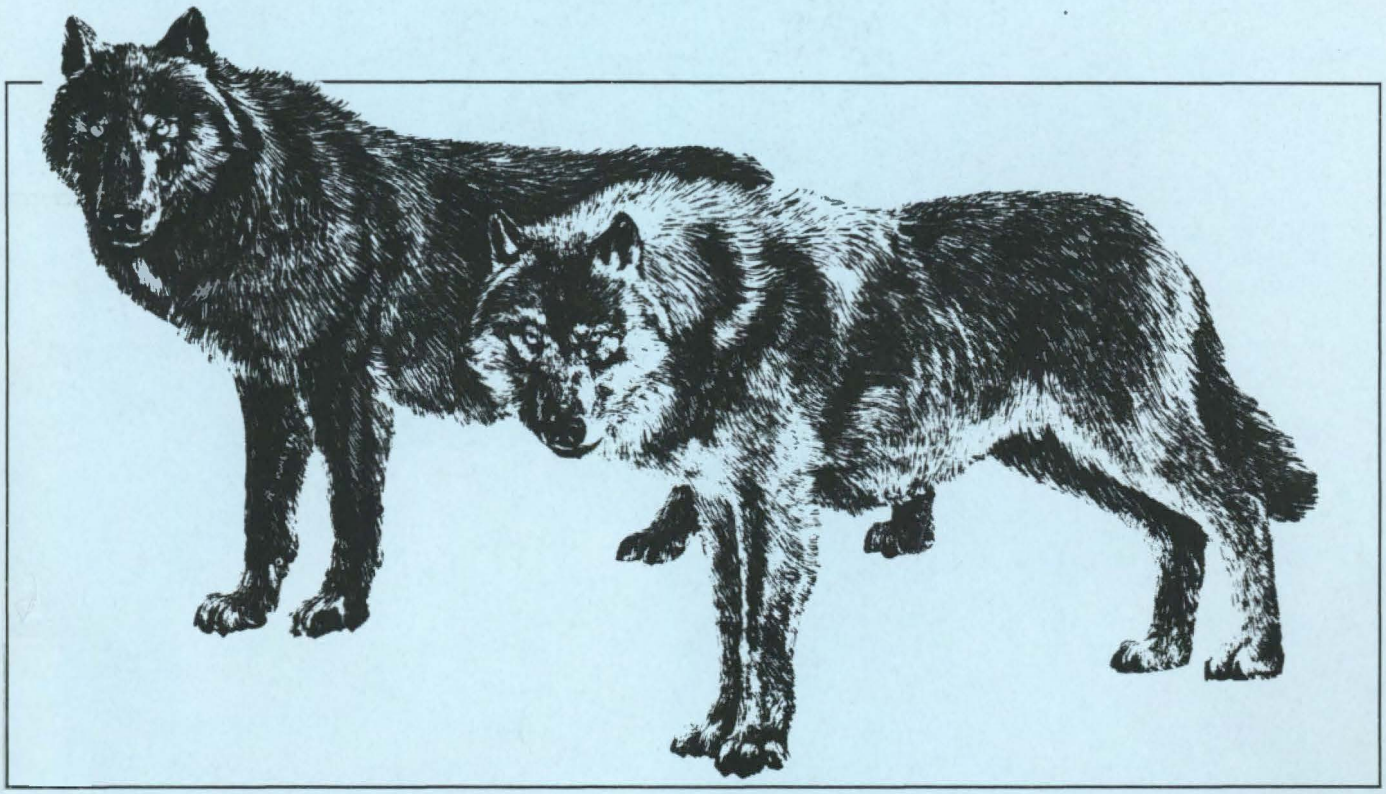
Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Annual Report of Survey—Inventory Activities
1 July 1987—30 June 1988

WOLF



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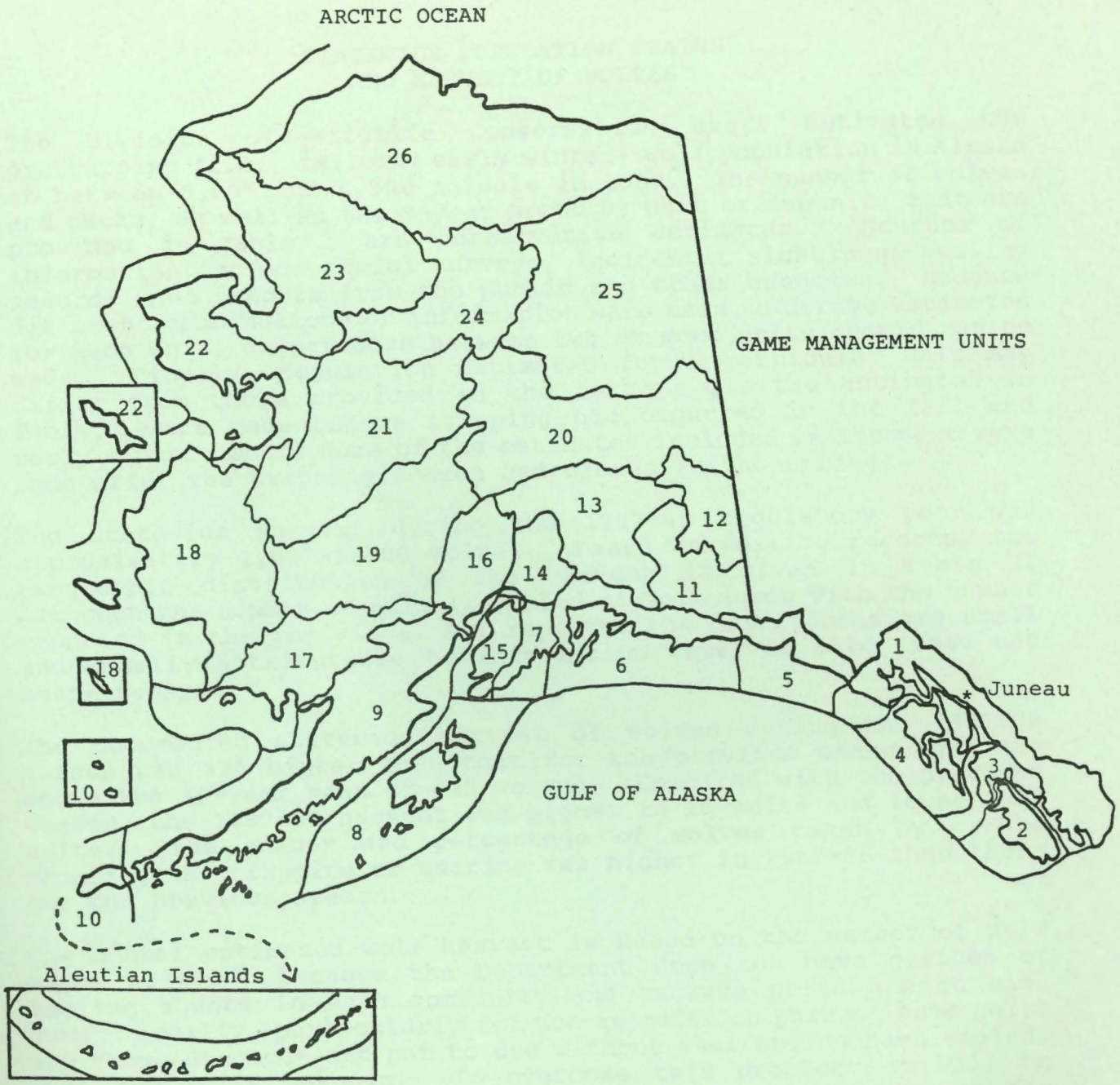
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STATEWIDE POPULATION STATUS AND HARVEST OF WOLVES

The Division of Wildlife Conservation staff estimated the pretrapping (i.e., fall and early winter) wolf population in Alaska at between 5,200 and 6,500 animals in 1987. The number of wolves and packs, as well as the 5-year trend by unit or subunit, that are provided in Table 1 are conservative estimates. Sources of information include aerial surveys, incidental sightings, sealing records, and reports from the public and other agencies. Because different combinations of information were used to derive estimates for each unit, comparisons between two or more units should not be made. Finally, population estimates for a particular unit may differ from those provided in the text; e.g., the estimates in Table 1 were made before trapping had occurred in the fall and early winter, while some of the estimates included in the text were made after the trapping season had closed in the spring.

The statewide harvest during the 1987-88 regulatory year was approximately 1,097-1,200 wolves. Based on sealing records, the geographic distribution of the harvest is given in Table 2. Although the number of animals sealed may not agree with the number reported in the individual S&I reports, the differences are small and usually attributable to information received after they had been prepared.

The documented statewide harvest of wolves during the 1987-88 season was 37% higher than that for the previous season and 33% above the 10-year mean of 823 wolves. Compared with the previous season, the 1987-88 harvest was higher in 14 units and lower in 9 units. The number and percentage of wolves taken by ground shooting vs. trapping or snaring was higher in 1987-88 than those for the previous season.

The annual estimated wolf harvest is based on the number of wolf pelts sealed. Because the Department does not have offices or sealing agents in each community and because pelts are in high demand locally, particularly for use as ruffs on parkas, some pelts are "home dressed" and put to use without ever having been sealed; that number is unknown. 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 easy for individuals to comply with sealing requirements, especially in rural areas of the state.

Herbert R. Melchior
Statewide Furbearer Coordinator

Table 1. Estimated statewide wolf population status (fall/winter 1987).

Unit/Subunit	Wolf Population	Number of packs	5-year trend
Region I			
1A	205	25	Increasing
1B	40	6	Stable
1C	100	16-19	Stable
1D	30	4	Stable
2	160	18	Increasing
3	55	10-12	Stable
4	0	0	--
5A	50	5	Stable
5B	15	2	Stable
Subtotal	655	86-91	--
Region II			
6	63-92	12	Increasing
7	40-45	7	Stable
8	0	0	--
9	135-165	14	Stable
10	15-25	2	Unknown
11	110-130	14	Slightly increasing
13	270-310	35-40	Slightly increasing
14	50-55	10	Stable
15	140-150	13	Stable
16	60-75	7	Stable
17	200-250	22	Increasing
Subtotal	1,083-1,297	136-141	--
Region III			
12	180-185	25-28	Stable
19A&B	225-260	22-26	Stable
19C	90-100	10-12	Stable
19D	120-140	16-22	Stable
20A	200-230	25-30	Increasing
20B	140-180	21-27	Increasing
20C	100-120	15-20	Stable
20D	60-80	11-13	Stable
20E	215-220	30-33	Increasing
20F	60-100	10-15	Stable

-continued-

Table 1. Continued.

Unit/Subunit	Wolf population	Number of packs	5-year trend
21A	155-175	19-23	Stable
21B	80-90	13-16	Stable
21C	35-40	4-6	Stable
21D	175-190	25-30	Stable
21E	75-95	9-12	Stable
24	400-440	55-60	Increasing
25A	220-270	30-40	Stable
25B	100-120	15-20	Stable
25C	50-60	8-10	Stable
25D	150-180	20-25	Stable
26B	15-25	3-4	Increasing
26C	25-30	5-6	Stable
Subtotal	2,870-3,330	391-478	--
Region V			
18	25-50	5	Slightly increasing
22	50-150	7-20	Stable
23	350-720	65-130	Stable
26A	145-310	14-30	Stable to slightly increasing
Subtotal	570-1,230	91-185	--
TOTAL	5,178-6,512	704-895	--

Table 2. Number of wolves sealed by unit during the 1987-88 harvest season.

