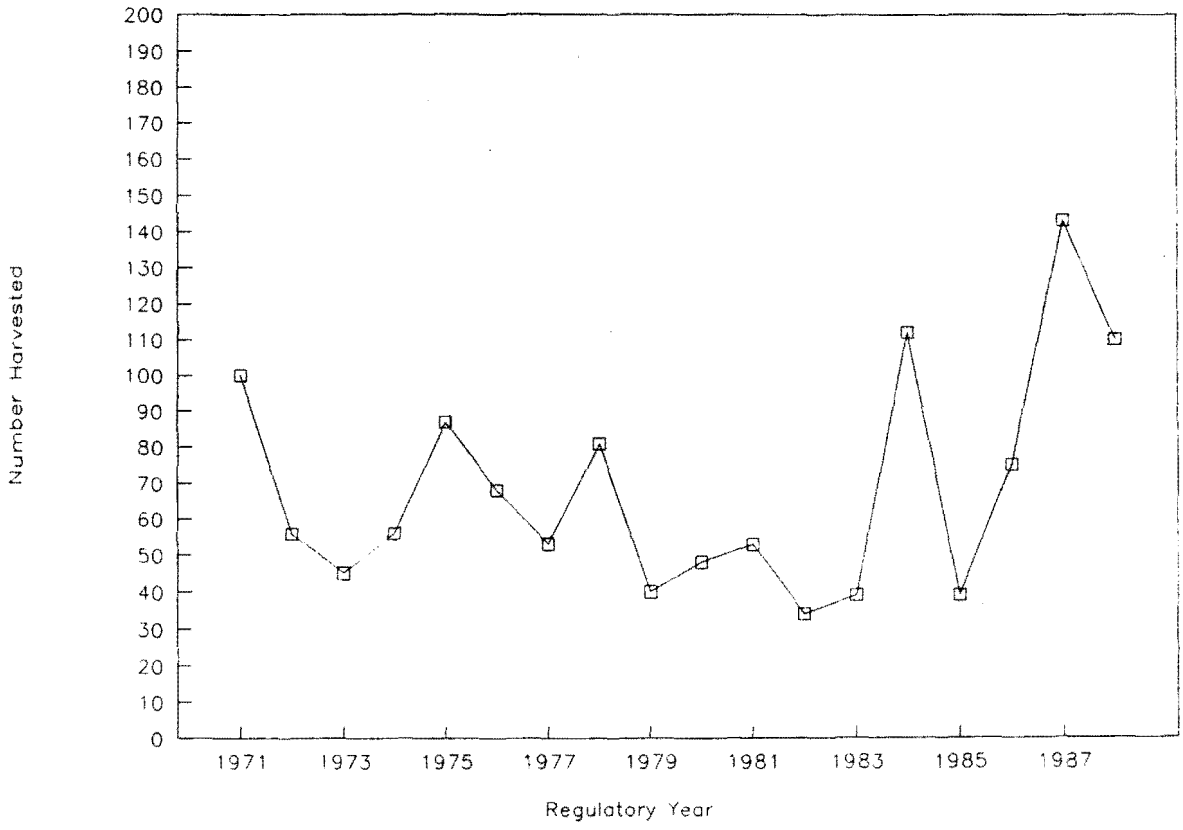


Fig. 1. Reported harvest of wolves in Unit 19, Subunits 21A and 21E, 1971-88.

Table 1. Estimated wolf pack data from Unit 19 and Subunits 21A, and 21E during the winter of 1988-89.

Subunit	Wolves/ pack	Number packs	10% lone wolves	Total wolves	Mean territory size (mi^2)
19A & B	9.1	22-26	24	225-260	738
19C	8.0	11-13	10	100-110	566
19D	6.1	20-24	15	140-160	562
21A	7.1	19-23	16	155-175	752
21E	8.2	10-12	10	90-110	717
Total/mean	7.6	82-98		710-815	672

STUDY AREA

GAME MANAGEMENT UNIT: 20A, 20B, 20C, 20F, and 25C (39,231 mi^2)

GEOGRAPHICAL DESCRIPTION: Lower Tanana Valley, Middle Yukon Valley

BACKGROUND

Few management programs receive the intensity of public scrutiny that is bestowed upon the management of wolves. In Interior Alaska wolves are an important furbearing resource to trappers, they are viewed as competition by big game hunters, and they are a symbol of the wilderness to people who may otherwise express little interest in wildlife or wildlife management. In the territorial days, Alaska wolves were managed as predators under a bounty system that continued until 1969. Early state regulations, however, classified wolves as furbearers, and in 1963 they were additionally classified as big game.

Recently, management of wolves 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 this study area in the mid-1970's and early 1980's resulted in increased moose and caribou populations (Gasaway et al. 1983). All but one of the wolf predation control programs have been terminated. The program in Subunit 20B was reauthorized by the Board of Game on 24 April 1988 for a 3-year period, because it embodies a management program with measurable moose and wolf populations and harvest rate objectives that have not yet been achieved. Prior reductions in the wolf population had resulted in a growing moose population. The program calls for continued monitoring of both wolf and moose populations to ensure that the wolf population recovers and that stated population levels are achieved for both species. Wolf control measures will not be used to remove additional wolves, unless specifically authorized by the Board following further review of the program.

MANAGEMENT OBJECTIVES

To determine population size by 1990 and 1991, estimate impact of current population on prey species by 1990 and 1991, improve the efficiency of wolf harvest by the public, and develop population objectives by 1990 and 1991 for Subunits 20A and 20B, respectively.

To develop estimates of population size by 1992 and population objectives by 1993 in Subunits 20C and 20F.

To determine population size and objectives by 1991 and 1992, respectively, for Subunit 25C.

METHODS

Sealing certificates provided documentation of wolf harvest and estimates of the size and location of packs from which wolves were harvested. Population estimates were made from sealing certificates, incidental observations, and wolf survey data. In Subunit 20C the National Park Service (NPS) has conducted intensive wolf studies within Denali National Park and Preserve (DNP). Density estimates from those studies were also used to estimate wolf numbers in Subunits 20B and 20C.

In Subunit 20A the population estimate was made by a systematic search of the Tanana Flats using 4 Super Cub and a Bellanca Scout aircraft. During the aerial survey the Tanana Flats was divided into 9 survey areas. Three or 4 days after the last snowfall the 9 areas were searched under ideal conditions 2 to 5 times each between 3 and 9 March. During each search observers plotted the locations of wolf tracks and estimated the number of wolves represented by each track. Because in most cases all the surveys in a given area were flown by the same pilot-observer team, they could distinguish between new tracks and those observed on a previous day. Additional information was provided by a 6th airplane that was used to survey the southeastern Tanana Flats and foothills on 16 and 27 February. Also, wolves in 2 packs on the Tanana Flats were radio-collared to assist biologists in distinguishing tracks of different packs.

The population estimate in the foothills portion of Subunit 20A was based on the location and monitoring of 8 radio-collared packs. Four of these packs were monitored for approximately 150 hours during aerial surveys conducted between 1 March and 1 April as part of a wolf prey selection study. After the aerial surveys had been completed, trapper reports and incidental observations of wolves were compared with documented sightings and track counts to determine if additional wolf packs existed that had been missed during the aerial surveys. The final estimate was then based on a composite of all data sources.

RESULTS AND DISCUSSION

Population Status and Trend

Subunit 20A:

During the fall of 1988 an estimated 25 wolf packs ranged within Subunit 20A. Eleven packs contained radio-collared wolves, 10 additional packs were identified from tracks or by observation during wolf surveys, and the presence of 4 packs was inferred from trapper reports (Table 2). Pack sizes ranged from 2 to 18 wolves and averaged 6.8 wolves/pack (SD = 4.2).

The minimum fall population estimate of 183 wolves was composed of 136 wolves associated with packs during the spring of 1989, 34

wolves harvested during the winter of 1988-89, and a 9% correction factor applied to the spring population for lone wolves (Stephenson 1978). Undoubtedly additional wolves present during the fall of 1988 were unaccounted for in trapper reports, missed during wolf surveys, or died of natural causes.

The estimated minimum wolf density in Subunit 20A during the fall of 1988 was 1 wolf/37 mi^2 (10.4 wolves/1,000 km^2). This density was similar to the highest wolf densities (10.3 wolves/1,000 km^2) reported by Ballard et al. (1987) for the Nelchina Basin between 1975 and 1982, but below those (13.3 wolves/1,000 km^2) estimated by Stephenson (1978) for Subunit 20A prior to initiation of wolf control in 1975.

There is no evidence wolf numbers have changed significantly since 1985. The 1985 estimate of 195 wolves was based on a thorough review of trapping records and interviews of trappers by ADF&G biologist R. Boertje. The 1987 estimate of 195 wolves was based on observation of radio-collared packs and trapper reports. Clearly, the 1988 estimate is the most soundly based estimate in recent years (i.e., observation of radio-collared packs, trapper reports, 65 hours of aerial surveys under ideal conditions on the Tanana Flats, and approximately 150 hours of radio-tracking in the central and western mountains of Subunit 20A.)

Subunit 20B:

The most recent estimate of wolf numbers in Subunit 20B was 143-163 wolves for the fall of 1987. Haggstrom (1987) made that estimate based 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 between 180 and 220 wolves.

No aerial surveys or radio-monitoring programs have been conducted in Subunit 20B since 1986. The wolf population in western Subunit 20B, however, appeared to increase after wolf control ceased in 1986, based on incidental observations of wolves in the control area during the winter of 1988-89. To arrive at a fall 1988 population estimate for Subunit 20B, I assumed a fall 1987 wolf population of approximately 150 wolves, subtracted the reported the 1987-88 winter harvest of 18 wolves, and assumed a 36% growth rate similar to that reported for wolves in Denali National Park (DNP) in adjacent Subunit 20C (Mech et al. 1988). Under those assumptions, the estimated fall 1988 wolf population in Subunit 20B was 180 wolves. Based primarily on trapper reports, the fall 1988 location and estimated size of 16 wolf packs ($\bar{X}$ = 6.3 wolves/pack, SD = 2.9), are given in Table 3.

Subunit 20C:

The National Park Service (NPS) has studied wolves in and near DNP within Subunit 20C since 1986. The density of 16 collared packs ranging over 5,207 mi^2 (13,489 km^2) was 1 wolf/44 mi^2 (8.7

wolves/1,000 km^2) during the fall of 1988 (Mech et al. 1988). ADF&G has not conducted aerial wolf surveys in Subunit 20C, but trapper reports identified at least 2 other packs north of the NPS study area (Table 4).

Extrapolating the wolf densities found in DNP to all of Subunit 20C yielded an estimate of approximately 270 wolves; however, it is doubtful that wolf densities in northern Subunit 20C are as high as those reported in the DNP study, because wolves in northern Subunit 20C have only a low-density moose population as prey. Wolves in DNP prey on caribou, moose, and sheep. A more reasonable estimate for Subunit 20C would be approximately 200 wolves, based on an assumed wolf density in northern Subunit 20C that is half that reported for DNP.

Wolf density reported in DNP increased an estimated 36% from 1987 to 1988. Mech et al. (1988) attributed the 1988 increase to an increase in the number of producing females as well as a more than doubling of the number of pups produced per pack.

Subunits 20F and 25C:

Aerial wolf surveys were not conducted in Subunits 20F or 25C. Minimal trapper reports (Table 5) were not sufficient to generate a population estimate. Because habitat and prey densities in Subunits 20F and 25C are similar to those of Subunit 20C, wolf densities may also be similar. If so, approximately 105 and 87 wolves inhabit Subunits 20F and 25C, respectively.

Mortality

Season and Bag Limit:

Hunting. The open season is from 10 August to 30 April; there is no bag limit in Subunits 20A, 20B, 20C, and 20F. In Subunit 25C the bag limit is 10 wolves. Same-day-airborne hunting of wolves is prohibited in Subunits 20A, 20B, 20C, and 20F, but it is allowed in Subunit 25C.

Trapping. The open season is from 1 November to 31 March; there is no bag limit.

Human-induced Mortality:

During the 1988-89 regulatory year hunters and trappers reported a combined harvest of 83 wolves from Subunits 20A, 20B, 20C, 20F, and 25C, including 46 males, 32 females, and 5 unspecifieds (Table 6). More than half (54%) were taken in snares, 21% were shot, and 24% were trapped. Forty-three percent of the combined reported harvest from 1984-85 to 1988-89 were taken in snares, 25% were shot, and 31% were trapped (Table 7). Overall the reported harvest represented 11% of the estimated fall 1988 wolf population. By subunit, harvest rates ranged from 3% to 19% of

estimated wolf populations (Table 7). Those harvests by themselves are insufficient to prevent wolf population growth.

Harvest Chronology. From 1984-85 to 1988-89 the chronology of the wolf harvest has not changed substantially; 54% of the harvest was taken in the November-January period and 39% in the February-April period. Only 7% of the harvest was taken during the August-October period, when trapping is closed and wolves are hunted as big game animals (Table 8).

Transport Methods. Transport methods were not reported on fur-sealing certificates prior to 1985. Since 1985 snow machines have consistently been reported as the most common method of transport. From 1985 to 1988, 59% of the harvest was taken with the aid of snow machines, 24% with airplane transport, 9% by dog team or on foot, and 8% by other means (Table 8).

Natural Mortality:

Two wolves that died from natural causes and 1 wolf that was killed by other wolves in Subunit 20C were salvaged and sealed by the NPS.