Unit	No. sealed	Unit	No. sealed
1	50	14	3
2	55	15	22
3	9	16	6
4	--[a]	17	79
5	8	18	11
6	10	19	142
7	3	20	122
8	--[a]	21	129
9	37	22	22
10	2	23	93
11	27	24	67
12	21	25	49
13	110	26	20

[a] None sealed for this unit.

Table 3. Number and percentage of wolves sealed in 1986-87 and 1987-88 by method of take.

Season	Ground Shooting		Trapping or Snaring		Total
	Number	Percentage	Number	Percentage	
1986-87	340	45	423	55	763[a]
1987-88	719	67	357	33	1076[b]

[a]The difference of 40 wolves between this total and the one exhibited in Table 4 is attributable to 29 harvest reports indicating no method of take and 11 showing some other method of take.

[b]The difference of 21 wolves between this total and the one exhibited in Table 4 is attributable to 16 harvest reports indicating no method of take and five showing some other method of take.

Table 4. Alaska wolf harvest from mandatory sealing certification data, 1977-78 to 1987-88.

Unit	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88
1	41	48	35	42	29	37	55	38	47	49	50
2	23	10	11	34	19	15	27	43	18	39	55
3	10	16	16	10	14	17	17	7	10	10	9
4	--[a]	--	--	--	--	--	--	--	--	--	--
5	1	12	10	2	6	11	10	16	5	14	8
6	3	6	0	2	1	1	2	3	1	3	10
7	19	12	6	10	12	4	11	5	13	19	3
8	0	0	0	0	0	0	0	0	0	0	0
9	26	17	20	22	22	13	18	54	24	34	37
10	9	0	0	0	1	0	0	0	6	4	2
11	51	40	7	18	8	26	33	38	9	16	27
12	12	34	35	23	33	34	23	22	45	38	21
13	132	69	54	48	55	91	118	127	70	84	110
14	24	4	4	3	7	17	13	6	10	4	3
15	20	44	38	32	50	42	45	42	53	29	22
16	11	31	44	23	20	13	12	19	2	9	6
17	17	20	25	8	17	45	7	43	13	28	79
18	2	1	0	1	1	5	0	3	7	4	11
19	53	81	40	48	53	34	41	110	39	75	142
20[b]	185	145	85	123	144	156	110	103	134	97	122
21	47	86	82	78	38	96	54	158	45	101	129
22	3	5	4	4	4	4	5	12	5	8	22
23	64	50	18	50	17	48	46	65	18	33	93
24	58	100	51	72	31	44	44	56	29	38	67
25b	45	37	74	56	68	63	47	71	51	57	49
26	39	36	15	42	39	9	4	13	21	10	20
Total	917	905	674	751	689	825	742	1054	675	803	1097

[a] No animals sealed this time period.
[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: Unit 2 - Prince of Wales and adjacent islands south of Sumner Strait and west of Kashevarof Passage and Clarence Strait.

Subunit 1A - Ketchikan area including mainland areas draining into Behm and Portland Canals.

BACKGROUND

Biological and harvest information has been collected for harvested wolves since the early 1960's. Records from 1961-62 to 1970-71 are from bounty payments. A mandatory sealing program has been in effect since that time.

POPULATION OBJECTIVES

To measure the economic value of wolves so that a planned management system can be implemented.

METHODS

Hunter and/or trappers are required to record the date and location of their harvests on a standard furbearer sealing form. Method of take, transportation, sex, and pelt color are also recorded.

Limited survey data are available for Revillagigedo Island. Surveys are generally made from a Piper 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 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 their current rate of increase. Generally, wolf numbers have increased synchronously with deer numbers, and at this time they appear to be steadily increasing.

Population Size:

In the late 1960's to early 1970's there was more than 1 wolf/10 mi^2 in both units. During the years of low deer numbers in the middle to late 1970's, population estimates for Revillagigedo Island suggested densities of between 1 wolf/22 mi^2 to 1 wolf/44 mi^2, or an island population of 25 to 50 wolves; the density in Unit 2 was probably similar. Mainland densities (i.e., where mountain goats are the primary prey species) are lower than those on the islands (i.e., where deer are the main prey).

Distribution and Movements:

Wolves are present throughout Subunits 1A and Unit 2, although they may not be year-round residents of some of the smaller islands. Observations and tracking of radio-collared animals have shown wolves readily swim over 0.5 mile to reach smaller islands.

Mortality

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. The accidental or illegal harvests are probably insignificant. In general, annual trapper harvests do not reflect wolf population status because of changes in trappers and trapper effort from year to year. The long-term harvest in Unit 2 will probably increase because of the increase in the wolf population, road access, and human activity. A smaller increase in harvest is expected in Subunit 1A because of poorer access. The differences in road access and human activity between Unit 2 and Subunit 1A are reflected by the high proportion of wolves harvested by shooting and the methods of transportation used in Unit 2 (Table 2). Highway vehicles were used by trappers for about 40% of the wolves harvested in Unit 2, while boats were used to harvest all of the wolves taken in Subunit 1A during the reporting period. This will change as the road systems on Revillagigedo Island and the Cleveland Peninsula develop, resulting in access similar to that in Unit 2.

The chronology of harvest data (Table 3) shows that the heaviest harvests occur during the winter months (i.e., December-March), which also encompasses the period of optimal pelt primeness (i.e., November-January). Many of the wolves taken outside of these months are taken incidentally to other hunting activities.

Habitat

While expanding road systems and increasing human population throughout most of Subunit 1A and Unit 2 will have a direct impact on wolves through additional hunting and trapping, the real long-term permanent loss of wolf habitat occurs indirectly through loss of deer habitat. Logging of the uneven-aged old-growth forests reduces the carrying capacity of the area for deer, particularly during the more severe winters, resulting in lower deer numbers. Accordingly, wolf populations will diminish. Population fluctuations will always occur, but the potential to support wolves will probably 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; seasons and bag limits reflect this. Trapping seasons encompassing the period of pelt primeness are closed during the time when bears are active to prevent them from getting caught in wolf traps.

The wolf hunting season allows hunters to incidentally harvest wolves during other hunting activities. Generally, hunters do not specifically hunt wolves in Subunit 1A and Unit 2.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers appear to be little affected by current hunting and trapping efforts. Population fluctuations seem to be more a result of changes in deer numbers. Availability of alternate food resources, primarily salmon and beaver, also has a significant impact on wolf populations during periods of low deer numbers.

In Unit 2, where road access is extensive and human settlement wide-spread, it is conceivable that 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. The extensive roading and logging in Unit 2 may cause problems for wolves on Prince of Wales Island as the human population increases. There is little doubt that the current potential to support wolves in Unit 2 and Subunit 1A will decline because of the loss in deer habitat brought about by logging. No changes in seasons or bag limits are recommended.

PREPARED BY:

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SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Annual wolf harvest for Subunit 1A and Unit 2, 1983-84 to 1987-88.

Year	No. Males	No. Females	No. Unknown	Total	No. Shot	No. Trapped	Color		
							White	Grey	Black
Unit 1A									
1983-84	14	19	0	33	2	31		21	12
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
Totals	51	50	0	101	16	85	1	70	30
Unit 2									
1983-84	11	12	1	24	11	10		15	4
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
Totals	93	79	7	179	83	92	2	128	42

Table 2. Transport methods in Subunit 1A and Unit 2, 1983-84 to 1987-88.

Year	Air	Boat	Highway vehicle
Subunit 1A			
1983-84	N/A		
1984-85	N/A		
1985-86	0	5	3
1986-87	10	11	0
1987-88	0	21	0
Totals	10	37	3
Unit 2			
1983-84	N/A		
1984-85	N/A		
1985-86	0	4	5
1986-87	0	14	25
1987-88	0	31	20
Totals	0	49	50

Table 3. Harvest chronology in Subunit 1A and Unit 2, 1983-84 to 1987-88.

	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Subunit 1A												
1983-84	0	0	0	1	1	0	4	11	16	0	0	0
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
Totals	0	1	3	2	2	8	21	32	24	4	3	1
Unit 2												
1983-84	0	2	0	2	1	4	3	7	2	1	1	0
1984-85	0	1	2	2	2	9	11	4	5	0	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
Totals	0	5	8	13	14	35	24	42	20	10	6	1

STUDY AREA

GAME MANAGEMENT UNIT: 1B and 3 (6,900 mi^2)

GEOGRAPHICAL DESCRIPTION: Southeast mainland from Cape Fanshaw to Lemusurier Point and adjacent islands

BACKGROUND

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

The current management program is centered around the trapping of wolves. From a historical perspective, current interest in "wolf-trapping" is relatively low because of the effort involved, the expense of larger traps, and the relatively low pelt value. In the Petersburg and Wrangell areas, trapping of wolves contributes less to the income of trappers than the trapping of other furbearers. Furthermore, trapping of wolves and other furbearers is a secondary source of income for most trappers, because many of them have seasonal occupations such as logging or fishing.

Historically, reduction of wolf populations, primarily for the benefit of deer populations, was frequently the main emphasis of federal and state wolf management. Currently, public controversy over killing wolves has effectively eliminated it as a management option; however, continuing criticism of (1) the Department's perceived unwillingness to directly address wolf-prey imbalances and (2) any intervention at all may require the systematic development of a new solution to this dilemma.

POPULATION OBJECTIVES

To measure the economic value of wolves so that a planned management system can be implemented.

METHODS

The harvest of wolves by trappers and hunters was monitored through the mandatory hide-sealing program. Data routinely collected include number harvested, location, date, sex, and number of wolves in associated packs. Reports by the public of sightings of wolf sign were used to indicate the presence or absence of wolves in areas and gross differences in densities between areas.

RESULTS AND DISCUSSION

Population Status and Trend

Data are insufficient to make a quantitative determination of the wolf population trend in Subunit 1B and Unit 3. However, incidental observations by ADF&G staff, trappers, hunters, and other members of the public have demonstrated the continuing presence of wolves throughout their historic range, suggesting an increasing number of wolves in some areas.

Mortality

Season and Bag Limit:

Hunting. There are no closed seasons or bag limit 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 in Unit 3 and Subunit 1B for the past 5 seasons (1983-84 to 1987-88) were 11 and 10 wolves, respectively (Table 1). The previous average annual harvests for Unit 3 in 5-year increments were 44, 21, and 20 wolves for 1968-72, 1973-77, and 1978-1982, respectively.

The decreasing harvest trend may be attributable to less trapping effort because of relatively low pelt prices and a smaller wolf population that is commensurate with low-to-moderate numbers of deer in Unit 3. Although deer populations may have stabilized south of Sumner Strait, north of there the populations are increasing, especially on Mitkof Island. Therefore, it is reasonable to expect an increase in the wolf population during the next few years. Whether the harvest will also increase significantly in the future (i.e., commensurate with an increase in the number of wolves) will depend largely on the degree of economic motivation to trappers. The methods by which wolves were harvested (Table 2) in 1987-88 reflected the past trend: primarily traps (15 wolves), shooting (7 wolves), and snares (1 wolf).

Harvest Chronology. Normally, February is the month during which most of the wolf harvest occurs in Subunit 1B and Unit 3 (Table 3); however, in 1987-88, 7 wolves were taken in November and only four in February. Also, of the total harvest (i.e., 23), 7 wolves were taken during the nontrapping season (i.e., May-October), representing the highest harvest recorded during the past 5 nontrapping seasons.

Transport Methods. Boats are most commonly used for transportation by those who harvest wolves in the Petersburg-Wrangell area

(Table 4). In the future there will doubtless be more use of highway vehicles on the increasing network of logging roads, representing a potential need for more restrictive seasons and bag limits, should the resultant harvests exceed desirable levels.

Game Board Actions and Emergency Orders

The opening and closing dates of the trapping season are intended to encompass the period during which pelt quality is highest and, hence, maximize the monetary value to trappers. There are no biological or allocation problems to necessitate a restriction of the bag limit. Relatively few wolves have been taken, and the harvests have been well below maximum sustained yield. The year-long hunting season is intended to maximize hunting opportunity. The resulting harvests have had negligible effects on the wolf population. Likewise, there is no compelling reason to restrict the bag limits.

CONCLUSIONS AND RECOMMENDATIONS

No significant progress has been made in attaining the stated population objective. The current objective may not be the most appropriate for the wolf management program in Subunit 1B and Unit 3. As an alternative, I recommend developing a database of population trend information through an annual trapper survey. Results of such surveys are used elsewhere in the state and provide meaningful, quantitative data that can be subjected to nonparametric analyses. I proposed the following population objective be adopted: To provide for an annual harvest of at least 11 wolves in Unit 3 and at least 10 wolves in Subunit 1B.

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SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Reported harvest of wolves in Subunit 1B and Unit 3, 1983-1988.

	Subunit 1B				Unit 3			
Year	M	F	U	Total	M	F	U	Total
1983	2	2	0	4	10	6	1	17
1984	4	6	0	10	3	5	1	9
1985	6	3	0	9	5	4	0	9
1986	7	4	0	11	6	3	1	10
1987	8	6	0	14	6	3	0	9

Table 2. Methods of harvest in Subunit 1B and Unit 3, 1983-1987.

		Method of take			
Year	Unit	Ground shooting	Trapping	Snaring	Other
1983	1B	4	0	0	0
	3	9	8	0	0
1984	1B	1	8	1	0
	3	2	6	1	0
1985	1B	3	6	0	0
	3	2	1	6	0
1986	1B	1	8	2	0
	3	1	7	1	1
1987	1B	3	10	1	0
	3	4	5	0	0

Table 3. Harvest chronology, 1983-1987.

Year	Unit	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	?
1983	1B	0	0	1	1	0	0	0	2	0	0	0	0	0
	3	1	0	0	0	1	1	1	8	3	0	0	0	2
1984	1B	0	0	0	0	0	3	0	2	4	1	0	0	0
	3	0	0	0	1	0	4	0	2	2	0	0	0	0
1985	1B	0	0	0	3	0	0	6	0	0	0	0	0	0
	3	0	0	0	0	0	0	3	1	2	0	1	0	2
1986	1B	0	0	1	0	1	1	2	1	3	2	0	0	0
	3	0	0	1	1	0	0	0	7	1	0	0	0	0
1987	1B	0	0	1	1	7	0	0	4	0	0	0	1	0
	3	0	0	0	1	0	2	0	1	0	2	1	2	0

Table 4. Method of transportation used by trappers and hunters who harvested wolves in Subunit 1B and Unit 3, 1986-87.

	1986		1987	
Transportation	Subunit 1B	Unit 3	Subunit 1B	Unit 3
Airplane	0	0	0	0
Dog sled,skis, or snowshoes	0	0	1	0
Boat	9	6	13	8
3- or 4-wheeler	2	0	0	0
Snowmachine	0	0	0	0
Other off-road vehicle	0	0	0	0
Highway vehicle	0	1	0	1
Unknown	0	3	0	0

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: The Southeast Alaska mainland and the islands of Lynn Canal and Stephan's Passage lying between Cape Fanshaw and the latitude of Eldred Rock, including Sullivan Island and the drainages of Berner's Bay.

BACKGROUND

Wolves are distributed throughout the mainland portion of Subunit 1C. They may be numerous in Glacier Bay National Park. No wolves have been reported from Douglas, Shelter, Lincoln, or the smaller islands within the subunit.

POPULATION OBJECTIVES

To measure the economic value of wolves so that a planned management system can be implemented.

METHODS

The mandatory sealing of wolf hides taken taken by successful trappers provided data on sex of harvest, date and method of take, and transportation means. Discussions with hunters during sealing were used to gain additional information on the population's status.

RESULTS AND DISCUSSION

Population Status and Trend

Based on harvest data and discussions with trappers and other interested parties, I believe the population is stable throughout Subunit 1C. Packs in the Berner's Bay, Nugget Creek, Carlson Creek, Taku River, and St. James Bay areas have been reported by hunters and trappers during the reporting period.

Mortality

Season and Bag Limit:

Hunting. There is no closed season or bag limit in Subunit 1C.

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

Human-induced Mortality:

Five trappers harvested a total of 10 wolves during the 1987-88 season (5 females and 5 males), averaging two wolves/trapper (Table 1). This harvest was slightly greater than that for 1986-87 but equal to the 5-year mean of 10.

Harvest Chronology. Of the 10 wolves harvested, four were taken in December, four in January, and two in February.

Harvest Method. Seven wolves were taken by snares, two by traps, and one by a firearm.

Transportation Methods. One trapper using a highway vehicle to access the trapping grounds harvested 4 wolves; 2 trappers using boats, 2 wolves; 1 trapper using an airplane, 3 wolves; and 1 trapping using snow shoes, 1 wolf.

CONCLUSIONS AND RECOMMENDATIONS

Based on harvest figures, wolf numbers appear to be generally stable in Subunit 1C. No changes in seasons and bag limits appear to be warranted at this time.

Prior to development of population objectives it may be prudent to examine the prey base for wolves inhabiting the coastal mainland and Chilkat Peninsula. Most known packs have access to moose, with the possible exception of a pack believed to inhabit the Nugget Creek drainage and the mountainous areas to the east of Juneau. Mountain goats in that area may be the only large mammal available to them. 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 goat numbers have not increased. The wolf scats collected incidental to mountain goat research conducted near Juneau in the early 1980's frequently contained goat remains (ADF&G files). The effect wolf predation could be having on the growth of the goat population must be considered when management objectives are formulated.

PREPARED BY:

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SUBMITTED BY:

David M. Johnson
Regional Management Coordinator

Table 1. Wolf harvest in Subunit 1C, 1983-84 to 1987-88.

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

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: That portion of the Southeast Alaska mainland lying north of the latitude of Eldred Rock, excluding Sullivan Island and the drainages of Berner's Bay.

BACKGROUND

The most recent wolf population estimate for Subunit 1D was made in 1985; 20-25 wolves in 4 packs were thought to inhabit the area. This estimate was based on sightings, hunter and trapper interviews, and sealing data. No wolf-prey investigations have been conducted in the area. Both moose and mountain goats inhabit the area, and their numbers are influenced or possibly limited by predation.

POPULATION OBJECTIVES

To measure the economic value of wolves so that a planned management system can be implemented.

METHODS

The mandatory sealing of wolf hides harvested by trappers and hunters provided data on sex of the harvest, date and method of take, and transportation methods.

RESULTS AND DISCUSSION

Population Status and Trend

Based on harvest reports and limited trapper interviews, the population of wolves in Subunit 1D appears to be stable.

Mortality

Season and Bag Limit:

Hunting. There is no closed season or bag limit in Subunit 1D.

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

Human-induced Mortality:

A total of 4 wolves (i.e., 3 males and 1 female) were taken by 3 trappers during this reporting period (Table 1), representing a

slight decline from the previous year's harvest (5) and the 5-year mean (7). Two wolves were taken in traps, one was shot, and one was taken in a snare.

Chronology of Harvest. One wolf was taken in November, two in December, and one in January.

Transport Methods. One trapper accessed the trapping grounds by airplane, 1 trapper used a boat, and one used a highway vehicle.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers appear to be stable in Subunit 1D, and no changes to seasons or bag limits are recommended at this time. Until such time as measurable population objectives for this species are developed, a population capable of sustaining harvests at the 1983-84 level (i.e., 6 wolves/year) should be maintained.

The effects of wolf predation on moose and mountain goats within the subunit should be examined. Substantial public concern exists in Subunit 1D because wolves and, especially, brown bears are limiting moose and mountain goat populations. Moose hunting in Subunit 1D 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 hunting opportunities and meat. Recent surveys suggest that goat populations may also be in a period of decline. Should restrictions be placed on goat hunting as well, sporthunters may advocate stringent predator control measures aimed at both wolves and bears. A better understanding of the predator-prey dynamics in the subunit will be enhance our ability to deal with current and future resource conflicts.

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Table 1. Wolf harvest in Subunt 1D, 1983-84 through 1987-88.

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
Mean	5	2	0	7

STUDY AREA

GAME MANAGEMENT UNIT: 5 (6,235 mi²)

GEOGRAPHICAL DESCRIPTION: Cape Fairweather to Icy Bay, eastern Gulf Coast

BACKGROUND

Anecdotal information indicates that wolves were present in the Yakutat Forelands area prior to the immigration of moose in the early 1930's (ADF&G files). There were no reports of wolves inhabiting the west side of Yakutat Bay (Subunit 5B) before 1971, which was well after the time moose had become established; viable wolf populations were probably established by 1976. Klein (1965) suggested that wolves gained access to the Yakutat 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 are probably very important for wolves as a late-fall/early winter food source.

Wolves played a role in the reduction of moose numbers in Subunit 5A in the mid-1970's. Severe winter weather was probably the most important cause of mortality, but predation by wolves, hunting, and reduction of browse quality (due to over-browsing) contributed to the decline. "Wolf-control" was attempted from 1974 to 1976, but only 1 wolf was killed; bad weather, rough terrain, and dense forest prevented a higher take.

POPULATION OBJECTIVES

To measure the economic value of wolves so that a planned management system can be implemented.

METHODS

Wolves were sealed by ADF&G staff in the Yakutat area office. Incidental observations of wolves were made during February aerial surveys of moose, and public and agency observations of wolves were noted.

RESULTS AND DISCUSSION

Population Status and Trend

A minimum population of 40 to 50 wolves in 5 to 7 packs occupies the Yakutat and Malaspina Forelands. While there are no quantitative data available, reports from reliable observers suggest that wolf numbers are stable.