Game Board Actions and Emergency Orders

In November 1987 the Board of Game voted to eliminate same-day-airborne hunting of wolves in Subunits 20A, 20B, 20C, and 20F. Subunit 25C remained open to same-day-airborne hunting, but a bag limit of 10 wolves was imposed on hunters.

CONCLUSIONS AND RECOMMENDATIONS

The wolf populations are stable in Subunit 20A and increasing in Subunits 20B and 20C. Wolves in western Subunit 20B are expected to reach precontrol levels by 1990. To document wolf population changes following the cessation of predator control in 1986, I recommend wolf surveys be conducted in western Subunit 20B during the winter of 1989-90.

Land-and-shoot hunting accounted for approximately 9% of the harvest of wolves in the study area from 1985 to 1987. I recommend same-day-airborne hunting of wolves be reinstated for Subunits 20A, 20B, 20C, and 20F. No other changes in season or bag limit are recommended.

LITERATURE CITED

Ballard, W. B., J. S. Whitman, and C. L. Gardner. 1987. Ecology of an exploited wolf population in southcentral Alaska. Wildl. Monogr. 98. 54pp.

Gasaway, W. C., R. O. Stephenson, J. L. Davis, P. E. K. Shepherd, and O. E. Burris. 1983. Interrelationships of wolves, prey, and man in Interior Alaska. Wildl. Monogr. 84. 50pp.

Haggstrom, D. 1987. Report to the Board of Game on wolf predation control - Subunit 20B. Alaska Dep. Fish and Game, Fairbanks. Mimeo. 24pp.

Mech, L. D., T. J. Meir, and J. W. Burch. 1988. Demography and distribution of wolves, Denali National Park and Preserve, Alaska. Natural Resources Progress Report AR-88/17. National Park Service, Anchorage. 32pp.

Stephenson, R. O. 1978. Characteristics of exploited wolf populations. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-17-3 through W-17-8. Juneau. 21pp.

PREPARED BY:

Mark E. McNay
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

Table 1. Wolves killed during control programs in Subunits 20A and 20B, 1975-88.

Regulatory year	Public aerial shooting 20A	Public aerial shooting 20B	ADF&G trapping/ aerial shooting 20A	ADF&G trapping/ aerial shooting 20B
1975	--[a]	--[b]	67	--[b]
1976	--[a]	--[b]	27	--[b]
1977	--[a]	--[b]	39	--[b]
1978	--[a]	--[b]	18	--[b]
1979	0	3	3	--[c]
1980	2	17	0	15
1981	7	4	20	2
1982	4	9	--[c]	26
1983	--[b]	--[a]	--[b]	3
1984	--[b]	--[a]	--[b]	26
1985	--[b]	--[a]	--[b]	32
1986	--[b]	--[a]	--[b]	--[c]
1987	--[b]	--[a]	--[b]	--[c]
1988	--[b]	--[a]	--[b]	--[c]
Total	13	33	174	104

[a] Not open to public aerial shooting.

[b] No control authorized.

[c] Department personnel not involved.

Table 2. Wolf packs known to occur in Subunit 20A during winter 1988-89.

Pack name	Estimated fall 1988 pack size[a]	Estimated spring 1989 pack size	1988-89 reported harvest	Source of pack identification[b]
Fish Creek	7	5	2	1, 2
Lower Tatlanika	13	8	5	1, 3
Blair Lake	8	6	2	1, 3
Crooked Creek	9	9	0	1, 2
Dry Creek	9	8	1	1, 3
100 Mile Creek	5	5	0	3
Buchanan Creek	7	7	0	3
West Fork	4	4	0	2
Snow Mountain	9	7	2	1, 2
Cody Creek	6	5	1	2
Mystic Creek	2	2	0	2
Dick Creek	6	5	1	3
Mt. Fellows	12	12	0	3
Lignite Creek	18	12	6	1, 3
Rex Dome	4	4	0	2, 3
Total Canyon	4	4	0	2
Tata (VABM)	14	13	1	2
Gold King	3	3	0	3
Daniels Creek	2	2	0	2
Lower Wood River	2	2	0	3
Tanana River	9	4	5[c]	1
Ewe Creek	5	4	1[d]	2
Buzby	3	2	1	1
Jumbo	2	1	1	1
Thistle Creek	4	2	2	1
Single wolves	15	13[e]	3	
Total	183	149	34[c,d]	

[a] Derived by adding the overwinter harvest to the spring 1989 pack size estimates.

[b] Source of pack identification:
1 = Trapper report
2 = Radio collared
3 = Wolf census

[c] Includes 1 wolf reported near north bank of Tanana River in Subunit 20B.

[d] Includes 1 wolf taken in Subunit 20C.

[e] 9% of spring population added to account for single wolves in the population.

Table 3. Wolf packs known to occur in Subunit 20B during winter 1988-89.[a]

Pack location	Estimated fall 1988 pack size[c]	Estimated spring 1989 pack size[b]	1988-89 reported harvest	Source of pack identification[d]
Big Lake	5	2	3	1
Tatalina	5	4	1	1
Swanneck	3	2	1	1
East Fork Chena	6	3	3	1
Chena Dome	13	9	4	1
Middle Fork Salcha	8	4	4	1
Lower Salcha	4	2	2	1
Minto Lakes	6	1	5	1
Flat Creek	7	5	2	1
Standard Creek	2	1	1	1
Globe Creek	3	2	1	1
Tanana River[e]	9	4	5	1
98 Creek	6	5	1	1
Chatanika	8	8	0	2
Hutlitakwa	10	10	0	3
South Fork Chena	8	8	0	1
Lone wolves			5	

[a] This does not constitute a total population estimate; no surveys were conducted. These data represent only trapper reports and incidental observations.

[b] The Hutlitakwa and South Fork Chena packs were identified during November 1989. Both were assumed to be resident packs during winter 1988-89.

[c] Derived by adding the overwinter harvest to the spring 1989 pack size estimates.

[d] Source of pack identification:
1 = Trapper report
2 = Fish and Wildlife Protection observation
3 = Fall 1989 moose survey

[e] This pack occurs primarily in Subunit 20A but harvest of 1 wolf was included in the 20B harvest.

Table 4. Wolf packs known to occur in Subunit 20C during winter 1988-89.[a]

Pack name	Estimated fall 1988 pack size	Estimated spring 1989 pack size	1988-89 reported harvest	Source of pack identification
Headquarters	7	7	0	NPS
East Fork	19	19	0	NPS
Clearwater	4	4	0	NPS
Pirate Creek	9	8	1	NPS
McLeod Lake	12	11	1	NPS
Castle Rocks	8	8	0	NPS
Swift Fork	2	2	0	NPS
High Power	8	8	0	NPS
McKinley River	10	10	0	NPS
Birch Creek	23	23	0	NPS
Totek Hills	8	8	0	NPS
Stampede	7	7	0	NPS
Ewe Creek[b]	5	4	1	NPS
Windy Creek	5	5	0	NPS
Kantishna	10	6	4	Trapper report
Lone & unidentified pack			4[b]	

[a] This does not constitute a total population estimate; no surveys were conducted. These data represent only trapper reports and incidental observations.

[b] The Ewe Creek pack is primarily a Subunit 20A pack but it also ranges into 20C. The harvested animal was taken in 20C.

[c] Three of these wolves are believed to be members of the Ewe Creek or Stampede packs.

Table 5. Wolf packs known to occur in Subunit 20F and 25C during winter 1988-89.[a]

Pack location	Estimated fall 1988 pack size	Estimated spring 1989 pack size	1988-89 reported harvest	Source of pack identification
Ray River (20F)	6	4	2	Trapper report
Birch Creek (25C)	5	3	2	Trapper report
Lone wolves (20F)	-	-	3	Trapper report
Lone wolves (25C)	-	-	1	Trapper report

[a] This does not constitute a total population estimate; no surveys were conducted. These data represent only trapper reports and incidental observations.

Table 6. Reported wolf harvests in Subunits 20A, 20B, 20C, 20F, and 25C, 1983-88.

Regulatory year	20A	20B	20C	20F	25C	Total
83-84	24	18[a]	13	5	2	62
84-85	23	40[a]	4	7	5	79
85-86	24	57[a]	8	2	2	93
86-87	37	6	4	2	1	50
87-88	36	18	11[b]	5	10	80
88-89	32	34	9[c]	5	3	83

[a] Includes wolves killed by ADF&G in wolf control programs; 3 in 1983, 26 in 1984, and 32 in 1985.

[b] Does not include 1 wolf that was sealed from Subunit 20C that was killed by other wolves.

[c] Does not include 2 wolves reported by the National Park Service that died from natural causes.

Table 7. Estimated fall population and harvest rates of wolves in Subunits 20A, 20B, 20C, 20F, and 25C during regulatory year 1988.

Subunit	Estimated 1988 fall population	Reported harvest	Estimated harvest rate (%)
20A	183	32	18
20B	180	34	19
20C	200	9	5
20F	105	5	5
25C	90	3	3

Table 8. Reported method of take, method of transport, and harvest chronology of wolves harvested in Subunits 20A, 20B, 20C, 20F, and 25C, 1983-88.

Year	Subunit	Method of take				Method of transporta				Harvest chronology		
		Ground shoot	Trap	Snare	Other	Air-plane	Dogsled/ on foot	Snow-machine	Other	Aug-Oct	Nov-Jan	Feb-Apr
1983	20A	8	7	9	0	--	--	--	--	5	9	11
	20B	3	7	3	5[b]	--	--	--	--	2	5	6
	20C	5	7	1	0	--	--	--	--	0	10	2
	20F	3	1	1	0	--	--	--	--	0	2	3
	25C	0	2	0	0	--	--	--	--	0	2	0
1984	20A	16	3	4	0	--	--	--	--	3	14	6
	20B	7	5	2	40[b]	--	--	--	--	1	7	4
	20C	4	0	0	4	--	--	--	--	1	0	3
	20F	4	0	2	6	--	--	--	--	0	2	4
	25C	0	4	1	5	--	--	--	--	0	0	5
1985	20A	7	8	9	24	7	8	5	0	2	10	11
	20B	5	7	13	57[b]	5	1	14	2	1	9	15
	20C	0	4	4	8	0	3	2	1	0	3	3
	20F	0	2	0	2	0	0	0	0	0	1	1
	25C	0	2	0	2	0	1	0	1	0	1	1
1986	20A	3	6	27	36	5	0	26	0	0	16	9
	20B	1	2	3	6	2	0	4	0	0	5	1
	20C	2	0	1	3	0	1	1	1	0	3	0
	20F	0	1	1	2	0	2	0	0	0	1	1
	25C	1	0	0	1	0	0	0	1	0	0	1
1987	20A	5	16	14	35	9	1	24	2	3	22	11
	20B	1	9	8	18	2	0	16	0	0	9	9
	20C	3	2	6	11	3	0	5	5	2	8	3
	20F	4	1	0	5	3	1	1	0	0	2	3
	25C	0	10	0	10	0	4	6	0	0	4	1

- continued -

Table 8. Continued.

Year	Subunit	Method of take				Method of transporta				Harvest chronology		
		Ground shoot	Trap	Snare	Other	Air-plane	Dogsled/ on foot	Snow-machine	Other	Aug-Oct	Nov-Jan	Feb-Apr
1988	20A	9	4	19	0	14	0	17	1	4	11	17
	20B	3	9	22	0	5	0	26	6	2	25	5
	20C	1	3	5	0	5	0	2	2	1	10	0
	20F	0	4	1	0	0	0	4	0	0	1	3
	25C	3	0	0	0	2	1	0	0	0	1	2
% of total reported 1983-88[c]		25	31	43	0	24	9	59	8	7	54	39

[a] Data were not compiled for 1983 and 1984.

[b] Includes 3, 26, and 32 wolves taken during authorized wolf control activities in Subunit 20B during 1983, 1984, and 1985, respectively.

[c] Does not include animals taken by Department under predator control programs.

STUDY AREA

GAME MANAGEMENT UNIT: 20D (5,720 mi^2)

GEOGRAPHICAL DESCRIPTION: Central Tanana Valley near Delta Junction

BACKGROUND

Wolves are located throughout Subunit 20D, where their primary prey are moose and caribou. Wolf and prey populations were high in Subunit 20D during the 1960's (i.e., 100-150 wolves). Moose populations began declining in the mid-1960's, and a wolf reduction program to increase the moose population was authorized in 1979 (ADF&G 1984). Permits were issued for aerial shooting of wolves by the public. From the fall of 1979 to the spring of 1983, 105 wolves were killed by trappers, ADF&G staff, and hunters with permits for aerial shooting. Most wolves were taken in southern and eastern Subunit 20D (ADF&G 1983).

MANAGEMENT OBJECTIVES

To manage the number of wolves to sustain a prey:wolf ratio of at least 30 moose or moose-equivalents per wolf.

METHODS

Aerial wolf surveys were conducted with a Piper PA-18 Super Cub from an altitude of 300-500 feet above ground level. When wolf tracks were located, they were followed to determine the number of wolves in the pack and territory size and visually locate the pack, if possible. Tracks were recorded on a topographic map. Trappers were also questioned about the number of wolves in their areas; this information was also plotted on topographic maps. Wolves harvested by trappers and hunters were sealed by ADF&G staff.

RESULTS AND DISCUSSION

Population Status and Trend

The wolf population appears to be stable. The current population estimate of 66 to 91 wolves is comparable to a spring 1987 estimate of 68 to 86 wolves (Crain 1988).