Mortality

Season and Bag Limit:

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 Unit 5 in 1987-88 (Table 1), compared with the 5-year mean of 10 (range, 4 = 14). Five males and 3 females were taken. Four wolves each came from west and east of the Dangerous River in Subunit 5A. Four gray, 2 black, and 2 white wolves were taken; one was snared, three were shot, and the remainder were trapped.

Trapper Residency and Success. Two nonresidents and 4 local residents were successful in taking wolves. One wolf was taken by each trapper, except for one who took three.

Harvest Chronology. Two wolves were taken in September, none in October, and two in November. One was taken each month from December through March.

Transport Methods. Most wolves (4) were taken by trappers using highway vehicles. Three were taken by trappers using aircraft, and one was taken by a trapper using an off-road vehicle.

CONCLUSIONS AND RECOMMENDATIONS

Preliminary external examination of moose incisors obtained after the 1988 hunting season in Subunit 5A indicates many young (1.5-3.5 year-olds) moose in the harvest; because this increase may reflect a growing moose population, a subsequent expansion of the wolf population may result. Existing seasons and bag limits should be retained, and incidences of predation upon moose should be documented.

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PREPARED BY:

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Table 1. Wolf harvest in Unit 5, 1983-87.

Year	Harvest
1982-83	11
1983-84	10
1984-85	14
1985-86	4
1986-87	13
1987-88	8
Mean	10

STUDY AREA

GAME MANAGEMENT UNIT: 6 (14,300 mi^2)

GEOGRAPHICAL DESCRIPTION: Prince William Sound and northern Gulf Coast

BACKGROUND

Wolves are endemic only to the mainland of Unit 6. Heller (1910) found wolf tracks in Nelson Bay; moreover, locals indicated they were also present east of Nelson Bay. Wolf numbers either declined or were naturally low during the early and mid-1900's. Introductions and expansion of Sitka black-tailed deer in the early 1900's and moose during the 1950's caused expansions of the wolf population in this area. Federal control efforts during the 1940's and 1950's caused a depression of that population, and wolves were notably rare east of Cordova during this period; however, by 1971 they had become reestablished. The wolf's increased presence beginning in the 1970's began to effect substantial reductions in mountain goat populations in Subunits 6A, 6B (Reynolds 1981), 6C, and the extreme portion of eastern 6D.

Population management has been passive. Observations from the public and incidental observations by the staff have produced crude population estimates. The harvest of wolves has been monitored through bounty records, aerial hunting permit reports, and mandatory sealing records.

Management goals for wolf populations in Unit 6 were established in 1976 (Rausch 1977). The primary and secondary goals were to provide an optimum harvest of wolves and the greatest opportunity to hunt or trap them, respectively.

POPULATION OBJECTIVES

To maintain a wolf population at a minimum of 5 packs, while sustaining an annual harvest of 10 wolves

METHODS

Observations of wolves or their tracks by the public and by Department employees were recorded, noting date, location, pack size, colors of individual pack members, and nature of observation. These dates were compared with the reported harvests and then assimilated into population estimates. Wolves harvested by hunters and trappers were sealed by Department staff to identify location, method, and date of harvest; transportation used; the sex and color of the wolf; and the size of the pack it had been a member of.

RESULTS AND DISCUSSION

Population Status and Trend

The wolf population in Unit 6 seems to have increased over the past 5-year period to an historically high level. The estimate has increased from 20-30 wolves (4 packs) in 1983-84 to 63-92 (12 packs) in 1987-88. Some of this increase may be the result of improved data, rather than an actual increase in wolves. Harvest data have been insufficient for indicating population trends in past years (Griese 1987). From 1986 to 1988 observations and evidence of wolves have increased daramatically in the shrub habitat on the Copper River Delta.

Population:

The April 1988 population estimate ranged between 62 and 92 wolves in at least 12 packs (Table 1). A disproportionately low density was indicated for Subunit 6D.

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 reported wolf harvest in 1987-88 was 10 wolves, the highest number ever recorded (Table 2). The previous high had been seven in 1975-76. Comparable harvest records prior to 1963 were not available.

The wolf harvest was distributed disproportionately (Table 3). Subunit 6C accounted for 80% of the reported harvest. The proximity of an increasing wolf population to Cordova is reflected by this distribution. Harvest distribution was evenly distributed between the sexes.

Harvest Chronology. During this reporting period 5 wolves were harvested in January, two in March, and one each in October, November, and February. Harvests during the 4 previous years had been two each in October, November, and January, and one each in August, March and April.

Transport Methods. Three of 10 wolves were harvested by individuals that had been transported by airplane; all 3 wolves were shot from the ground. Over the 4 previous years, six of 9 wolves were shot from the ground; however,

none were shot by individuals that had been transported by aircraft.

Game Board Actions and Emergency Orders

Hunting and trapping regulations for wolves in Unit 6 have not changed in the last 5 years.

CONCLUSIONS AND RECOMMENDATIONS

Population objectives were met during this period. The harvest of 8 wolves in Subunit 6C approaches the maximum sustainable harvest for that subunit; however, harvest and effort in the remainder of the unit were far below potential levels.

No changes to current regulations are recommended. Sustainable harvest levels for the current population in Unit 6 probably range between 20 and 30 wolves. Harvest efforts have been light, with the exception of Subunit 6C. Poor weather conditions, distance to population centers, limited access points, and basic lack of interest for harvesting furbearers suggest that additional regulatory limitations are unnecessary.

Because the wolf's role as predator in Unit 6 is not understood, it should be investigated. The increased presence of wolves 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). Wolves are also highly suspected causes of the dramatic decline of mountain goat numbers in much of the unit. While public opinion is unlikely to allow wolf control measures as a management option, understanding the impacts of unmanaged predators is essential to management of prey species.

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Table 1. Wolf population estimate by subunit in Unit 6, August 1987-April 1988.

	Subunit				
	6A	6B	6C	6D	Total
Wolves observed (packs)	6 (1)[a]	8 (2)	10 (2)[a]	0 (0)	24 (5)
Estimated population (packs)	30-38 (+5)	10-19 (+2)	10-15 (+2)	13-20 (+3)	63-92 (+12)

[a] Estimated from tracks.

Table 2. Historical wolf harvest reported for Unit 6, 1983-1988.

Regulatory year	Harvest[a]
1963-64	1
1964-65	1
1965-66	5
1966-67	0
1967-68	0
1968-69	0
1969-70	1
1970-71	0
1971-72	0
1972-73	3
1973-74	6
1974-75	4
1975-76	7
1976-77	4
1977-78	3
1978-79	3
1979-80	0
1980-81	2
1981-82	1
1982-83	1
1983-84	2
1984-85	3
1985-86	1
1986-87	3
1987-88	10
Total	61

[a] Data between 1963 and 1971 are from aerial hunting permits and bounty records; 1971 to 88 data are from sealing records.

Table 3. Annual wolf harvests in Unit 6 from 1983-84 to 1987-88 and by subunit for 1987-88.

Year	Reported				Estimated other[a]	Total
	Male	Female	Unknown	Total		
1983	1	1	0	2	3	5
1984	2	1	0	3	1	4
1985	0	1	0	1	1	2
1986	1	1	1	3	5	8
1987	5	5	0	10	1	11
Subunit						
A	1	0	0	1	1	2
B	0	1	0	1	0	1
C	4	4	0	8	0	8
D	0	0	0	0	0	0

[a] Includes unreported, unrecovered, and illegal harvests.

STUDY AREA

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

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

Following a 50- to 60-year absence, wolves reestablished populations on the Kenai Peninsula during the 1960's. In 1961 Jack Didrickson (ADF&G files) observed the first single wolf between Skilak and Tustumena Lakes. The regularity of observations increased throughout the 1960's; the first wolf pack sighting occurred in 1968 by Dimitri Bader (ADF&G, files).

The high losses of moose calves to starvation and the weakened condition of adult moose because of the severe winters of 1972 through 1975 made prey easily available, benefitting the expanding wolf population. In less than 15 years, wolves apparently repopulated the most suitable habitats; moose were the primary prey species; Peterson and Woolington (1981) estimated that wolf predation annually claims 9-15% of the calves and 5-7% of the adult moose in the area.

Aerial track counts conducted by ADF&G from 1975 to 1988 indicated that the Kenai Peninsula wolf population increased rapidly during the early 1970's, remaining relatively stable at about 200 animals through the reporting period. 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.

The legal wolf harvests on the Kenai Peninsula were begun with a permit hunt during the winter of 1973-74. Two wolves were harvested in 1973-74; six were harvested in 1974-75 (Table 1). Because both hunting and trapping were allowed in 1975-76, the harvest increased to 15 (i.e., six by trappers, nine by hunters). Although the 9-month season was liberal, the harvest of wolves increased only slowly until 1978-79, when 55 wolves were taken. The harvest from 1978-79 through 19878-88 ranged from 42 to 65 wolves, averaging 49; this mean annual harvest indicates that 25% of the estimated population has been harvested annually since 1978-79. The harvest, however, has not been equally distributed by unit or subunit. Subunit 15A supported the majority of the harvest because of its high wolf population, good access, and proximity to the 2 largest cities 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 summer and early fall. Almost all wolves have been taken for recreational purposes. Those that were trapped were taken primarily for recreation; the dollar value received for pelts was a secondary benefit. Most wolves have been taken by trappers and hunters operating from the road system, although some have been taken by trappers utilizing aircraft for accessing their traplines. In the spring of 1986 the Board of Game prohibited the use of aircraft to locate wolves for the purpose of landing and then shooting them. This land-and-shoot method of killing wolves was responsible for only 6% of the annual harvests from 1973 to 1985, occuring in only five of the 12 years. The low harvest was not attributed to the lack of wolves or hunting effort; rather, it was attributable to poor tracking and landing conditions, because many areas were heavily forested or closed to aircraft (i.e., Kenai National Wildlife Refuge).

POPULATION OBJECTIVES

To maintain 28 wolves with a postseason range of 25 to 38 in Subunit 15A, excluding the Big Indian and Quartz/Mystery Creek packs.

To maintain a moderate but secure spring wolf population in Subunits 15B and 15C and Unit 7.

METHODS

Aerial surveys were scheduled during November and December and conducted only after suitable snow cover and tracking conditions had occurred. Additionally, information was provided by local trappers concerning wolf pack distribution and size for areas not surveyed. 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 during this reporting period because of unfavorable snow conditions during early winter. Harvest data, observations by Department staff, and reports from trappers suggested the number of wolves had not significantly changed from that of the previous year. A slight decline over the peak population estimate in 1983 continued to occur in Subunit 15A; however, the discovery of a new pack in Subunit 15C during 1985-86 and reduced harvest because of the closure of lynx trapping during 1987-88 maintained the current population estimates at 200 wolves (21 packs) in Units 7 and 15.

Season and Bag Limit:

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:

Twenty-five wolves were killed during the 1987-88 hunting and trapping season in Units 7 and 15. The male:female ratio was 20:5. This harvest represents 13% of the estimated population. The historical harvest by subunit is summarized in Table 1. Eight (35%) wolves were taken by ground shooting, nine (39%) by trapping, and six (26%) by snaring.

Harvest Chronology. The chronology of harvest was as follows: August, 1(4%); September, 3 (13%); December, 5 (22%); January, 10 (43%); February, 3 (13%); and March, 1 (4%). Fifteen (60%) of the 25 wolves harvested were classified as either pups or adults; of those, seven (47%) were pups and eight (53%) were adults.

Natural Mortality:

Although the deaths of wolves are commonly related to natural causes, actual observations of such events are uncommon. A radio-collared wolf in Subunit 15A was found dead near Beaver Lake during November 1987. This wolf was a young dispersing male that had been killed by the resident pack of that portion of Subunit 15A. Inspection of the carcass revealed it had not been fed upon by other wolves.

Game Board Actions and Emergency Orders:

The Board of Game adopted a Department proposal during the spring 1987 meeting to reduce wolf trapping seasons to 10 November-28 February. The hunting season and bag limit were not changed.

If the postseason population rises beyond 35 wolves for 2 consecutive years, the trapping season for wolves and coyotes will be extended by Emergency Order in the second year. If the estimated fall population is less than 38 in any year, the trapping and hunting season will immediately be closed by Emergency Order.

CONCLUSIONS AND RECOMMENDATIONS

The harvest of 25 wolves represents 13% of the early winter population estimate of 200 for Units 7 and 15. With this rate of harvest, the wolf population is expected to increase over most of the Kenai Peninsula.

Wolves residing in Subunit 15A should be monitored closely because of the potential for excessive harvests in that area; the harvest should be managed on a quota basis. Hunting and trapping should be closed by Emergency Order if the estimated minimum population reaches 28 animals. No changes in seasons or bag limits are recommended.

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PREPARED BY:

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SUBMITTED BY:

John Trent
Management Coordinator

Table 1. Known wolf mortalities for Units 7 and 15, 1973-74 to 1987-88.

Year	Unit 7	Subunit 15A	Subunit 15B	Subunit 15C	Total
1973-74	1	0	0	0	2[a]
1974-75	1	0	1	4	6
1975-76[b]	7	3	1	8	9
1976-77[b]	3	5	2	3	13
1977-78[b]	16	5	7	8	19
1978-79[b]	12	24	5	14	55
1979-80[b]	6	15	13	12	46
1980-81[b]	12	18	1	11	42
1981-82[b]	12	28	15	7	62
1982-83[b]	8	27	10	3	48
1983-84	10[b]	27[c,d]	5	8	50
1984-85	5[b]	32[c]	3	7	47
1985-86	13[b]	23[c,e]	13	16	65
1986-87	20[b]	8[c]	13	8	49[f]
1987-88	3	8[c]	9	5	25

[a]Two nonsport kills.

[b]Trapping season: 10 November to 31 March.

[c]Trapping season: 10 November to 15 March.

[d]Western portion of 15A closed to trapping and hunting February 12 because of lice control efforts.

[e]Trapping and hunting closed 15 February 1986 (quota set at 20)

[f]One nonsport kill in Unit 7 and one nonsport kill in Subunit 15B.

STUDY AREA

GAME MANAGEMENT UNITS: 9 (45,500 mi^2)
10 Unimak Island (1500 mi^2)

GEOGRAPHICAL DESCRIPTION: Alaska Peninsula and Unimak Island

BACKGROUND

Wolves occur throughout Unit 9 and on Unimak Island in Unit 10 in low-to-moderate densities. Specific data on historic wolf abundance are lacking, but the population was probably reduced following wolf control efforts by USFWS during the 1950's.

Prey abundance has varied during the past 20 years. Moose densities north of Port Moller have decreased significantly. The Mulchatna caribou herd increased from about 14,000 in 1974 to about 60,000 in 1988. 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 in 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 during the past 10 years. Although the mainland segment of the Southern Alaska Peninsula Herd peaked at over 10,000 in 1983, it had declined to 6400 by 1987.

POPULATION OBJECTIVES

To maintain a wolf population that will sustain a 3-year-average harvest of 50 wolves per year in Units 9 and 10.

METHODS

No specific data have been collected on wolf densities in Units 9 and 10. Trends are monitored through observations made during other field work, reports from hunters and guides, and 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. Twenty-three trappers rated the abundance of wolves as low (11), moderate (10), and high (2); whereas in 1986-87, 4 trappers said there were fewer wolves, 10 said there were about the same number, and two said there were more wolves.

Population Size

Based on incidental observations of wolf packs and estimated territory sizes, I estimate that Units 9 and 10 contain a minimum of 150 wolves; it is probably conservative. Considerable funding, as well as abnormally good snow and flying conditions, would be required to obtain a refined, objective estimate of the population size.

Mortality

Season and Bag Limit:

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 Units 9 and 10 is 10 November 10 31 March; there is no bag limit.

Human-induced Mortality:

The 1987-88 reported harvest in Unit 9 was 37 wolves (25 males, 11 females, and one not specified); on Unimak Island 4 wolves were harvested (2 males and 2 females). Eighty-five percent (35/41) of the harvested wolves had been shot.

Harvest Chronology. Thirteen wolves (32%) were taken during October. Of the remainder, 1 (2%), 12 (29%), 3 (7%), 7 (17%), and 2 (5%) wolves were harvested in November, January, February, March, and an unspecified date, respectively. The 1987-88 harvest was nearly the same as that for the previous year; however, it was slightly above the long-term average of 26 for Unit 9.

Transport Methods Inaccurate reporting of the method of transportation used for harvesting wolves limits the analysis; however, I believe that at least 70% involved the use of aircraft.

Game Board Action and Emergency Orders

During the 1987 fall meeting, the Board of Game made changes in the hunting and trapping regulations. The harvest of wolves on the same day that a trapper had been airborne was prohibited statewide.

In Unit 9 it was allowable to harvest wolves on the same day that a hunter had been airborne; the season limit was established at 10 wolves.

CONCLUSIONS AND RECOMMENDATIONS

Wolf harvests in Unit 9 vary widely, according to weather conditions and the activity of several individuals who use aircraft; however, I believe that the harvest level has had little impact on the wolf populations in Units 9 and 10. No regulatory changes are recommended.

For practical and budgetary reasons, an accurate estimation of the wolf population has not been possible in Unit 9; however, the National Park Service has recently expressed an interest in acquiring more information on wolves in the 3 parks/preserves in the unit. If funding is approved for this research, the resulting population density estimate can be extrapolated to the remainder of Unit 9.

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STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Wrangell Mountains

BACKGROUND

From 1900 to 1930 wolf numbers were low in Unit 11; however, the wolf population subsequently increased, and a wolf control program was initiated in the late 1940's (Skoog 1968). After the conclusion of this program, wolves increased throughout the unit; by the early 1970's they had become abundant (i.e., 1 wolf/8 mi^2 or 100-125 wolves; McIlroy 1974). Since sealing became mandatory in 1971, reported wolf harvests in Unit 11 have fluctuated widely. Between 1972 and 1982 they averaged 27 wolves per year (range = 6-51).

POPULATION OBJECTIVES

To maintain the wolf population at a minimum of 50 wolves after the hunting season.

METHODS

The harvest is monitored through the mandatory sealing process. Population estimates are obtained by interviewing hunters and trappers when pelts are sealed and by recording the number and distribution of all wolves incidentally observed while conducting aerial surveys for other species.

RESULTS AND DISCUSSION

Population Status and Trend

The wolf population in Unit 11 increased slightly from the fall of 1985 to the fall of 1987. Historically, wolf numbers have fluctuated from year to year in response to harvest rates. Overall, the wolf population is considered to be stable or increasing slowly.

Population Size:

The 1987 population estimate (i.e., 110-130 wolves), is higher than those for 1985 and 1986 (i.e., 80-100 and 100-125 wolves, respectively).

Distribution and Movements:

Wolf densities appear to be higher in the northern portions of Unit 11, especially from the Dadina River north to the Copper River.

Caribou are available to wolves in this area, and moose are more abundant than in areas to the south. Although the wolf population in the lower Chitina River Valley is stable, densities are lower. In this area caribou are absent, moose numbers are low, and sheep and mountain goat are more heavily utilized.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Hunters and trappers sealed 27 wolves from Unit 11 during the 1987-88 season (Table 1); although the harvest represented almost twice the number taken the previous year, it was near 5-year (1983-86) average of 24 wolves. Males composed 56% of the harvest; since 1983 they have composed 59% of the total harvest. Sealing data for the 1987-88 reporting period indicate that wolf harvests were not distributed evenly throughout the unit. Hunters and trappers reported taking 24 (89%) wolves from the area north of the Dadina River to the Unit 12 border.

Table 2 presents the harvest methods over the past 5 seasons (1983-34 to 1987-88). Overall, more wolves have been taken by trapping and snaring than by shooting. From 1985 to 1987, when the number of wolves taken by the land-and-shoot trapping method were recorded, ground shooting and land-and-shoot methods accounted for equal numbers of wolves (i.e., 9). Illegal harvests occur in Unit 11, but they are not common. Prior to 1987, most illegal harvests occurred by aerial shooting. In 1987, 5 wolves were taken by a trapper using poison baits.

Hunter and Trapper Residency and Success. During the 1987-88 season 16 individuals sealed one or more wolves from Unit 11, averaging 1.4 wolves/trapper. During the past 5 seasons, the average harvest was 2.1 wolves/trapper. Two nonresidents each took 1 wolf during the past season.

Harvest Chronology. Table 3 presents the chronology for wolves harvested over the past 5 years. Overall, harvest rates for each month have varied from year to year and no trends have been evident. The harvest chronology most likely reflects favorable snow and weather conditions each year, rather than any particular pattern of effort or success.

Transport Methods. The method of transportation used in taking wolves has only been recorded on sealing certificates since 1985; for the past 3 years, snowmachines and aircraft have been

principally used (Table 4). Individuals using aircraft were primarily big game hunters. Aircraft use during the winter by trappers was minimal.

Game Board Actions

In 1986 the Board of Game made it illegal for trappers to kill wolves by the land-and-shoot method, unless the wolf had been caught in a trap or snare. Because wolves could also be hunted, land-and-shoot hunting remained legal; however, the Board has prohibited it beginning with the 1988-89 season.

CONCLUSIONS AND RECOMMENDATIONS

Wolves are numerous in Unit 11; the fall estimate was the highest in 3 years. In recent years, the estimated number of wolves far exceeded the management objective (i.e., 50 post-season wolves). Field observations suggested that wolves were numerous in the area north of the Dadina River; 89% of the harvest was from this area. Wolf numbers are low in the Chitina River Valley, presumably in response to low prey densities. Recent reported harvests from this area have been very low, although there are many trappers in this area (i.e., especially along the Chitina-McCarthy Road).

All population estimates for Unit 11 are based on field observations by ADF&G staff as well as reports of sightings by hunters, trappers, and others. Because track surveys have not been conducted since 1978, I recommend that they be initiated in an established survey area to obtain more dependable population density and trend data. To coincide with areas of greatest wolf abundance and include as much of the Mentasta caribou calving area as possible, the survey area should be located north of the Dadina River.

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Table 1. Annual wolf harvests in Unit 11, 1983-87.