Population Size:

A total of 17.3 hours of aerial surveys were conducted from 5 to 8 March 1989. Subunit 20D was searched south and north of the

Tanana River on 5 and 7 March and 6 and 8 March, respectively. Additional information was contributed by the local Fish and Wildlife Protection Officer from flights he made in the area. Eight packs were located during aerial surveys, and an additional 5 packs were identified from trapper interviews (Table 1).
An estimated 8 packs have territories that are confined to Subunit 20D, and an additional 5 packs have territories that are partially within Subunit 20D. The estimated number of wolves within Subunit 20D ranges from 66 to 91 (Table 1).

Mortality

Season and Bag Limit:

Hunting. The open hunting season is from 10 August to 30 April; there is no bag limit.

Trapping. The open season is from 1 November to 31 March; there is no bag limit.

Human-induced Mortality:

The reported harvest during 1988-89 was 22 wolves, an increase from 10 in 1987-88 (Table 2) and similar to the mean harvest of 21 per year for the previous 5 years. The 1988-89 harvest consisted of 4 males, 14 females, and 4 unspecifieds. Ten different trappers reported taking wolves (mean = 2.2 wolves/trapper). The most common methods of taking wolves were by snaring (68%),trapping (23%) and ground shooting (9%).

Harvest Chronology. Most wolves (68%) were harvested during December, January, and February (Table 3).

Transport Methods. Snow machines were the most commonly used method of transportation for harvesting wolves (91%). This is similar to 1987-88, when 80% of wolves were taken from snow machines (Table 4).

CONCLUSIONS AND RECOMMENDATIONS

The wolf population appears to be stable, based on analyses of aerial survey and harvest data. Although precise moose population estimates are not available for Subunit 20D, available data suggest that the management objective of sustaining a prey:wolf ratio of at least 30 moose or moose-equivalents per wolf is being met in the southern portion of the subunit. However, there are probably fewer than 30 moose:wolf in northern portion of the subunit, and wolf predation is limiting moose population growth. A reduction in the wolf population is necessary to accomplish both wolf and moose management objectives in this area.

LITERATURE CITED

Alaska Department of Fish and Game. 1983. Wolf management programs in Alaska 1975-1983. Alaska Dep. Fish and Game. Unpubl. rep. 17pp.

Alaska Department of Fish and Game. 1984. Summary of the implementation plan to control predation by wolves in Game Management Unit 20D. Alaska Dep. Fish and Game. Unpubl. rep. 9pp.

Crain, E. 1988. Subunits 20A, 20B, 20C, 20D, 20F wolf survey-inventory progress report. Pages 40-42 in S. O. Morgan, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XVIII. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-6. Juneau. 64pp.

PREPARED BY:
Stephen D. DuBois
Wildlife Biologist III

SUBMITTED BY:
Christian A. Smith
Management Coordinator

REVIEWED BY:
Dale A. Haggstrom
Wildlife Biologist II

Table 1. Wolf pack names, locations, estimated size, and source of information for Subunit 20D during March 1989.

Pack name	Location	Pack size	Source
Jarvis Pack	Upper Jarvis Creek	3	Aerial survey
100 mile[a]	Upper 100 mile Creek, Donnelly Dome	5	Aerial survey
Macomb	Macomb Plateau	4	Aerial survey
Robertson River[a]	Robertson River	6[b]	Interview
Billy Creek[a]	Billy Creek	3	Interview
Healy River	Healy River	10+	Aerial survey
Barley	Delta Agricultural Project	5-8	Interview
Volkmar	South Fork Goodpaster, Volkmar River	13	Aerial survey
Shaw Creek	Shaw Creek Flats	9[b]	Interview
Central Creek	Central Creek	5-6	Aerial survey
Black Mountain	Eisenmenger Fork, upper Central Creek	10+	Aerial survey
Indian Creek[a]	Indian Creek	5-6	Interview
Eisenmenger[a]	Upper Eisenmenger Fork	3	Aerial survey

[a] Packs with territories that extend outside Subunit 20D.

[b] Pack size in spring 1988.

Table 2. Annual reported harvest of wolves in Subunit 20D, 1981-89.

Year[a]	Males	Females	Unknown	Total
1981-82	7	6	1	14
1982-83	17	19	4	40
1983-84	6	14	0	20
1984-85	10	6	2	18
1985-86	17	10	1	28
1986-87	12	7	1	20
1987-88	2	4	4	10
1988-89	4	14	4	22

[a] 1 July through 30 June.

Table 3. Harvest chronology for wolves taken in Subunit 20D, 1987-88 to 1988-89.

Month	1987-88		1988-89	
	n	%	n	%
July	0	--	0	--
August	0	--	1	5
September	0	--	0	--
October	0	--	0	--
November	3	30	1	5
December	0	--	5	23
January	1	10	4	18
February	2	20	6	27
March	4	40	0	--
April	0	--	1	5
May	0	--	0	--
June	0	--	0	--
Unknown	0	--	4	18
Total	10	100	22	100

STUDY AREA

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 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 also manages the Fortymile Wild and Scenic River corridor that was created in 1980. The remainder of Subunit 20E is composed largely of unreserved federal land, Native corporation selections, and state land.

Wolf numbers have fluctuated widely in Subunit 20E over the years 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 residents of the area, wolves were relatively abundant in the late 1940's, even though the Fortymile Caribou Herd (FCH) reportedly had declined to only 10,000 from a high of several hundred thousand in the 1920's (Valkenburg and Davis 1987). Moose were also uncommon by the late 1940's.

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

In the mid-1960's, caribou and moose populations began to decline steadily, continuing into the mid-1970's and 1980's, respectively, 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 crashed (Figs. 1 and 2). When wolf numbers declined the Forty-Mile herd began increasing (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 1980's (Boertje et al. 1987).

A great many incidences of interpack strife and cannibalism were noted and reported by trappers in the area during the early 1970's. This supports the hypothesis that food stress caused the

dramatic wolf population decline. Within only 1 or 2 years (1974-76), the wolf population plummeted to only one-third or less of its pre-1974 level (ADF&G files).

Wolf numbers remained approximately stable until the late winter of 1981-82, when an ADF&G wolf control program was initiated in a 3,000-mi^2 area in southern Subunit 20E. Gasaway et al. (1986) summarized the effects of this program. During the period 1981 to 1982, wolves 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 per wolf had increased 43% by fall of 1982 (Table 1). According to W. Gasaway and R. Boertje (ADF&G files), comparative ovarian activity among female wolves from before and after the control program suggested greater fertility after the ADF&G wolf control effort than before.

Caribou censuses after the wolf reduction indicate that increased growth rate of the FCH rate coincided with the 1981-83 wolf control effort in southern Subunit 20E (Valkenburg and Davis 1987). Although moose numbers in the control area stopped declining after wolf reduction, they increased only about 5% annually during the period 1981-88 (Fig. 1). Wolf numbers in the control area rapidly increased to 90% of the precontrol level by the fall of 1987, despite heavy annual harvests. Across Subunit 20E estimates of wolf numbers were greater in the fall of 1986 than before wolf control, presumably because of the increased available biomass, primarily caribou.

Subunit 20E is becoming an increasingly popular moose and caribou hunting area once again, despite the shortage of moose. Local subsistence hunters have traditionally hunted in this area. In addition, statewide loss of hunting opportunity as a result of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) has raised the profile of Subunit 20E for nonlocal hunters as well. Despite increasing interest in Subunit 20E, low ungulate densities and a combination of grizzly bear and wolf predation necessitate conservative ungulate hunting regulations that severely restrict human-use opportunities, contributing to allocation controversies between local and nonlocal hunters.

Furthermore, depleted big game populations in Subunit 20E are a source of aggravation for the 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 OBJECTIVES

To monitor wolf numbers, population characteristics, and harvests.

To temporarily reduce wolf numbers to less than 100 by 1993 amd thereby increase the growth rates of both caribou and moose populations by lowering wolf:ungulate ratios.

METHODS

Estimating Wolf Population Size

Extensive aerial 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. 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.

Estimates of population size for the preceding fall were back-calculated by correcting the late-winter estimate upward on the basis 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 have been captured by aerial darting, trapping, or live-snaring and fitted with radio collars. Radio-collared wolves were located during other activities throughout the year. Observations allowed more accurate determinations of seasonal pack size, territory and location, and pup survival. Only 2 packs still had collared wolves during this reporting period.

Harvest Monitoring:

All wolves taken in Alaska must be sealed by a Department representative or appointed fur sealer. 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

Thirty-two hours were spent surveying wolves in Subunit 20E during late winter 1988-89 (i.e., 20 hours by the Department and 12 hours by the Yukon Department of Renewable Resources). The resultant spring 1989 population estimate is 156 wolves, a 6%

increase from the spring 1988 estimate of 147; however, the fall 1988 estimate of 173 wolves represents a decline of 20% from the fall 1987 estimate of 217 wolves (Table 2). This is attributed to an extremely low wolf harvest during the winter of 1988-89 that allowed a greater overwinter survival rate than those in previous years.

The wolf population in this area increased during the period 1983 to 1986 (i.e., after state wolf control ended). I believe the population has been either stable or decreasing slowly since 1986 or 1987 (Table 2). Reported harvests have been low in relation to fall population estimates, so changes in wolf abundance, if any, are due primarily to prey abundance and vulnerability. Recent but modest increases in moose numbers in southern Subunit 20E have resulted in a greater proportion of the moose population being middle aged and therefore relatively invulnerable to wolf predation during normal winters.

The future trend of the wolf population in Subunit 20E and the ultimate population level to be sustained is linked to the performance of the Subunit 20E moose and caribou populations. Short-term measured control of wolf numbers would assure continued growth and greater ultimate numbers of prey populations and hence eventual restoration of a moderate density wolf population. Conversely, resumed growth of the present wolf population would be expected to result in the premature stabilization of moose, caribou, and wolf populations at relatively low densities. Therefore, the future welfare of wolves in Subunit 20E is largely dependent upon the future management of this multiple predator/multiple-prey system to affect significant increases in prey biomass.

Distribution:

Wolves occur throughout all of Subunit 20E (Fig. 3). Pack sizes indicated in Figure 3 are not necessarily from comparable times of the year, and the seemingly vacant areas have been caused by insufficient monitoring of pack movements.

Mortality

Season and Bag Limit:

Hunting. The open season in Subunit 20E is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Subunit 20E is from 1 October to 30 April; there is no bag limit.

No person may harvest a wolf in Unit 12 or Subunit 20E during March, April, and October with a steel trap or snare smaller than 3x.

Human-induced Mortality:

The 1988-89 wolf harvest in Subunit 20E was the lowest recorded in recent years. Only 9 wolves (2 males, 7 females) were sealed during this reporting period, representing a 78% reduction in harvest from the 40 wolves taken in 1987-88 (Table 3). In addition, 3 wolves were illegally taken from the Gold Creek Pack by aerial shooting, for a total of 12 wolves killed during the reporting period. The legal harvest was approximately 5% of the estimated fall 1988 population of 173 wolves, while total human-caused mortality (n = 12) was about 7%.

Harvest Chronology:

Hunters took only 1 wolf (11%) in September, while trappers took 2 wolves each (22%) in December and January, three (33%) in February, and one (11%) in March. No wolves were taken by snaring in October and April. By comparison, 8 wolves were taken during the 1987-88 season in March and seven in April by land-and-shoot trappers.

Transport Methods:

Trappers using snow machines took 6 wolves during the 1988-89 season, while 1 wolf each were taken by people using an airplane, a dog sled, and a 3- or 4-wheeler for access. During the 1987-88 season, 43% of the harvest was taken by people using aircraft for access. Aircraft are needed to access most wolf packs in Subunit 20E because of the relative inaccessibility of most of the area to people using ground transportation.

Habitat

Assessment:

Nearly all of Subunit 20E constitutes wolf habitat, which is determined by the distribution and abundance of ungulate prey rather than by vegetative characteristics. The better wolf habitat occurs where there is a greater ungulate prey base year round; in Subunit 20E, this in the northern and northwestern portion of the unit. Even though moose densities are believed to be slightly greater in southern Subunit 20E, the FCH provides most of the available 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 undoubtedly lowered the carrying capacities for prey species such as moose and beavers. Food is currently not a limiting factor for any ungulate prey

species; however, predation by wolves and grizzly bears is a limiting factor.

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 evenly distributed. In turn, moose tend to be evenly distributed throughout these burned areas. In unburned areas, seasonal moose foods tend to be concentrated linearly in riparian and subalpine zones, leading to concentrations of moose. The underlying assumption is that predators can be more efficient when prey are concentrated.

Enhancement:

Subunit 20E is included in the "Alaska Interagency Fire Management Plan: Fortymile Area", and at least 60% of the area is classified in limited suppression status. This should assure a near-natural wildfire regime in those, that, in turn, should increase habitat diversity and benefit wolf prey species and predators, providing the present predation limiting factor can be addressed.

Game Board Actions and Emergency Orders

The Board of Game's prohibition against taking wolves by landing and shooting became effective during this reporting period. As predicted, the wolf harvest declined to a truly insignificant level. For the 5 years prior to this prohibition, land-and-shoot taking averaged 28% of the total harvest.

CONCLUSIONS AND RECOMMENDATIONS

Wolves occur at low densities but are well distributed throughout Subunit 20E. This low-density wolf population has been limited primarily by a low-density prey base of moose and caribou. Conversely, the growth rates of this low-density prey base are being limited by wolf and grizzly bear predation. Associated populations of avian and mammalian scavengers are also believed to be limited by low ungulate biomass and low numbers of wolves, which make food available to scavengers. Consequently, most large mammalian species in Subunit 20E exist at levels far below the potential carrying capacity. Associated beneficial human use opportunities for many species are being limited by the scarcity of moose and caribou in Subunit 20E.