	1983-84	1984-85	1985-86	1986-87	1987-88
Total harvest:	33	36	8	14	27
Males	21 (64%)	24 (67%)	4 (50%)	7 (50%)	15 (56%)
Females	11 (33%)	12 (33%)	4 (50%)	6 (43%)	12 (44%)
Sex unknown	0	0	0	1 (7%)	0
Successful trappers	16	13	4	8	16

Table 2. Unit 11 Annual wolf harvest by method of take in Unit 11, 1983-87.

	1983-84		1984-85		1985-86		1986-87		1987-88	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Shooting	0		20	(56)	--	--	--	--	--	--
Trapping	29	(88)	16	(44)	6	(55)	9	(64)	8	(30)
Snaring	0		0		0		3	(21)	2	(7)
Ground shooting[a]	--	--	--	--	1	(9)	2	(14)	6	(22)
Land-and-shoot[a]	--	--	--	--	4	(36)	0		5	(19)
Illegal	0		0		0		0		5	(19)
Unknown	4	(12)	0		0		0		1	

[a] Land-and-shoot was not broken out from other forms of ground shooting in sealing records until 1985.

Table 3. Wolf harvest chronology by month in Unit 11, 1983-87.

Month	1983-84		1984-85		1985-86		1986-87		1987-88	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
September	0		0		0		2	(14)	2	(7)
October	0		0		1	(13)	0		0	
November	7	(21)	9	(25)	1	(13)	0		1	(4)
December	19	(58)	1	(3)	1	(13)	0		2	(11)
January	5	(15)	6	(17)	2	(25)	6	(43)	5	(19)
February	2	(6)	12	(33)	0		5	(36)	9	(33)
March	0		8	(22)	3	(37)	1	(7)	5	(19)
April	0		0		0		0		2	(7)

Table 4. Annual wolf harvest by transportation method in Unit 11, 1985-87.

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

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, which is managed by the National Park Service (NPS). The approximately 1,000,000 acres in eastern Unit 12 immediately north of the preserve compose the Tetlin National Wildlife Refuge, which is 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, approximately 2,000-3,000 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 area is marginal wolf habitat.

In Unit 12 there has been a great deal of public dissatisfaction with the management of wolves and their primary prey species, moose, during the past 20 years; the past 5 years (1984-88) have been particularly controversial. This dissatisfaction stems from the fact that moose are the most sought after subsistence animals in the area (Haynes et al. 1984, Halpin 1987) as well as the primary prey species for wolves (ADF&G files, USFWS files). Therefore, humans and wolves have been in competition for moose in this area for many years.

During the past 20 years moose declined from moderate to relatively low densities in most of the area. Restoration efforts centering on 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 important 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 a 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 the illegal out-of-season harvesting of moose for personal use in this economically depressed area has concurrently developed.

Many nonconsumptive users of wildlife, namely visitors to Alaska using the Alaska Highway, are also dissatisfied with the paucity of moose in this area. Wildlife viewing, particularly viewing and photographing of big game species, is important to most visitors, judging from complaints concerning game scarcity received by the Department and local workers in the tourism industry. Previous to the mid-1970's, moose and wolf densities in Unit 12 were comparable to 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, declining precipitously by the late winter of 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 densities by 30-40%. The wolf populations took 3-5 years to recover (Boertje et al. 1985). Moose populations in the Unit 12 portion responded by approximately doubling in size in the Robertson River drainage. Moose population growth in these areas has now stabilized far below carrying capacity; however, moose populations in other areas have not benefited from this program. Yearling recruitment rates in the control area doubled as a result of the reduction in wolf numbers.

Both moose and wolf populations exist at densities lower than the habitat can support in the majority of Unit 12. The wolf population is probably limited more by depressed moose populations than by human exploitation (Keith 1983). Annual harvests of wolves have been much lower than required to control wolf population growth. Trapping pressure on wolves is light in Unit 12.

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 to the trappers. Wolves are wary and difficult to trap, and they 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.

Although unable to continue the control program, 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 found to be ≥10 years of age. This small sample suggests a skewing toward an old age structure, possibly reflecting poor recruitment. During the next 3 years, predation was the probable cause of death for five of these adults. Wolves killed two and both wolf and grizzly bear tracks were present at the other three 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 cases (63%) and was suspected in one other. Although 1985 was a year of exceptionally high calf survival, 55% of the study calves died within 34 weeks of birth. The conclusions of this study are that (1) wolves were the most important predator on moose during that spring and (2) wolf predation alone could have prevented moose population growth.

Following the 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 4 wolf packs containing 38 wolves (range = 5-15 wolves/pack) were radio-tracked on a daily basis. One lone male was also located daily during the same period (16 January-13 February) (S. Breeser, pers. commun.). The observed time interval between kills ranged from 2.5 days for a pack of 15 wolves to 7 days for the pack of five. Two packs with 9 members each averaged a kill every 4 and 5 days, respectively. The lone wolf killed only once in 29 days. Of the 29 kills observed, 26 were moose; adult caribou 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 from 16 May to 15 June 1988, 7 collared members in a pack of 8 wolves were monitored twice daily (J.J. Doyle, pers commun.). 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. Clearly the most important prey, moose were killed at the rate of 1.37 per wolf per month, approximately twice the winter kill rate.

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

GOALS AND OBJECTIVES

Strategic Goals

To provide for an optimum harvest of wolves

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

Management Objectives

To monitor wolf numbers, population characteristics, and harvests.

To temporarily reduce wolf numbers from an estimated 207 to less than 100 by 1993.

To allow wolf numbers to increase and reach an equilibrium with available prey after moose numbers increase to desired levels.

To increase the moose population in Unit 12 from an estimated 2,500-3,500 to 5,000-7,000, with an annual harvestable surplus of 3% (150-210/yr) by the year 2000.

METHODS

Estimating Wolf Population Size

Extensive aerial wolf surveys during March and April have been conducted periodically since 1980. 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. Lastly, 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 that were wholly or partially in Unit 12 were included in the estimate. Previous attempts to adjust the estimate for "border" packs were unproductive.

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. A mean percentage change was then calculated for these "known" packs and subsequently used as a correction factor to estimate the earlier sizes for those packs counted in late winter but not in the fall. This assumes homogeneous trapping pressure throughout the subunit.

Determining Wolf Population Characteristics

During the past 8 years, wolves in Unit 12 were captured by aerial darting, trapping, or live-snaring, fitted with radio collars, and 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 most wolves are marketed within the state.

RESULTS AND DISCUSSION

Population Status and Trend

The 100 hours spent aerially surveying wolves in Unit 12 during this reporting period resulted in a late-winter estimate of 141 wolves in 26 packs (mean pack size = 4.9, range = 2-12) as well as solitary ones. The calculated fall 1987 population was 201 wolves (mean pack size = 7.0, range = 2-13). Assuming that only 7,000 mi^2 of Unit 12 is actually suitable wolf habitat, the density in the area was approximately 1 wolf/36 mi^2 in the fall of 1987; however, it decreased to approximately 1 wolf/50 mi^2 by the spring of 1988, a decline of about 30% from fall to late winter. These densities may be characterized as moderate to low compared with other areas of Alaska having greater densities of wolf prey species. In contrast, the density ~~of~~ in Unit 12 (i.e., wolves/100 mi^2) is roughly twice that of Subunit 20E, where prey densities are even lower. These low densities are biased upward by inclusion of "border" packs, which actually live outside these units part of the time but are counted in the population of the unit.

The wolf population in Unit 12 is stable at this time. It has fully recovered from the limited wolf reductions (1980-83) in northwestern Unit 12. Prey density (i.e., mostly moose), increased in the area where wolves were removed, but it was not enough to allow significant growth in the wolf population. The largest wolf packs (range = 11-13) continue to exist in those portions of Unit 12 with the greatest availability of ungulate prey year round, while packs having territories in seasonal moose and caribou ranges are generally smaller.

Population Composition:

Based upon observed fall-to-spring changes in the wolf population (-30%), apparent stability from year to year, and the assumption that immigration equals emigration, pups probably compose at least 30% of the population. During the summer of 1987, the 8-member Mansfield Pack had 3 pups (38%) and the 9-member Lick Creek Pack had 3 pups (33%). The following spring the 8-member Yerrick Creek Pack had 4 pups (50%), for an average of 40% pups in these radio-marked packs. Over the years we have observed a steady attrition of yearling and 2-year-old wolves through dispersal, thereby maintaining stability in population size through behavioral mechanisms.

Distribution and Movements:

Wolves occur throughout Unit 12, but the vast icefields and rugged mountains in southern Unit 12 are not inhabited by wolves as consistently as mid- and low-elevation areas (Fig. 1). Not all pack sizes 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 their absence. Figure 1 is presented only as a gross representation of inhabitated wolf range and approximate locations of known pack territories.

Mortality

Season and Bag Limit:

Hunting. The open season in Unit 12 is 10 August to 30 April. There is no bag limit

Trapping. The open season in Unit 12 is 1 October to 30 April. There is no bag limit. No person may take a wolf in Unit 12 or Subunit 20E during April and October with a steel trap or snare smaller the 3x; only land-and-shoot trapping and snaring with 3x or larger snares are legal means during these months.

Human-induced Mortality:

Twenty-one wolves (12 males, 9 females) were sealed in Unit 12 during the 1987-88 season. In addition, 4 wolves were caught in the Ptarmigan Lake area, but they were eaten by other wolves; 6 other wolves were known to have been trapped in the same area, but were not sealed (Table 1). Therefore, hunters and trappers took at least 32 wolves during this reporting period. This level of harvest approximates the 5-year mean of 31 wolves. Other human-caused wolf mortality included the death of 3 pup wolves as a result of a foreign wolf researcher working at the den of the Mansfield Pack in the summer of 1987. Therefore, total human-caused overwinter mortality (n =

32) was about 16% of the estimated fall 1987 population of 201 wolves.

Harvest Chronology. One wolf (4%) was harvested in August, four (14%) in November four (14%) in December, four (14%) in January, eight (29%) in February, seven (25%) in March, and none in April. The date of harvest was not specified for 4 wolves. In previous deep-snow winters much of the late-season harvest has been taken by land-and-shoot trappers, especially in the winter of 1984-85 (Table 1).

Transport Methods. Hunters and trappers using aircraft for access harvested 4 wolves (18%), dog sleds were used for harvesting one (5%), three- or four-wheelers for two (9%), snow machines for 13 (59%), and highway vehicles for two (9%). Transport means are unknown for 10 harvested wolves .

Habitat

Assessment:

Good wolf habitat is determined more by ungulate prey abundance than by vegetative characteristics. Using this criteria, the better wolf habitat in Unit 12 occurs along the foothills of the Wrangell, Mentasta, and Nutzotin Mountains and the eastern Alaska Range, where either resident or migratory moose are available to wolves year round. Even though mountainous areas support dense populations of Dall sheep, wolves apparently cannot thrive on sheep alone as a primary prey species, because the cost in energy is high and they are not always successful. The nonmigratory Chisana Caribou Herd (CCH) also provides a reliable food source for wolves in eastern Unit 12; however, the herd contains only 1,500 caribou. Caribou from the Mentasta, Nelchina, Macomb, and Fortymile herds have also used portions of Unit 12 in recent years, but seasonal movements have been unpredictable and the number of these caribou seasonally available to wolves has fluctuated widely. 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. Human impacts on wolves have been indirectly caused by human competition for prey populations. Harvests of wolves by humans have had an insignificant impact.