Since 1948 the only periods during which moose and caribou have flourished followed either natural (1974-76) or human-caused (1948-59, 1981-83) reductions in wolf numbers. Then, as prey numbers increased following wolf population reductions, so did wolf numbers. Increased human-use opportunities occurred

following wolf population reductions, and the wolf population also benefited.

Harvests of wolves by the public in Subunit 20E have been low, in relation to the wolf population levels and, with only a few highly localized exceptions, have not affected the wolf population trend. At present rates of population growth, the Subunit 20E moose population is likely to attain the stated population objective within the specified time frame. If the wolf population increases significantly in response to initial increases in prey populations, recently observed prey population growth rates may well slow or stop altogether. In this case, caribou, moose, and wolf populations could reach equilibrium at levels far below stated population objectives. If this situation occurs and population objectives are not achieved, strategic human-use goals cannot be met.

I recommend that all species of large mammalian prey and predators be managed in a coordinated and comprehensive manner to attain stated population management objectives in Subunit 20E. Subunit 20E currently supports about 22,000 caribou, 2,400-3,000 moose, 400 grizzly bears, and 173 wolves which, in turn, provide annual harvests of 350, 50, 20, and 26, respectively, in this 11,000-mi^2 area. There is no biological reason why this area, with effective management, could not support at least 50,000 caribou, 8,000-10,000 moose, 400-450 grizzlies, and 300 wolves as well as associated increases in human-use opportunities.

To effect management to realize these increases, I recommend the following actions: (1) maintain conservative harvests of moose and caribou; (2) maintain liberal grizzly bear hunting regulations; (3) restore maximum opportunities for the public to take wolves by reinstating land-and-shoot taking as a legal method for harvesting wolves; (4) supplement annual harvests of wolves by the public with additional efforts outside the Yukon-Charley Rivers National Preserve to reduce predation and, hence, to increase both moose and caribou population growth rates until population objectives are achieved (this action depends on continued public support for intensive big game management in Subunit 20E); (5) after prey population objectives are achieved, regulate human-caused predator and prey mortality to assure that human-use goals are met in the future; and (6) encourage a near-natural wildfire regime in the area, while discouraging significant incompatible human development of wildlife habitat.

Obviously, the intent of these coordinated actions is to increase standing crops of ungulate prey species in the area to support healthy and productive populations of predators and scavengers as well as to allow increased use of all species by humans in this traditionally important hunting area.

The only population objective to be met since 1983 has been to monitor wolf numbers, population characteristics, and harvests. Continuation of such minimal impact management could result in

nonattainment of stated objectives for all affected species. Future reductions in wolf harvests resulting from the prohibition on land-and-shoot taking of wolves will further aggravate the present management and human-use problems.

Either management of this game-depleted ecosystem should be made more effective, or strategic goals and population management objectives should be restated. If they are to be restated, new goals and objectives should reflect the state's intent to provide only custodial management of Subunit 20E as a low game density area incapable of satisfying even modest demands for diversified human-use opportunities.

The potential benefits from managing this area as recommended would be substantial. Such management has been supported overwhelmingly by local subsistence hunters, affected Fish and game advisory committees, and statewide conservation organizations.

LITERATURE CITED

Boertje, R. D., W. C. Gasaway, D. V. Grangaard, D. G. Kelleyhouse, and R. O. Stephenson. 1987. Factors limiting moose population growth in Subunit 20E. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-5. Juneau. 86pp.

Gasaway, W. C., R. D. Boertje, D. V. Grangaard, D. G. Kelleyhouse, and R. O. Stephenson. 1986. Factors limiting moose population growth in Game Management Unit 20E. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-4 and W-22-5. Juneau. 52pp.

_____, R. O. Stephenson, J. L. Davis, P. E. K. Shepherd, and O. E. Burris. 1983. Interrelationships of wolves, prey, and man in interior Alaska. Wildl. Monogr. 84. 50pp.

Mech, L. D. 1973. Wolf numbers in the Superior National Forest of Minnesota. U.S. Dep. Agric. For. Serv., Res. Pap. NC-97, North Cent. For. Exp. Sta., St. Paul, Minn. 10pp.

Stephenson, R. O. 1978. Characteristics of exploited wolf populations. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-17-3 through W-17-8. Juneau. 21pp.

Valkenburg, P., and J. L. Davis. 1987. Population status of the Fortymile Caribou Herd and identification of limiting factors. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-5 and W-22-6. Juneau. 17pp.

PREPARED BY:

David G. Kelleyhouse
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

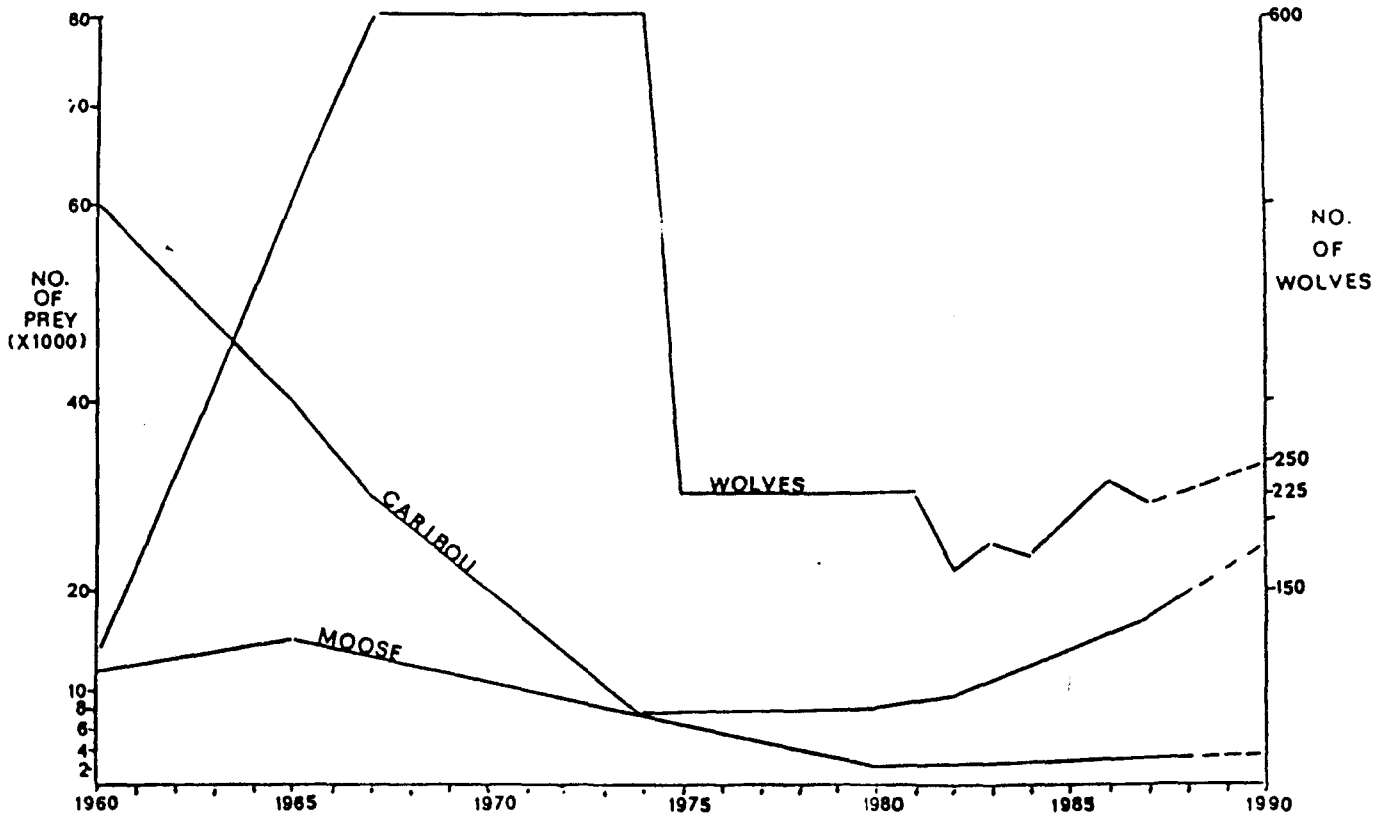


Fig. 1. Estimated and projected numbers of wolves, caribou, and moose in Unit 20E, 1960-90.

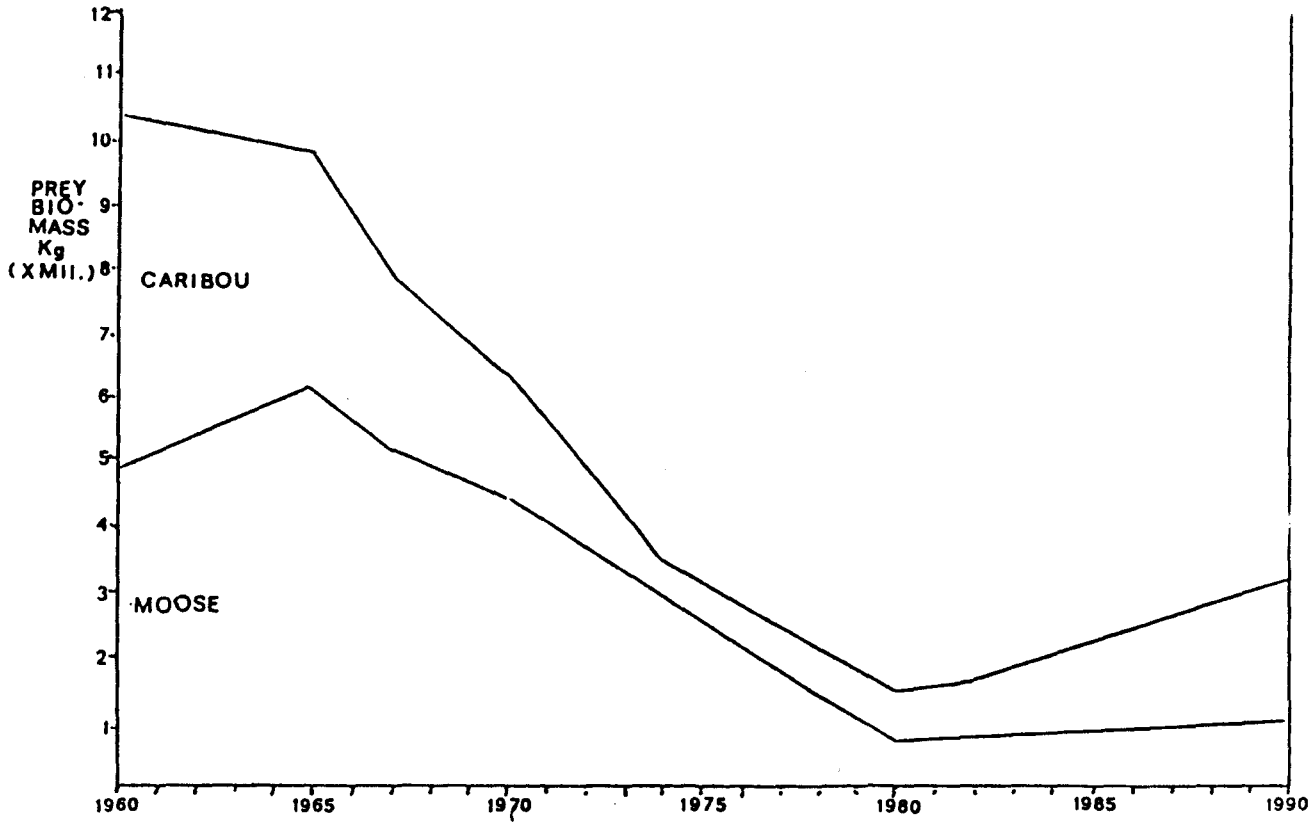


Fig. 2. Estimated and projected biomass of caribou and moose available to wolves in Unit 20E, 1960-90.

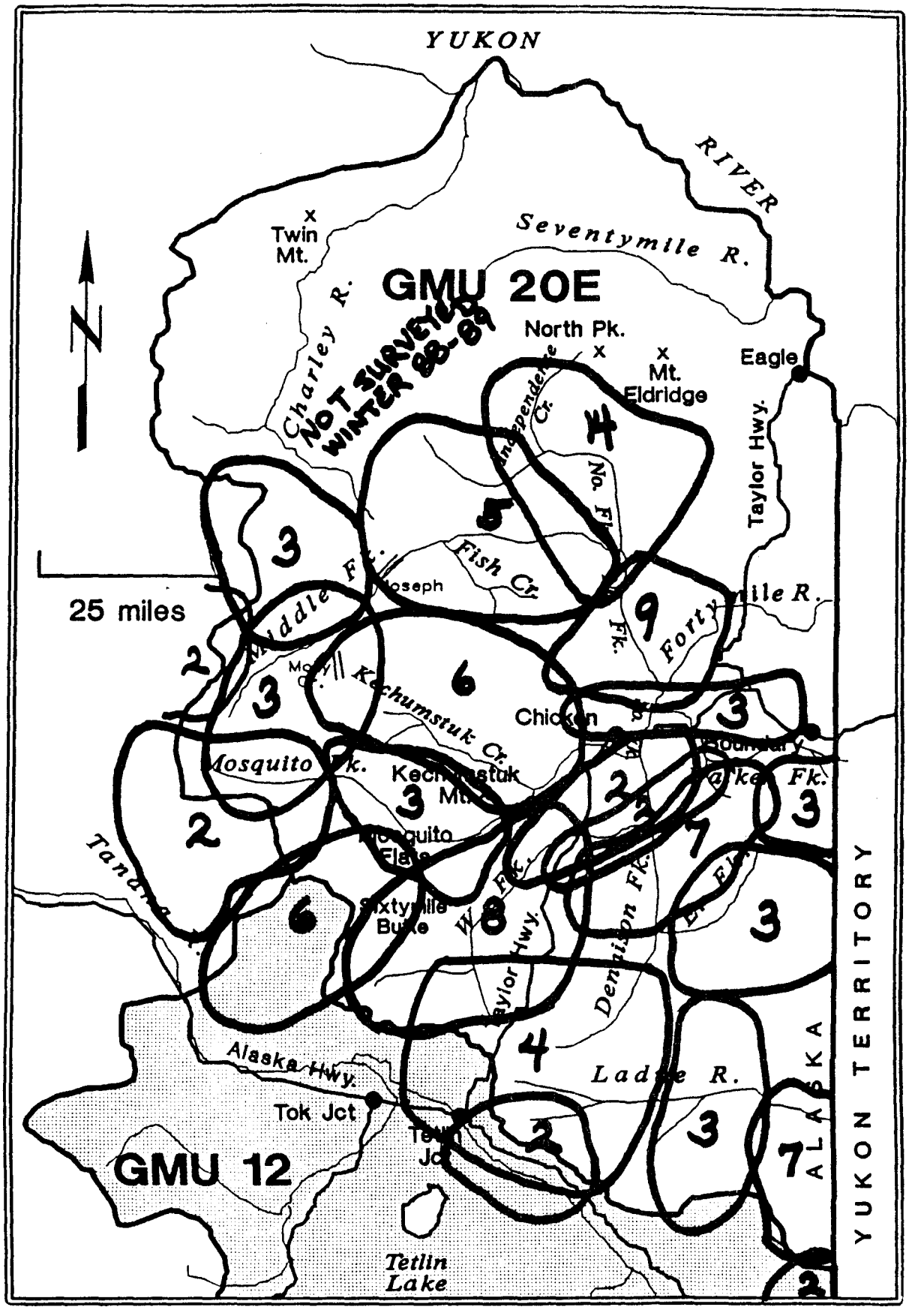


Fig. 3. Approximate wolfpack territories and pack sizes during winter 1988-89, Subunit 20E.

Table 1. Caribou, moose, and wolf population estimates, biomass of prey, and biomass of prey/wolf in Subunit 20E, 1960-88.

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
1870	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	235	2,312,550	9,841
1987	16,800	2,325	217	2,479,725	11,427
1988	20,000	2,400	173	2,801,600	16,194

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

Table 2. Wolf population estimates and reported harvests, Subunit 20E, 1984-89.

Year	No. of wolves		Reported harvest	% of fall population
	Spring	Fall		
1984	155	179	11	6
1985	157	198	16	8
1986[a]	170	215	28[b]	13
1987[a]	164	217	45[b]	21
1988[c]	147	173	9[d]	5
1989	156			
Mean	158	196	22	11

[a] Yukon-Charley Rivers Preserve intensively surveyed.

[b] Includes research take by ADF&G (6 in 1986, 5 in 1987).

[c] Land-and-shoot taking prohibited winter 1988-89.

[d] An additional 3 wolves were taken illegally but not reported.

Table 3. Wolf harvest characteristics, Subunit 20E, 1984-88.

Year	Total taken	Hunting		Trapping[a]		Method of take: Ground shoot		Land & shoot		Trap or snare		Unk	Sex: Male		Female		No. unk
		n	%	n	%	n	%	n	%	n	%	n	n	%	n	%	
1984	11	1	9	10	91	1	9	9	82	1	9	0	5	50	5	50	1
1985	16	2	13	14	87	2	13	4	25	10	63	0	11	69	5	31	0
1986[b]	22	2	9	20	91	2	9	0	0	20	91	0	12	55	10	45	0
1987	40	4	10	36	90	4	10	13	33	23	58	0	14	35	24	65	2
1988[c]	9[d]	1	11	8	89	2	22	--	--	7	78	0	2	22	7	78	0
Mean	21[e]	2	10	18	90	2	10	7	33	12	57	0	10	48	11	52	

[a] Includes take by land-and-shoot through 1987.

[b] Does not include 4 males and 2 females taken by ADF&G for scientific purposes.

[c] Land-and-shoot taking prohibited in 1988.

[d] Three additional wolves were taken illegally from the Gold Creek pack and not reported.

[e] Includes ADF&G take in 1986.

STUDY AREA

GAME MANAGEMENT UNIT: 21B, 21C, and 21D (20,150 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon River drainage above Paimiut to Tozi River, including Koyukuk River to Dulbi Slough

BACKGROUND

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

Harvests have ranged from 45 to 130 wolves per year and average about 52 per year. The local demand for wolf pelt parka ruffs and gifts at funeral potlatches 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 appear scarce.

MANAGEMENT OBJECTIVES

To maintain at least 50 moose per wolf until the moose population objective of 4,000 to 4,500 is attained in Subunit 21B.

To maintain a stable fall wolf density of approximately 1 wolf/50 mi^2 and sustain an 11-32% annual harvest rate from the wolf population in Subunits 21B, 21C, and 21D after the moose population objective has been attained.

METHODS

Wolf pack numbers and distribution were determined by aerial surveys during the winter in cooperation with U.S. Fish and Wildlife Service (USFWS) and U.S. Bureau of Land Management (USBLM) and by interviews with wolf trappers and light aircraft

pilots. Harvests were monitored during the hide-sealing process. Wolf meat was also collected for radiocesium (Cesium 137) analysis.

RESULTS AND DISCUSSION

Population Status and Trend

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

The minimum estimated Subunit 21B population is 80-95 wolves in 13-16 packs, and the trend is toward increasing numbers. The Subunit 21C population is 34-40 wolves in 4-6 packs and the trend is stable. The Subunit 21D population is 175-190 wolves in 25-30 packs and the trend is stable. The estimates are derived by plotting known pack locations. These packs occupy 40% of Subunit 21B, 50% of Subunit 21C, and 50% of Subunit 21D; within the remaining area wolf numbers are unknown, thus the total unit population is undoubtedly higher.

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 21 is from 10 August to 30 April; the bag limit is 10 wolves.

Trapping. The open season in Unit 21 is from 1 November through 31 March; there is no bag limit.

Human-induced mortality:

Hunters and trappers reported harvesting 11 wolves during the period; of these 5 were males and 6 were females. Four, 4, and 3 wolves were harvested in Subunit 21B, 21C, and 21D, respectively. The actual number harvested was probably higher, because village residents seal only those wolf pelts that are sent to a commercial tannery or sold to a fur buyer.

Game Board Actions and Emergency Orders

The provision in the 1987-88 trapping regulations that permitted the taking of wolves on the same day that the trapper was airborne was transferred to the hunting regulations for the 1988-89 regulatory year. This means that those persons who wish to take wolves with a firearm by the land-and-shoot method must now have a hunting license, instead of a trapping license, and conform to the requirements stipulated in the hunting regulations. At the same time, the Board of Game reduced the

hunting bag limit to 10 wolves per regulatory year, regardless of the method of take and stipulated that the land-and-shoot method was not to be used after 31 March. The latter provision simply retained the season ending date that had been previously in effect for land-and-shoot wolf trapping prior to these changes. Thus, the net effect on persons wishing to take wolves by the land-and-shoot method was to limit them to 10 wolves each per regulatory year.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate in Unit 21 will increase because increasing populations of prey species and as more information is known about pack distribution. Presently only 50% of the area has been surveyed for wolf distribution. 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 radiotelemetry studies to enable us to more accurately determine wolf population sizes. Within the Nowitna National Wildlife Refuge I recommend a detailed study be initiated as a follow-up to the present moose calf mortality project to help improve wolf population estimates and knowledge of predation rates.

PREPARED BY:

Timothy O. Osborne
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

STUDY AREA

GAME MANAGEMENT UNIT: 22 (23,000 mi^2)

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

BACKGROUND

Information provided by long-term local residents indicate that wolf numbers have been low or nonexistent for at least 50 years throughout Unit 22. Packs of wolves are known to inhabit portions of Subunits 22A and 22B, and limited data indicate their numbers are low but increasing, especially during the winter months when the Western Arctic Caribou Herd is seasonally present. Reindeer herders, especially those residing in Subunits 22A and 22B, continue to regard wolves as nuisances, because they prey on reindeer, particularly during the winter months.

POPULATION OBJECTIVES

To protect, maintain, rehabilitate, enhance, and develop the wolf resource and its habitat.

To provide for the optimum sustained use, both consumptive and nonconsumptive, of the wolf resource consistent with the social, cultural, aesthetic, environmental, and economic needs of the public.

To maintain and/or increase viable wolf populations consistent with environmental conditions, legal mandates, and public desires.

To minimize adverse interactions of wolves with the public.

METHODS

Surveys or censuses to gather population data on wolves were not conducted in Unit 22. Limited information on wolf distribution, densities, harvest, and human use were obtained from incidental observations reported by the staff, responses to the annual Trapper Questionnaire, observations provided by reindeer herders and other local residents, and sealing certificate data.

RESULTS AND DISCUSSION

Population Status and Trend

Although wolf numbers are low in Unit 22, their numbers appear to be increasing in portions of Subunits 22A and 22B in response to increased numbers of reindeer, moose, and caribou in the area. Because censuses or surveys have never been conducted in Unit 22, the actual size of the wolf population is unknown. Estimates provided by staff in the past indicated the population may range in size from 50 to 150 animals.

Mortality

Hunting Season and Bag Limit:

Hunting. The open season in Unit 22 is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Unit 22 is from 1 November to 15 April; there is no bag limit.

Human-induced Mortality:

Sealing-certificate data indicate that 14 wolves (6 males, 7 females, 1 unknown) were taken during the 1988-89 season (Table 1). Illegal and unreported harvests of wolves remain a problem in Unit 22. Many harvested wolves are not sealed, because they are used in the local domestic manufacture of parka ruffs and other garments. The magnitude and accuracy of this unreported harvest is unknown. I estimate the overall Unit 22 harvest of wolves during the reporting period to be at least 30.

Hunter Residency and Success. Sealing certificate data indicate that the 1988-89 harvest of 14 wolves was taken by 5 hunters and/or trappers from Subunits 22A and 22B. Four residents of 2 villages located in Subunit 22A accounted for 57% of the reported harvest; 1 resident of Subunit 22B accounted for the remaining 43%.

Responses from the trapper questionnaire and sealing-certificate data indicate that very few Unit 22 residents trap wolves, rather they shoot them on an opportunistic basis. Sealing-certificate data indicate that 13 of the 14 wolves harvested this year were taken by ground shooting. The remaining wolf was taken in a trap (Table 2).

Harvest Chronology. The 1988-89 reported wolf harvest occurred during a 4-month period (Table 1), and the greatest number of wolves (6) were taken during April.

Transport Methods. Snowmachines continued to be the only method of travel used by hunter and/or trappers of wolves.

CONCLUSIONS AND RECOMMENDATIONS

Several specific goals need to be addressed in the future, if we are to effectively manage wolves on the Seward Peninsula. A long-term management plan is needed. It is currently unclear whether we are managing for high or low wolf numbers in Unit 22. The annual Trapper Questionnaire indicated that compliance with our sealing requirements remains poor throughout the unit. Some village residents only seal those pelts that are to be commercially tanned or sold to fur buyers. Improving the accuracy of our harvest data may be accomplished by a more active information and education program and enforcement of our sealing regulations. Quantitative information on wolf populations in Unit 22 is lacking. I recommend the implementation of research studies to improve our understanding of wolf population dynamics and the impacts of wolf predation on local ungulate populations in Unit 22.

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

PREPARED BY:

Robert R. Nelson
Wildlife Biologist III

SUBMITTED BY:

Steven Machida
Survey Inventory Coordinator

Table 1. Sex structure and chronology of the wolf harvest in Unit 22, 1971-89.

Year	Sex				Harvest chronology							
	M	F	U	Total	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk
1971-72	9	2	0	11	0	8	1	0	1	1	0	0
1972-73	3	2	0	5	0	2	0	0	0	3	0	0
1973-74	4	2	1	7	1	0	0	1	2	2	1	0
1974-75	12	8	1	21	0	0	1	11	7	2	0	0
1975-76	1	1	0	2	0	0	0	0	1	1	0	0
1976-77	7	3	0	10	0	0	0	0	0	4	6	0
1977-78	1	1	1	3	0	0	0	2	0	1	0	0
1978-79	4	1	0	5	0	0	1	0	1	3	0	0
1979-80	2	2	0	4	0	0	1	0	0	2	0	1
1980-81	2	3	2	7	0	0	0	0	0	6	0	1
1981-82	1	1	2	4	0	0	2	2	0	0	0	0
1982-83	3	2	0	5	0	2	0	1	1	1	0	0
1983-84	3	2	0	5	1	0	0	4	0	0	0	0
1984-85	5	6	1	12	0	2	0	1	1	2	0	6
1985-86	0	1	2	3	0	0	2	0	0	1	0	0
1986-87	4	2	2	8	0	0	6	0	0	2	0	0
1987-88	6	6	10	22	0	3	8	3	5	3	0	0
1988-89	6	7	1	14	0	0	1	3	4	6	0	0

Table 2. Location and method of take for the Unit 22 wolf harvest, 1971-89.