Enhancement:

A large percentage of Unit 12 has been afforded limited suppression status for wildfires; unfortunately, much of those areas are essentially unburnable. High mountain valleys are unlikely to burn because of high fuel moistures, low temperatures, and lack of ignition through lightning. Much of the more readily burnable land is in state or private ownership and has been afforded critical, full, or modified suppression status. However, nearly all of the Wrangell-Saint Elias National Park and Preserve and most of the Tetlin National Wildlife Refuge in Unit 12 have a limited suppression classification.

In valley bottom areas near human developments, mechanical improvement of habitat is being accomplished primarily to increase habitat diversity and winter browse supplies for moose that, in turn, should benefit wolves. Over 1,000 acres of tall decadent willow stands have been crushed since 1982; 380 acres were treated during this 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

During their spring 1988 meeting, the Alaska Board of Game voted to prohibit the practice of land-and-shoot harvesting of wolves in Unit 12. This prohibition is expected to reduce future wolf harvests by the public, especially during deep-snow winters such as the one occurring in 1985-86, when land-and-shoot trappers took 23% of the wolf harvest.

CONCLUSIONS AND RECOMMENDATIONS

Wolves in Unit 12 exist at moderately low density and are well distributed throughout suitable habitat. The population appears to be moderately productive and receives only light trapping pressure each year. The annual harvest is not controlling growth in this population. I believe that social interactions precipitated by a limited prey base are causing sufficiently high rates of natural mortality and emigration to stabilize wolf numbers. In turn, wolves are keeping their primary prey species, moose, at densities far below habitat carrying capacity in most of Unit 12.

Strategic human-use goals are not being met at sustainable levels for either wolves or moose, because of the low-density equilibrium being maintained at this time. Strategic goals cannot be satisfactorily achieved until numbers of both species are increased, as specified by population management objectives for these species in Unit 12.

In my opinion, the 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. Although heavier wolf harvests by the public could contribute somewhat to the management of depressed moose populations in the unit, they are unlikely to cause moose population growth. Under existing conditions, I do not think wolf harvests by the public can lower wolf numbers enough to cause significant moose population growth. Additional efforts by the Department will be necessary, if wolf numbers are to be reduced sufficiently for moose numbers to increase significantly.

First, I recommend that the Alaska Board of Game reverse its recent prohibition against land-and-shoot trapping of wolves in Unit 12. This would increase public opportunity to harvest wolves. Increasing opportunity to hunt and trap wolves to the maximum is a current management goal. It would also promote an optimum wolf harvest.

Second, I recommend that wolves be managed in concert with black bears, grizzly bears, and moose in northwestern Unit 12, an area composed mostly of state and private lands. This area is of great importance to local subsistence moose 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 illegal human harvest At this time, legal moose harvests are being maintained at less than 3% of the populations and are limited to bulls, except for those taken for funeral potlatches. Bear hunting regulations are liberal. Because exploitation of wolves by the public is so light in this area, the Department should implement a wolf reduction program to effect desired growth in moose numbers.

My recommendation to conduct a temporary wolf reduction effort in this area is consistent with both the existing strategic goals and management objectives. It is also consistent with guidelines for such programs recognized in the "Manifesto on Wolf Conservation" adopted by the 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."

As it did in the early 1980's a 60-80% reduction in fall wolf numbers in this area could be expected to nearly double the recruitment of yearling moose. If this degree of wolf population reduction can be effected and maintained for 5 years, significant growth of these moose populations can be expected. Afterward, wolf numbers should increase rapidly in

response to the expanded prey base. The result would be greatly enhanced human-use opportunities, both consumptive and nonconsumptive, for both 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 the hardships being endured by local subsistence hunters and lead to increased tension between local subsistence and nonlocal recreational 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 due to internal agency policies. This leaves state and private lands available for restorative game management to meet consumptive demands.

Many local hunters feel that demands by nonconsumptive users for unhunted and unmanaged wildlife populations were generously addressed by the creation of vast new national parks through ANILCA. These Alaska residents have frequently stated their belief that game on other lands should be managed more intensively. The prevailing situation (i.e., where wildlife on state and private lands are being maintained at levels these residents find unacceptably low because of recent regulatory actions that protect wolves at the expense of moose) has been criticized as unwise and senseless. It is impossible to satisfactorily explain to local subsistence hunters and fish and game advisory committees why, in their perception, their problems are not being addressed.

In Unit 12 nonconsumptive users can enjoy wolves in aesthetic surroundings in the Wrangell-Saint Elias Park. I also recommend that an additional strategic goal be adopted for that portion of Unit 12 within the Wrangell-Saint Elias National Park but not in the Preserve: to provide opportunity

to view and study wolves largely unaffected by hummans in a remote, undeveloped environment within the Wrangell-Saint Elias National Park.

My rationale is that the NPS is opposed to wolf population control and has the unilateral authority to prevent any management action designed to result in significant human-caused reductions in wolf abundance. Most of the Wrangell-St. Elias Park area has also been designated as wilderness where wildlife habitat values will be preserved. It is an ideal area in which to attempt to enjoy wolves in solitude. Conversely, management could 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.

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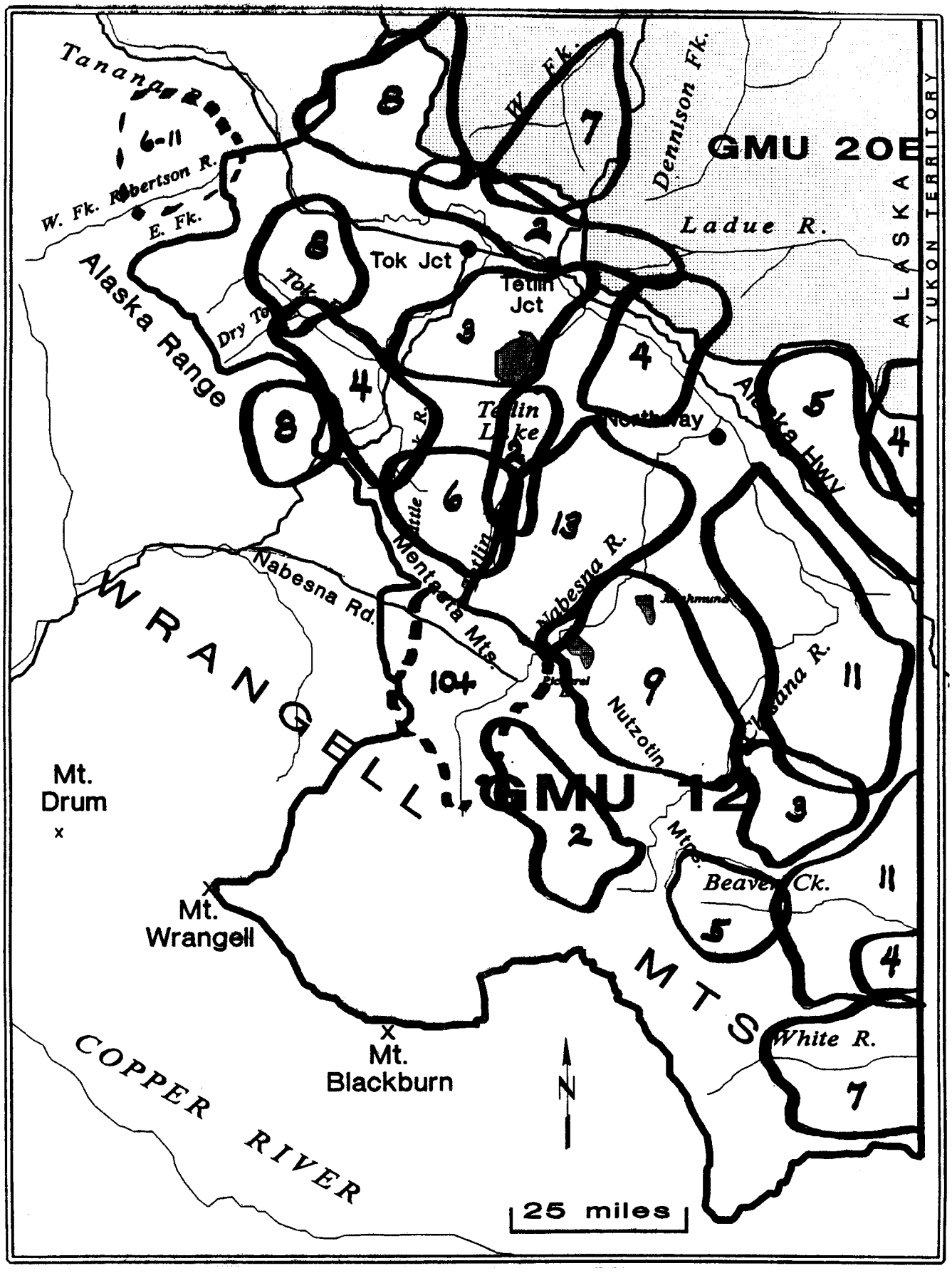

Figure 1. Approximate wolf pack territories and pack sizes during winter 1987-88, Unit 12.

Table 1. Wolf harvest characteristics, Unit 12, 1983-87.

Year	Total trapping	Total hunting	Total taken	Method of Take: Land-shoot n(%)	Method of Take: Trap-snares n(%)	Method of Take: Unk n	Sex: M n(%)	Sex: F n(%)	Sex: Unk n
1983	20	2	22	--	18(100)	2	12(55)	10(45)	0
1983[a]	1	--	--	--	--	--	1(100)	--	--
1984	18	2	20	2(22)	7(78)	9	5(45)	6(55)	9
1985	41	4	45	9(23)	31(77)	1	23(55)	19(45)	3
1986	33	3	36	2(6)	31(94)	0	13(39)	20(61)	3
1986[b]	--	--	1	--	--	--	--	--	--
1987	31	1	32	--	31(100)	0	13(59)	9(41)	10
Mean	31[a]	2.4	28.6	2.6(10)	23.6(90)	2.6	13.6(52)	12.8(48)	5

[a] Wolves taken by ADF&G (control 1983; research 1986).

[b] Includes wolves taken by ADF&G.

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Nelchina and upper Susitna Rivers

BACKGROUND

The wolf population in Unit 13 was low from the late 1900's until the early 1930's, reflecting low prey densities (Skoog 1968). Numbers subsequently increased, 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 reviewed by Rausch (1967), only 12 wolves remained in Unit 13 in 1954. Following the cessation of wolf control, wolves 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 until 1979 (Ballard et al. 1987).