Year	Subunit						Total	Method of take[a]				
	A	B	C	D	E	Unk[b]		1	2	3	4	5
1971-72	0	0	0	0	0	11	11	3	0	0	8	0
1972-73	0	0	0	0	0	5	5	3	2	0	0	0
1973-74	0	0	0	0	0	7	7	7	0	0	0	0
1974-75	0	0	0	0	0	21	21	16	0	0	0	5
1975-76	0	0	0	0	0	2	2	2	0	0	0	0
1976-77	0	0	0	0	0	10	10	10	0	0	0	0
1977-78	0	0	0	0	0	3	3	2	1	0	0	0
1978-79	2	1	1	1	0	0	5	4	0	0	1	0
1979-80	0	0	0	0	0	4	4	4	0	0	0	0
1980-81	2	5	0	0	0	0	7	7	0	0	0	0
1981-82	2	2	0	0	0	0	4	3	0	0	1	0
1982-83	0	5	0	0	0	0	5	4	1	0	0	0
1983-84	0	4	0	1	0	0	5	1	4	0	0	0
1984-85	4	8	0	0	0	0	12	7	0	5	0	0
1985-86	0	3	0	0	0	0	3	3	0	0	0	0
1986-87	5	3	0	0	0	0	8	7	0	1	0	0
1987-88	18	4	0	0	0	0	22	10	12	0	0	0
1988-89	8	6	0	0	0	0	14	13	1	0	0	0

[a] 1 = Ground shot
2 = Trapped
3 = Snared
4 = Shot from aircraft
5 = Unknown

[b] Unit 22 was divided into subunits beginning in the 1978-79 recording period.

STUDY AREA

GAME MANAGEMENT UNIT: 23 (43,000 mi^2)

GEOGRAPHIC DESCRIPTION: Kotzebue Sound and western Brooks Range

BACKGROUND

Wolves are indigenous to northwest Alaska and have long been sought by hunters and trappers in this area for their pelts. Inupiats in this region have traditionally used wolf pelts for the manufacture of fur garments. Currently, the high monetary value and aesthetic appeal of wolf pelts have maintained a steady harvest demand for wolves in Unit 23.

Prior to 1987 information concerning wolf populations were limited to infrequent track surveys and opportunistic observations of wolves, wolf tracks, and possible kills during aerial surveys conducted for other species. In March 1983 the Department attempted to determine the distribution and movements of wolves on winter range of the Western Arctic Caribou Herd (WAH). Unfortunately, poor tracking conditions and low wolf numbers thwarted this attempt (James 1984). In 1987 the Department initiated a cooperative research study with the National Park Service (NPS) and the U. S. Fish & Wildlife Service (USFWS) in Unit 23. The objectives of this investigation are to (1) determine the number of wolves occurring within the range of the WAH; (2) determine the spatial relationships among wolf packs on caribou winter range; (3) develop and test precise and effective census methods for wolves on caribou winter range; and (4) estimate the impacts of wolf predation on the WAH (Ballard 1989).

POPULATION OBJECTIVES

To maintain a healthy, viable population of wolves.

METHODS

Data on wolf distribution, movements, productivity, mortality, predation rates, and abundance are being collected in the cooperative research study using conventional and satellite radiotelemetry techniques. Forty-nine wolves from 13 packs were radio-collared in Unit 23 between April 1988 and April 1989. Seven of the collared wolves were fitted with a satellite transmitter, and the remainder were instrumented with conventional transmitters. Feeding habits of wolves are being determined from direct observations during relocation flights and from scats collected at den sites. Measurements of each den have been recorded for site descriptions. Detailed documentation of the cooperative research study was provided by Ballard et al.

(1989). Harvest information was determined from wolf sealing certificates.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size:

Results of the research study and reports from residents of Unit 23 indicated that wolves were abundant during the 1988-89 season and the population appeared to be increasing. Ballard et al. (1989) estimated the density within their study area was 2.7-6.3 wolves/1,000 km^2. Extrapolating this density to the entire unit, they estimated the population at 322, 750, and 429 wolves in the spring of 1987, fall of 1988, and spring of 1989, respectively. Because these estimates assumed a uniform wolf density throughout Unit 23, they only approximated the actual population size. Nevertheless, they are the first quantitative estimates of wolf abundance in Unit 23, representing a significant step toward reaching wolf management objectives in northwest Alaska.

Population Composition:

Male wolves have composed > 50% of the reported harvest (excluding wolves of unspecified sex) every year since 1979, constituting 63% of the total harvest (Table 1). In 1988-89, 42 (54%) of 78 known-sex wolves reported harvested were males. Capture data from the research study showed the sex ratio for pups was skewed toward females and no evident difference for adults (Ballard et al. 1989), suggesting that male wolves are more susceptible to harvesting than females, possibly because they travel more. Movement data from wolves equipped with satellite transmitters should better enable us to evaluate this explanation. Alternatively, the skew toward males in the harvest may reflect selectivity by hunters. Since harvest data have been first collected, most of the wolves reported from Unit 23 have been shot. During the reporting period, 90% of the total harvest was shot, rather than trapped; therefore, hunter selectivity could certainly explain the preponderance of males in the harvest.

Distribution and Movements:

Mean pack size determined from sealing certificates was 4 wolves (SD = 3, $\underline{n}$ = 33, range = 1-12, median = 3). Ballard et al. (1989) reported that territory sizes ranged from 950 to 2,358 km^2 for the 4 packs having sufficient number of relocations to determine territory size. During the first year of the research study, all packs containing radio-collared wolves were nonmigratory. In 1988-89, at least 2 of 6 packs with radio-collared members moved 170-230 km south of their previously determined pack areas, presumably in search of caribou. This

supports reports from area residents that at least some wolves in Unit 23 are migratory. Although wolves and wolf tracks were opportunistically observed by Department personnel throughout Unit 23 during 1988-89, it is not known whether wolf densities were uniform throughout the Unit.

Mortality

Seasons and Bag Limits:

Hunting. The open season in Unit 23 is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Unit 23 is from 1 November to 15 April; there is no bag limit.

Human-induced Mortality:

Eighty-three wolves were sealed by hunters and trappers in Unit 23 during the 1988-89 season (Table 1). Conversation with knowledgeable area residents indicated that 10 additional wolves (sex not specified) were taken during the 1988-89 season but not sealed. The total harvest for Unit 23 was therefore at least 93 wolves in 1988-89. Because noncompliance with sealing requirements is common in northwest Alaska and only 2 villages reported unsealed wolves, the total harvest is a minimum estimate. The 1988-89 harvest is somewhat lower than the reported harvest for 1987-88, but it is still the second-highest one reported since 1977-78 (Table 1). As in 1987-88, the high harvest reported in 1988-89 probably reflects an abundance of wolves in Unit 23, but it may also indicate that compliance with sealing requirements has improved from those of previous years.

As of 30 June 1989, all but one of the 49 wolves radio-collared in Unit 23 were accounted for. Sixteen of the collared wolves (33%) were killed by humans. Thirteen were shot by snowmachine hunters, two were shot by hunters using aircraft, and one was destroyed by Department staff (Ballard et al. 1989).

Methods of Transport and Take. Of the 93 wolves taken by hunters and trappers in Unit 23 during 1988-89, 11 (12%) were taken with aircraft, 80 (86%) were taken by snowmachine hunters, one (1%) by dog team or foot, and one (1%) by unknown means (Table 2). Eighty-four of the 93 wolves (90%) were shot, and nine (10%) were trapped.

Harvest Chronology. As reported in 1987-88, most wolves taken in 1988-89 were harvested between January and April, and the highest monthly harvest occurred during March (Table 2). Because most wolves taken in the unit during 1988-89 were shot by snowmachine hunters, chronological differences by various methods and means of harvest are not apparent.

Hunter Residency. Residents of Unit 23 took 82 (88%) of the known harvest of 93 wolves. Alaska residents living outside of the unit took 7 wolves (8%), and nonresidents took two (2%). Two wolves (2%) were harvested by hunters of unknown residency.

Game Board Actions and Emergency Orders

No changes in season or bag limit were made by the Board of Game during 1988-89; however, in November 1988 the NPS imposed a 1-year ban on aerial hunting of wolves (i.e., "land-and-shoot" method) in all national preserves in Alaska, including the Noatak and Bering Land Bridge National Preserves in Unit 23. This undoubtedly contributed to the lower proportion of wolves harvested by aircraft hunters during 1988-89, compared with 1987-88, and it may have altered the distribution of the harvest as well. The NPS has since collected public testimony on whether to make the ban permanent. If no decision is made by November 1989, the temporary ban on aerial wolf hunting will expire and "land-and-shoot" wolf hunting will again be legal on national preserves. However, in November 1989, the Alaska Board of Game will consider a proposal submitted by the Park Service to permanently ban the use of aircraft for taking wolves on preserve lands.

CONCLUSIONS AND RECOMMENDATIONS

Although quantitative estimates of wolf population size presented by Ballard et al. (1989) are only rough approximations of actual ones, they represent the first objective estimates of wolf abundance in northwest Alaska. These rough estimates represent the first step in achieving the principal recommendation stated repeatedly in wolf progress reports for at least the last 5 years (James 1984); that is, to achieve a quantitative index of wolf abundance for making management decisions. Data should be gathered to evaluate the assumption that wolf densities are uniform throughout the unit and, if necessary, the population estimates should be modified accordingly.

Ballard et al. (1989) indicated that during 1989-90, one objective of the wolf research study will be to begin testing potential wolf survey techniques to evaluate their feasibility for management purposes (i.e., survey techniques that do not need costly telemetry support). To attain maximum value from the research project for achieving management goals, this objective of the study should be given the highest priority during the coming year. A reasonably precise, accurate, and statistically repeatable technique for estimating wolf abundance is especially needed in Unit 23, given the poor compliance with sealing requirements that characterizes the unit. Quantitative estimates of wolf numbers are needed, not only for managing wolves but also for understanding fluctuations in the abundance of prey species such as moose, caribou, muskox, and sheep.

As part of an organized review of game regulations applicable to Unit 23, Department personnel visited all villages within the unit last winter and spring. During some of these visits, staff explained the need for harvest data, particularly in furbearer management. Many village residents willingly shared their knowledge of wolf abundance and distribution and appeared grateful for information on survey techniques and the opportunity to voice their opinions concerning management of local wildlife populations. Such efforts benefit both managers and the public and should be continued, even when projects such as the regulatory review are not in progress.

The NPS is a significant land manager in Unit 23. Implementation of a permanent ban on aerial hunting of wolves in national preserves would undermine the ability of the Department to manage wildlife on all lands in Alaska. The effects of such actions are not limited to preserve lands or just to wolf populations. A ban on aerial wolf hunting in preserve lands could displace aircraft hunters to surrounding areas and result in localized overharvesting of wolves. If wolf numbers increase in the Noatak National Preserve as a result of the ban, sheep and moose populations in the preserve will experience higher predation. This comes at a time when hunting pressure from recreational hunters on moose populations in the upper Noatak River drainage is rapidly increasing. In short, implementation of such regulations that affect harvests narrows the Department's options for managing wildlife populations on preserve lands. The Department should work cooperatively with NPS staff to ensure that our ability to manage wildlife is not compromised.

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

LITERATURE CITED

Ballard, W.B., L.A. Ayres, S.G. Fancy, D.N. Larsen, D.J. Reed, K.E. Roney, and M.A. Spindler. 1989. Demography and movements of wolves in relation to the Western Arctic Caribou Herd of northwest Alaska. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Research Prog. Rep. Juneau, AK. (In Prep.)

James, D.D. 1984. Home range dynamics of wolf packs on winter range of the Western Arctic Caribou Herd. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-22. Job 14.12R Juneau, AK. 5pp.

PREPARED BY:

Jim Dau
Wildlife Biologist II

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Reported wolf harvest summarized from sealing certificates for Unit 23, 1977-1989.

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]

[a] At least 10 additional wolves were taken but not sealed during 1988-89.

Table 2. Chronology of wolf harvest in Unit 23 during 1988-89 in relation to method of transport.

Month	Aircraft	Snowmachine	Other[a]	Month
September	2	0	0	2
October	0	0	0	0
November	0	1	0	1
December	0	18	0	18
January	0	13	0	13
February	0	11	1	12
March	7	22	0	29
April	2	5	1	8
Unknown	0	10	0	10
Total	11	80	2	93[b]

[a] Includes dog team and unknown means.
[b] Includes 10 wolves taken in Unit 23 but not sealed.

STUDY AREA

GAME MANAGEMENT UNIT: 24 (24,150 mi^2)

GEOGRAPHICAL DESCRIPTION: Koyukuk River drainage above Dulbi River

BACKGROUND

Wolves occur throughout Unit 24. Wolf abundance in Unit 24 has fluctuated over time in response to the availability of prey and, in more recent times, the controlling activities of humans. Wolf numbers were low in the Brooks Range during the late 1800's because of the paucity of moose, caribou, and Dall sheep, the primary big game prey species available to wolves (Campbell 1974). Prey populations increased during the early 1900's, leading to concurrent increases in wolf numbers. Currently, wolves are more numerous than in the 1970's, but they are not as abundant as during the 1940-50's (R. Stephenson, pers. commun.).

There were probably fewer wolves in the southern portion of the unit prior to the 1940's than exist now, because a stable prey base was nonexistent. At the time, moose populations were still expanding into this area and the availability of caribou varied widely year-to-year. Federal wolf control efforts greatly reduced the limiting effect of wolf predation on local moose populations, resulting in a rapid increase in moose numbers. When wolf control ceased, this newfound abundance of moose 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 and average about 52 wolves annually.

MANAGEMENT OBJECTIVES

To maintain a stable fall wolf density of approximately 1 wolf/50 mi^2 with the intent to sustain an annual harvest of 30 wolves in the southern part of Unit 24, south of Hughes (6,150 mi^2).

To reduce wolf density to 1 wolf/100 mi^2 to achieve a moose:wolf ratio of 50:1 in the central part of the unit; i.e., Hughes to Bettles.

TO maintain a stable fall wolf density of approximately 1 wolf/50 mi^2 and sustain an annual harvest of 30 wolves, while providing for nonconsumptive uses within GAAR; i.e., in the northern part of Unit 24 north of Bettles.

METHODS

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

RESULTS AND DISCUSSION

Population Status and Trend

Wolves are found throughout the unit in all habitat types and in close approximation to human settlements. The numbers of wolves within the unit vary depending on the availability of prey. 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 movements of caribou.

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

Aerial surveys and radio locations conducted between April and December 1987 in GAAR provided information about home ranges and approximate territory sizes for 17 packs. During the spring of 1987, 97 other wolves were seen with the collared wolves. During early winter 1987, 122 other wolves were seen with the marked wolves (Adams and Stephenson 1988). A minimum density of 1 wolf/55 mi^2 is estimated within GAAR (R. Stephenson, pers. commun.). Based on observations of radio-marked packs in GAAR, there were approximately 41% pups in the winter population (Adams and Stephenson 1988).

Two wolves collared within GAAR dispersed after May 1987 and were subsequently relocated in October 1987, 310 miles east in the Old Crow Flats of the Yukon Territories, Canada (Adams and Stephenson 1988). Both wolves came from different packs and were found in separate areas, so their movements may have been independent.

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

Mortality

Seasons and Bag Limits:

Hunting. The open season in Unit 24 is from 10 August to 30 April; the bag limit is 10 wolves.

Trapping. The open season in Unit 24 is from 1 November to 31 March; the is no bag limit.

Human-induced Mortality:

Hunters and trappers reported harvesting 76 wolves during the period; 38 males, 32 females, and 6 unknowns. By region, the harvest was 19 in the south, 45 central, and 12 north. Generally, village residents seal only those wolf pelts that are sent to commercial tanneries or are sold to a fur buyer; thus the total harvest may be higher.

Game Board Actions and Emergency Orders

The provision in the 1987-88 trapping regulations that permitted the taking of wolves on the same day that the trapper was airborne was transferred to the hunting regulations for the 1988 regulatory year. This means that those persons who wish to take wolves with a firearm by the land-and-shoot method must now have a hunting license, instead of a trapping license, and conform to the requirements stipulated in the hunting regulations. At the same time, the Board of Game reduced the hunting bag limit for wolves in Unit 24 to 10 wolves per regulatory year, regardless of the method of take, and stipulated that the land-and-shoot method was not to be used after 31 March. The latter provision simply retained the season-ending date that had been previously in effect for land-and-shoot wolf trapping prior to these changes. Thus the net effect on persons wishing to take wolves by the land-and-shoot method was to limit them to 10 wolves each per regulatory year.

CONCLUSIONS AND RECOMMENDATIONS

The current wolf population estimate for Unit 24 is much higher than previous estimates, the wolf populations have increased, and the cooperative USNPS and USFWS studies have enabled us to more accurately determine wolf population sizes through radiotelemetry of packs. Present population levels are stable or increasing.

I recommend that seasons and bag limits remain as liberal as possible to encourage a larger wolf harvest from the central portion of the unit. I also recommend that packs occupying the Kanuti area be radio-collared and monitored to help improve population estimates and provide information on predation rates.

LITERATURE CITED

Adams, L. G., and R. O. Stephenson. 1988. Population ecology of wolves in Gates of the Arctic National Park and Preserve, Alaska-1987 Progress Report. Natural Resources Progress Report AR-88/07, Natl. Park Serv., Anchorage. 53pp.

Campbell, J. M. 1974. Effects of late prehistoric and early historic Eskimo hunting of Dall Sheep in North Alaska: examples of aboriginal overkill. Pages 108-126 in Proc. North. Wild Sheep Council. Montana Dep. of Fish and Game, Missoula.

PREPARED BY:

Timothy O. Osborne
Wildlife Biologist III

SUBMITTED BY:

Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

STUDY AREA

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 study area. They are well adapted to living in the taiga forests of the Interior, the rugged mountains of the Brooks Range, and the tundra of the Arctic Slope. Despite the availability of caribou, moose, Dall sheep, and other prey, wolves are relatively scarce in this area.

Little is known about wolf populations or of their influence on ungulate populations in northeastern Alaska, although U.S. Fish and Wildlife Service (USFWS) biologists studied the movements and denning of 11 packs in the northern Arctic National Wildlife Refuge (ANWR) during 1984 and 1985 (Garner and Reynolds 1986). Subsequent occasional aerial surveys of packs 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 OBJECTIVES

To estimate the population size, trend, and distribution of wolves by 1991.

To establish accurate harvest estimates by 1990 in Unit 25 and Subunit 26C.

METHODS

Population data were extrapolated from survey estimates made in 1984 and 1985 and from incidental observations. Sealing certificates provided most of the data on population status and harvest.

RESULTS AND DISCUSSION

Population Status and Trend

Few wolves are present in the study area, 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 470-570 wolves among 65-85 packs were present in Subunits 25A, 25B, and 25D in 1988-89. Average wolf density in those areas was roughly 1 wolf per 86-104 mi^2. Nowlin (1988) believed that the wolf population density was lowest in Subunit 25D (West). An estimated 50-65 wolves among 10-12 packs occurred in Subunits 26B and 26C, for 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 packs were found (Garner and Reynolds 1986).

Distribution and Movements:

Radio-collared wolves in northern ANWR were members of packs in Canning, Sadlerochit, Aichilik, Kongakut, Hulahula, and Egakserak Rivers and Drain and Malcolm Creeks (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, preying on caribou from spring to fall and taking alternate prey (i.e., Dall sheep, moose, or small game) during the winter. However, several wolves dispersed widely within a maximum of approximately 500 miles (Garner and Reynolds 1986).

Mortality

Season and Bag Limit:

The hunting season in Units 25 and 26 is from 10 August to 30 April. There is no bag limit in Subunits 25A, 26B, and 26C; however, same-day-airborne hunting of wolves is prohibited. The bag limit in the remainder of Unit 25 is 10 wolves, and same-day-airborne hunting is allowed from 10 August to 31 March.

The trapping season in Unit 25 from 1 November to 31 March. The season in Unit 26 is from 1 November through 15 April. There is no bag limit.

Human-induced Mortality:

The wolf harvest in Unit 25 declined by 43% between 1988 and 1989 (Table 1), but it was over 3 times higher in Unit 26, mostly in Subunit 26B (Table 2). The harvest in Subunit 25A dropped the most, which may have been the result of the prohibition of land-

and-shoot hunting during the reporting period. However, the same restriction applied to Unit 26 with the opposite results. In 1988-89 the reported harvest in Subunit 25D was again low, but twice as many wolves were harvested in Subunit 25B. The harvest in Subunit 26C was about the same as those in previous years.

Most wolf harvests occurred in southern, eastern, and northern Subunit 25A; central and southern Subunit 25B; west-central Subunit 25D; southern and central Subunit 26B; and northern Subunit 26C. Hunter-trapper success averaged 1.4, 1.5, and 1.0 wolves/reporting user in Subunits 25A, 25B, and 25D, respectively. Hunter-trapper success averaged 1.5 wolves/reporting user in both Subunits 26B and 26C. Harvest of males and females was nearly even in the study area during the reporting period, and most wolves taken were either gray or black (Tables 1 and 2). Average pack sizes of harvested wolves by subunit in 1988-89 were as follows: 25A = 2.3, 25B = 5.8, 25D = 1.5, 26B = 9.3, and 26C = 7.0.

Many wolves harvested throughout the study area were not reported, despite the requirement to seal hides of (1) hunted wolves within 30 days of harvest and (2) trapped wolves within 30 days of the end of the season. The unreported harvest may be substantial, particularly in Subunits 26B and 26C where hides are often used for clothing (Whitten 1988).

Harvest Chronology. Most of the reported wolf harvest occurred in September and March in Subunit 25A and from December through March in Subunits 25B and 25D (Table 3). Wolves in Subunits 26B and 26C were taken mostly from December through April (Table 4). Chronology of harvests in all subunits was similar among years.

Harvest and Transport Method. Most harvested wolves were taken by shooting, trapping, or snaring in Subunit 25A and by trapping or snaring in Subunits 25B and 25D during the 1988 regulatory year (Table 5). Both of the latter subunits sustained much more harvesting by shooting in recent years than the previous one. Ground shooting was the only method of harvesting in Subunits 26B and 26C in 1987-88, but nearly as many were trapped and snared as were shot in 1988-89 (Table 6).

Snow machines and dog sleds were the most common transport methods in Unit 25 (Table 5). Wolves taken in Unit 26 were transported mainly by snowmachines, highway vehicles, or aircraft (Table 6).

Natural Mortality:

The relatively low density of wolves in Subunits 26B and 26C may result, in part, from small litter sizes and low survival rates. Garner and Reynolds (1986) reported that 8 of 11 known packs in ANWR in 1984-85 had 5 or fewer wolves, which seemed to inhibit productivity and pup survival. Summer survival rates for packs

of 5 or fewer wolves were 23-25%, while larger packs had about 100% survival.

Game Board Actions and Emergency Orders

The provision in the 1987-88 trapping regulations that permitted the taking of wolves on the same day that the trapper was airborne was transferred to the hunting regulations for the 1988 regulatory year. This means that those persons who wish to take wolves with a firearm by the land-and-shoot method must now have a hunting license, instead of a trapping license, and conform to the requirements stipulated in the hunting regulations. At the same time, the Board of Game prohibited same-day-airborne hunting of wolves in Subunits 25A, 26B, and 26C. The taking of wolves on the same day airborne in Subunits 26B and 26C was previously prohibited under the trapping regulations. In Subunits 25B and 25D, the Board of Game reduced the hunting bag limit for wolves to 10 wolves per regulatory year, regardless of the method of take and stipulated that the land-and-shoot method was not to be used after 31 March. The latter provision simply retained the season-ending date that had been previously in effect for land-and-shoot wolf trapping prior to these changes. Thus the net effect on persons wishing to take wolves by the land-and-shoot method was to exclude them from 1 additional subunit and to restrict their take to 10 wolves each per regulatory year in the remaining areas open to this activity.

CONCLUSIONS AND RECOMMENDATIONS

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

The next priority is to improve documentation of hunter and trapper harvest of wolves. People throughout the study area and especially those in Subunits 26B and 26C must be informed of the sealing requirement for harvested wolves. Known harvests of wolves account for 3-15% of the estimated populations. Harvests are probably much higher in the eastern Brooks Range and on the North Slope.

LITERATURE CITED

Garner, G. W., and P. E. Reynolds, eds. 1986. Gray wolf (Canis lupus). Pages 316-337 in Final report baseline study of the fish, wildlife, and their habitats. Vol. I. Arctic Natl. Wildl. Refuge Coastal Plain Resource Assessment, U.S. Fish and Wildl. Serv., Region 7, Anchorage, Alaska.

Nowlin, R. A. 1985. Wolf survey-inventory progress report. Pages 47-49 in B. Townsend, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XV. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-3. Juneau. 54pp.

_____. 1988. Wolf survey-inventory progress report. Pages 55-59 in S. O. Morgan, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XVII. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-6. Juneau. 64pp.

Whitten, K. R. 1988. Wolf survey-inventory progress report. Page 64 in S. O. Morgan, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XVIII. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-6. Juneau. 64pp.

PREPARED BY:
Howard N. Golden
Wildlife Biologist III

SUBMITTED BY:
Christian A. Smith
Management Coordinator

REVIEWED BY:

Dale A. Haggstrom
Wildlife Biologist II

Table 1. Number, sex, and pelt color of wolves harvested in Unit 25, 1984-88.

Subunit/ Year	Reported harvest	Sex			Color			
		Male	Female	Unk	White	Gray	Black	Unk
25A								
1984-85	25	14	10	1	3	14	6	2
1985-86	14	6	8	0	0	10	2	2
1986-87	9	6	3	0	0	5	3	1
1987-88	30	14	16	0	1	13	12	4
1988-89	10	2	6	2	2	5	3	0
25B								
1984-85	15	4	4	7	0	8	6	1
1985-86	20	11	9	0	0	13	6	1
1986-87	13	5	4	4	0	4	8	1
1987-88	6	4	1	1	0	2	4	0
1988-89	12	3	4	5	0	6	6	0
25D								
1984-85	24	9	10	5	0	17	5	2
1985-86	15	8	5	2	0	6	9	0
1986-87	34	25	5	4	1	23	9	1
1987-88	6	2	2	2	0	5	0	1
1988-89	2	0	0	2	0	1	1	0
Total								
1984-85	64	27	24	13	3	39	17	5
1985-86	49	25	22	2	0	29	17	3
1986-87	56	36	12	8	1	31	20	3
1987-88	42	20	19	3	1	20	16	5
1988-89	24	5	10	9	2	12	10	0

Table 2. Number, sex, and pelt color of wolves harvested in Subunits 26B and 26C, 1984-88.

Subunit/ Year	Reported harvest	Sex			Color			
		Male	Female	Unk	White	Gray	Black	Unk
26B								
1984-85	2	0	0	2	-	-	-	-
1985-86	4	3	1	0	-	-	-	-
1986-87	2	0	2	0	-	-	-	-
1987-88	3	2	1	0	0	1	2	0
1988-89	15	12	3	0	0	12	3	0
26C								
1984-85	3	0	0	3	-	-	-	-
1985-86	1	0	0	1	-	-	-	-
1986-87	2	2	0	0	-	-	-	-
1987-88	2	1	1	0	0	1	0	1
1988-89	3	3	0	0	0	2	0	1
Total								
1984-85	5	0	0	5	-	-	-	-
1985-86	5	3	1	1	-	-	-	-
1986-87	4	2	2	0	-	-	-	-
1987-88	5	3	2	0	0	2	2	1
1988-89	18	15	3	0	0	14	3	1

Table 3. Harvest chronology for wolves taken in Subunits 25A, 25B, and 25D, 1984-88.

Subunit/ Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	Total
25A											
1984-85	0	0	0	3	7	0	0	15	0	0	25
1985-86	0	3	0	0	2	1	1	7	0	0	14
1986-87	0	0	0	1	3	0	1	3	0	1	9
1987-88	1	2	0	1	2	2	2	20	0	0	30
1988-89	0	3	0	1	1	0	1	4	0	0	10
25B											
1984-85	0	1	0	1	3	2	3	5	0	0	15
1985-86	0	0	0	1	6	7	0	1	0	6	21
1986-87	0	0	0	4	4	1	0	0	0	3	12
1987-88	0	0	0	1	1	2	1	1	0	0	6
1988-89	0	0	0	2	6	1	2	1	0	0	12
25D											
1984-85	0	0	0	3	4	1	1	14	1	0	24
1985-86	0	0	0	0	1	0	9	5	0	0	15
1986-87	0	0	0	6	6	8	1	13	0	0	34
1987-88	0	0	0	0	3	2	1	0	0	0	6
1988-89	0	0	0	0	1	0	1	0	0	0	2
Totals											
1984-85	0	0	0	7	14	3	4	34	1	6	64
1985-86	0	3	0	1	9	8	10	13	0	0	50
1986-87	0	0	0	5	13	9	2	16	0	4	55
1987-88	1	2	0	2	6	6	4	21	0	0	42
1988-89	0	3	0	3	8	1	4	5	0	0	24

Table 4. Harvest chronology for wolves taken in Subunits 26B and 26C, 1985-88.

Subunit/ Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	Total
26B											
1985-86	0	0	0	3	1	0	0	0	0	0	4
1986-87	0	0	0	0	0	0	0	0	0	2	2
1987-88	0	0	0	0	0	0	1	1	1	0	3
1988-89	0	2	0	1	5	0	0	6	1	0	15
26C											
1985-86	0	0	0	0	0	0	0	0	0	1	1
1986-87	0	0	0	0	0	0	0	0	0	2	2
1987-88	1	0	0	0	0	0	0	0	1	0	2
1988-89	0	2	0	0	0	0	0	0	1	0	3
Totals											
1985-86	0	0	0	3	1	0	0	0	0	1	5
1986-87	0	0	0	0	0	0	0	0	0	4	4
1987-88	1	0	0	0	0	0	0	1	2	0	5
1988-89	0	4	0	1	5	0	0	6	2	0	18

Table 5. Method of take and transportation of wolves harvested in Subunits 25A, 25B, and 25D, 1984-88.

Subunit/ Year	Method of take[a]				Method of transportation[b]							
	1	2	3	4	1	2	3	4	5	6	7	8
25A												
1984-85	15	7	3	0	-	-	-	-	-	-	-	-
1985-86	8	3	1	2	6	1	0	0	4	0	0	3
1986-87	5	2	2	0	2	0	0	0	7	0	0	0
1987-88	23	3	4	0	22	2	1	0	5	0	0	0
1988-89	4	3	3	0	1	2	1	0	6	0	0	0
25B												
1984-85	6	6	3	0	-	-	-	-	-	-	-	-
1985-86	10	4	6	0	9	6	0	0	5	0	0	0
1986-87	0	9	3	1	1	0	0	0	11	0	0	1
1987-88	1	1	4	0	0	1	0	0	4	0	1	0
1988-89	0	6	6	0	0	2	0	0	10	0	0	0
25D												
1984-85	15	7	2	0	-	-	-	-	-	-	-	-
1985-86	11	2	2	0	12	0	0	0	3	0	0	0
1986-87	11	7	16	0	13	3	0	0	18	0	0	0
1987-88	0	1	5	0	0	0	0	0	6	0	0	0
1988-89	0	2	0	0	0	0	0	0	2	0	0	0
Totals												
1984-85	36	20	8	0	-	-	-	-	-	-	-	-
1985-86	29	9	9	2	27	7	0	0	12	0	0	3
1986-87	16	18	21	0	16	3	0	0	24	0	0	1
1987-88	24	5	13	0	22	3	0	0	15	0	1	0
1988-89	4	11	9	0	1	4	1	0	18	0	0	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 of wolves harvested in Subunits 26B and 26C, 1984-88.

Subunit/ Year	Method of take[a]				Method of transportation[b]							
	1	2	3	4	1	2	3	4	5	6	7	8
26B												
1984-85	2	0	0	0	-	-	-	-	-	-	-	-
1985-86	3	1	0	0	-	-	-	-	-	-	-	-
1986-87	2	0	0	0	-	-	-	-	-	-	-	-
1987-88	3	0	0	0	1	0	0	0	0	0	1	0
1988-89	7	5	2	1	2	0	0	0	7	0	5	1
26C												
1984-85	3	0	0	0	-	-	-	-	-	-	-	-
1985-86	1	0	0	0	-	-	-	-	-	-	-	-
1986-87	2	0	0	0	-	-	-	-	-	-	-	-
1987-88	2	0	0	0	1	0	0	0	0	0	0	1
1988-89	3	0	0	0	2	0	0	0	1	0	0	0
Totals												
1984-85	5	0	0	0	-	-	-	-	-	-	-	-
1985-86	4	1	0	0	-	-	-	-	-	-	-	-
1986-87	4	0	0	0	-	-	-	-	-	-	-	-
1987-88	5	0	0	0	2	0	0	0	0	0	1	1
1988-89	10	5	2	1	4	0	0	0	8	0	5	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.

STUDY AREA

GAME MANAGEMENT UNIT: 26A (53,000 mi^2)

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

The current status of the wolf populations in Subunit 26A is not known with certainty. James (1982) and Trent (1988) provided minimal population estimates, 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.

POPULATION OBJECTIVES

To provide maximal harvest opportunities within sustained-yield limits.

METHODS

No surveys to determine wolf numbers or densities were conducted during the reporting period. Harvest data were obtained from sealing certificate records, informal discussions with knowledgeable village residents, and research activities conducted in several communities. Composition data were obtained from wolf carcasses collected at Anaktuvuk Pass.

RESULTS AND DISCUSSION

Population Status and Trend

Population Size:

The current wolf population size and trend for most of the western North Slope is not known at this time. James (1982) made the most recent estimate of the population size for Subunit 26A at 144 to 310 wolves for the winter of 1981-82. Twenty-five percent of the subunit (10,044 mi^2) was surveyed and a density of 1-wolf/653-1,524 mi^2 was extrapolated to the remainder of the subunit.

During 1986 Trent (1988) surveyed 6,480 mi^2 in the vicinity of Umiat, observing 2 packs totalling 9 wolves. Wolf track observations were also made, and when combined with wolf sightings, 9 packs totalling 44 wolves were tentatively

identified. The estimated density for the 1986 survey area was 1 wolf/147 mi^2.

Trent (1988) surveyed the same drainages in 1987, and he observed 4 to 5 packs (37 wolves) inhabiting 8,226 mi^2 of habitat. When track observations were included, 11 to 12 packs totalling 57 to 69 wolves 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 (ADF&G files) have collected necropsy data on wolves harvested at Anaktuvuk Pass since the winter of 1985-86. Thirty-four carcasses from wolves harvested in or immediately adjacent to Subunit 26A were examined during 1988-89. Twenty-two (65%) were pups, and 12 (35%) were adults. Twenty-one (62%) were males, and 13 (38%) were females. One of the animals 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.

These composition data may be biased, because pups are usually more susceptible to harvest than adults. Composition data other than hunter harvests 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. Wolves exist at lower densities on the coastal plain and apparently have been increasing in number during the last 2 years, according to residents of Atqasuk and Wainwright.

Mortality

Seasons and Bag Limits:

Hunting. The open season in Subunit 26A is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Subunit 26A is from 1 November to 15 April; there is no bag limit.

Human-induced Harvest:

Twelve wolves taken by 2 hunters from Anaktuvuk Pass in Subunit 26A were sealed during 1988-89. Stephenson and Adams (ADF&G files) determined that at least 41 wolves from Subunit 26A were harvested by Anaktuvuk Pass hunters during 1988-89. Eric Loring (pers. commun.) of Steven Braund and Associates, a company conducting a U. S. Minerals Management Service subsistence study,

reported that 5 wolves were harvested by Wainwright hunters. Discussions with knowledgeable village residents indicate that Atqasuk hunters took at least 6 wolves; Barrow, 4 wolves; Point Lay, 2 wolves; and Nuiqsut, 5 wolves. Therefore, at least 60 wolves were harvested in Subunit 26A during 1988-89.

During 1987-88, Stephenson and Adams reported that a minimum of 26 wolves were harvested from Subunit 26A by Anaktuvuk Pass hunters, but no reliable data are available on harvest from other villages. During 1986-87, Stephenson and Adams reported at least 23 wolves were harvested at Anaktuvuk Pass, and an estimated minimum of 51 wolves were taken in Subunit 26A (Trent 1987). A minimum of 51 wolves was also reported taken in Subunit 26A during 1985-86, of which 37 were reported by Stephenson and Adams as taken by Anaktuvuk Pass hunters.

Of the 12 wolves reported harvested on sealing certificates, 11 were shot and one was trapped. Two were taken in February, and 10 were taken in March; all were taken by hunters using snowmachines as transportation.

Habitat Assessment

Subunit 26A contains an extensive prey base. The Western Arctic Caribou Herd, which numbers over 340,000, seasonally occupies the subunit, a portion of the herd remaining through the winter. The Teshekpuk Lake Caribou Herd numbers over 16,000 and resides in the subunit throughout the year. In addition, over 1,500 moose reside along the Colville River. 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 is needed to determine the density in various areas and to derive a population estimate for the entire subunit. Surveys conducted by Trent during 1986 and 1987 were quite useful, but they 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 a part-time person in each village to collect harvest information. Until obtaining accurate harvest information becomes a high enough priority to justify the expense, the current system of relying on harvest data gathered at Anaktuvuk Pass and interviewing knowledgeable individuals from other villages will probably provide an adequate index of harvest.

The public needs to be consulted, and clear management goals should be established. We must determine what effect wolves are having on the moose population of the Colville River to help decide whether it is desirable for the wolf population to increase, decrease, or stay the same.

Because "land-and-shoot" or same-day airborne hunting for wolves is prohibited, extensive areas in Subunit 26A will receive little impact from hunters. Except for the area within 50 to 70 miles of Anaktuvuk Pass, much of the population inhabiting the foothills of the Brooks Range probably will not be heavily utilized. On the coastal plain, wolves will continue to be vulnerable to hunters on snowmachines and probably will not become plentiful.

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

LITERATURE CITED

Adams, L. G. and R. O. Stephenson. 1986. Wolf survey, Gates of the Arctic National Park and Preserve--1986. Unpubl. National Resources Survey-Inventory Report AR-86/04. National Park Service, Anchorage, Alaska. 11pp.

James, D. D. 1982. Unit 26A wolf survey-inventory progress report. Pages 114-115 in J. A. Barnett, ed. Annual report of survey-inventory activities. Part VII. Beaver, Furbearers, Lynx, Wolf, and Wolverine. Vol. XII. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-1. Job 7.0, 14.0, and 15.0. Juneau. 126pp.

Trent, J. N. 1988. Unit 26A wolf survey-inventory progress report. Pages 60-63 in S. O. Morgan, ed. Annual report of survey-inventory activities. Part XV. Wolf. Vol. XVIII. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-6, Job 14.0. Juneau. 64pp.

_____. 1985. Unit 26A furbearer survey-inventory progress report. Pages 62-73 in B. Townsend, ed. Annual report of survey-inventory activities. Part XIV. Furbearers. Vol XVI. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-4. Job 7.0. Juneau. 94pp.

_____. 1984. Unit 26A furbearer survey-inventory progress report. Pages 77-79 in B. Townsend, ed. Annual report of survey-inventory activities. Part XIV. Furbearers. Vol XV. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-22-3. Job. 7.0. Juneau. 100pp.

PREPARED BY:

Geoffrey Carroll
Wildlife Biologist III

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Annual harvest and composition from Subunit 26A and Anaktuvuk Pass, 1985-89.

Year	Subunit harvest	Harvest from Anaktuvuk Pass	Percentage sex of harvest[a] M	F	Percentage Age of harvest[a] Pups	Adults
85-86	51	37	33	67	75	25
86-87	51	23	52	48	64	36
87-88	--	26	56	44	52	48
88-89	60	41	62	38	65	35

[a] Data derived from necropsy data collected at Anaktuvuk Pass and from information reported on sealing certificates.

Federal Aid Project
funded by your purchase of
hunting equipment