Prior to statehood (i.e., 1959), wolves were harvested according to FWS regulations that provided for year-round seasons and no bag limits; denning and aerial shooting were legal, and bounties were paid. Wolf control, which included use of poison baits, was conducted between 1948 and 1953. In 1960 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 sealing requirements were established and aerial shooting without a permit was prohibited (Harbo and Dean 1983). Between 1971 and 1982 an average of 87 (range = 46-128) wolves per year were sealed in the unit.

POPULATION OBJECTIVES

To maintain the wolf population at a minimum of 150 wolves following the hunting and trapping seasons.

METHODS

To determine pack sizes and distribution of wolves, aerial surveys were conducted during late February or March in portions of the unit. The population estimate obtained during these surveys, as well as other data, is used to determine a population estimate. Harvests are monitored through the mandatory sealing process. Trappers are interviewed when pelts are sealed to obtain additional population or trend information pertaining to wolves 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; since 1983 the population has been relatively stable (Table 1). Fall wolf estimates over this period indicated that wolf numbers increased approximately 80% from spring to fall, suggesting a rather high yearly recruitment.

Population Size:

Fall and spring population estimates are presented in Table 1. The spring 1988 estimate of 160 wolves is identical to that for 1987 and close to the 5-year average (1984-88) of 155.

Distribution and Movements:

Wolf distribution and abundance are primarily dependent on the availability of prey. Wolf numbers are typically higher in habitat types that support high moose numbers. Wolf packs in Unit 13 maintain stable territories and do not appear to be migratory, except within their own territory. Wolf distribution is also affected by escape cover; wolves are currently more numerous in forested areas, where land-and-shoot trapping is not possible. Wolves are vulnerable to this method when they frequent open areas; e.g., large lakes, rivers, or tundra habitats.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Hunters and trappers sealed 109 wolves in Unit 13 during the 1987-88 season, representing a 30% increase from the previous year's harvest of 84 and a 7% increase over the 5-year (1983-87) mean of 101 wolves (Table 2). Males composed 58% of the 1987-88 harvest. These composition figures are similar to those for the past 5 years; i.e., males composed 60% of the harvest.

Table 3 presents the methods for harvesting wolves in Unit 13. Wolves taken by the land-and-shoot method have been recorded since 1985. From 1983 to 1988, the land-and-shoot method has accounted for 51% of the harvest, compared with 40% for trapping and snaring. The increase in the reported land-and-shoot wolf harvest in 1987-88 was attributed, in part, to good snow conditions. Snow cover was deep enough to create good aerial tracking and landing

conditions for land-and-shoot trappers. Because this method will be prohibited beginning with the 1988-89 season, the use of aircraft by land-and-shoot trappers was particularly heavy during the reporting period.

Illegal harvesting of wolves, mostly by aerial shooting, occurs in Unit 13. Although observations of suspected illegal harvest sites by ADF&G personnel and others suggest the number of wolves taken in this manner is not large, during this reporting period substantial illegal wolf harvesting may have occurred. One report placed the illegal harvest of 2 individuals at 35 wolves; citations were not issued because the allegations could not be substantiated.

Hunter and Trapper Residency and Success. In 1987-88, 50 trappers sealed one or more wolves from the unit; the average harvest was 2.2 wolves/trapper. The average annual harvest per trapper over the last 5 years (1983-88) has also been 2.2 wolves. Four nonresidents sealed 17 wolves from Unit 13 during 1987-88, averaging 4.3 wolves each.

Harvest Chronology. Table 4 presents the harvest chronology for wolves harvested in Unit 13 over the past 5 years. Overall, more wolves have been harvested during January, February, and March than at any other time. Ground-based trappers have consistently reported taking over 50% of their catch during the early part of the season; in 1987-88 they reported taking 65% of their catch during November and December. Land-based trappers usually have the first opportunity to harvest wolves, because they need far less snow to run snowmachines and set traps than is required to aerially track wolves or land aircraft in various types of terrain. The months of February and March generally have had snow conditions more favorable for aircraft-based trappers, especially those using the land-and-shoot method.

Transport Methods. The methods of transportation used by trappers to harvest wolves have been recorded only for the past 3 years (Table 5). The majority of wolves were taken with the use of aircraft for transportation. Many wolf packs never come near a road or an established trapline. Snowmachines were also an important transportation method for accessing wolf habitat. Other methods of transportation accounted for relatively few harvested wolves.

Natural Mortality:

In a portion of Unit 13, natural mortality rates for radio-collared wolves were determined by Ballard et al. (1981), who attributed 11% of the annual mortality to intraspecific strife and 9% to injuries, starvation, and drownings. The remaining 80% were attributed to legal and illegal human harvests.

Game Board Actions

In November 1987 the Board of Game prohibited the harvesting of wolves by the land-and-shoot method (i.e., beginning with the 1988-89 season) unless it was already in a trap or snare. Hunters or trappers using aircraft for transportation cannot shoot a wolf until after 0300 hours of the following day on which flying occurred.

CONCLUSIONS AND RECOMMENDATIONS

Between 1975 and 1982, wolf population estimates for Unit 13 were obtained by extrapolating densities determined from radio-collared packs in a portion of the unit (Ballard et al. 1987). Since 1983 estimates have been derived by extrapolating numbers of wolves determined from track surveys in a portion of the unit; observations reported by hunters, trappers, ADF&G personnel, and others are also taken into consideration. Extrapolations based solely on these 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 to replace or supplement track surveys; however, a reliable technique for estimating wolves without the extensive use of radio collars has not been developed. I recommend that research be directed at 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.

Currently, the wolf population is relatively stable, because human exploitation rates have been high. The recent spring population estimate of approximately 160 wolves slightly exceeds the population objective of 150 wolves. Annual recruitment is high, and it appears that 100 wolves can be harvested annually without resulting in a population decline, provided the spring population remains at 160 wolves.

Over the past few years, land-and-shoot harvesting has been the most popular and successful method of taking wolves in Unit 13, but it has been prohibited starting with the 1988-89 trapping season. The effect of this restriction on the wolf population is unknown. Since land-and-shoot trappers have taken a large proportion of the harvest, it is unrealistic to expect ground-based trappers to initially make up the difference. Most wolves harvested in interior portions of the unit were taken by the land-and-shoot method, while harvest by ground-based trappers occurred in close proximity to the road system. Until trapping patterns in the unit change in response to the new restriction, I expect to see a decrease in the number of wolves harvested in the more remote portions of the unit.

The management plan for wolves has always provided for the maximum opportunity to participate in wolf hunting and trapping. Wolf

harvests have usually been limited by the number of wolves available and hunting or trapping conditions, rather than by regulatory controls. Usually when the spring population has declined, trapper success has also dropped and the wolves have increased without departmental intervention. Accordingly, when wolves increased, trapping pressure and harvests also increased. Human harvests limited the upward expansion of the wolf population; however, the new restriction on methods and means of trapping may reduce the number of wolves trappers will be able to take. Given the demonstrated reproductive potential of wolves, the wolf population in Unit 13 could increase substantially.

I recommend that increased monitoring of wolf numbers, distribution, and predation rates be initiated as soon as possible to detrmine the impact, if any, that the new restrictive trapping regulations may have on wolf numbers or distribtuion. New management plans for wolves and their prey need to be developed to reflect regulation changes. I recommend that plans be drafted that set new guidelines for the minimum and maximum number of wolves to be maintained in the unit. These objectives should be developed so that they are compatible with those for important prey species such as moose and cairbou. The wolf population should be managed within these new management guidelines, and it should not be allowed to increase above or decrease below these objectives.

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SUBMITTED BY:

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Table 1. Wolf population estimates in Unit 13, 1975-88.

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
1991	160 (135-185)	N/A

Table 2. Annual wolf harvest by subunit in Unit 13, 1983-87.

Year	Subunit					Unknown	Total unit
	A	B	C	D	E		
1983-84	30	26	15	26	17	4	118
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
Mean	28	22	18	16	17	1	101

Table 3. Methods used for annual harvesting of wolves in Unit 13, 1983-87.

Method	1983-84 No. (%)	1984-85 No. (%)	1985-86 No. (%)	1986-87 No. (%)	1987-88 No. (%)
Shooting	76 (65)	85 (68)	-- --	-- --	-- --
Trapping	31 (26)	34 (27)	22 (32)	31 (37)	32 (29)
Snaring	7 (6)	3 (3)	11 (16)	6 (7)	2 (2)
Ground shooting[a]	-- --	-- --	8 (12)	7 (8)	6 (6)
Land-and-shoot[a]	-- --	-- --	28 (40)	37 (44)	69 (63)
Unknown	4 (3)	3 (2)	0	3 (4)	0

[a] Land-and-shoot was not broken out from other forms of ground shooting in sealing records until 1985.

Table 4. Wolf harvest chronology by month in Unit 13, 1983-87.

Month	1983-84		1984-85		1985-86		1986-87		1987-88	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
August	2	(2)	1	(1)	0		1	(1)	0	
September	3	(2)	1	(1)	4	(6)	5	(6)	2	(2)
October	0		0		1	(1)	1	(10)	1	(1)
November	16	(14)	11	(9)	7	(10)	10	(12)	4	(4)
December	17	(14)	13	(10)	4	(6)	6	(7)	21	(19)
January	24	(20)	4	(3)	8	(12)	27	(32)	24	(22)
February	41	(35)	38	(30)	12	(17)	20	(24)	40	(37)
March	13	(11)	58	(46)	31	(45)	14	(17)	16	(14)
April	2	(2)	0		0		0		1	(1)
Unknown	0		0		2	(3)	0		0	

Table 5. Methods of transportation used during the annual wolf harvests in Unit 13, 1985-87.

Transportation		1985-86		1986-87		1987-88	
(1)	Aircraft	29	(42%)	37	(44%)	74	(68%)
(2)	Dogsled/skiis	3	(4%)	2	(2%)	0	
(3)	Boat	0		2	(2%)	3	(3%)
(4)	3/4-wheeler	0		0		0	
(5)	Snowmachine	27	(39%)	28	(33%)	30	(27%)
(6)	ORV	0		1	(1%)	0	
(7)	Highway vehicle	2	(12%)	8	(10%)	2	(2%)
	Unknown	8	(12%)	6	(7%)	0	

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 and bounty payments. Since the 1970's development in the Anchorage area and along the highway system in the Matanuska-Susitna Valley has been keeping wolf numbers low near human settlements. Large increases in the human population during this period resulted in substantial increases in hunting and trapping pressure, and 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 furbearers in Subunits 14A and 14B. The annual wolf harvest was determined by sealing records.

RESULTS AND DISCUSSION

Population Status and Trend

Wolf density is generally low throughout Unit 14. The largest number of wolves occur in the remote areas where access is the most difficult, but established wolf packs also occur in a few areas near human settlements and/or areas with high human use. A questionnaire was mailed to 47 trappers who had operated traplines in Subunits 14A and 14B and/or had previously sealed furbearers in these subunits. The questionnaire covered all species of furbearers, including wolves. Nineteen trappers responded to

questions about the abundance of wolves: 45% (9) reported wolves as scarce, 26% (5) as not present in their area, 16% (3) as common, and 11% (2) did not know. When asked whether wolves had increased or decreased compared with the previous trapping season, 42% (8) reported numbers were the same; 11% (2) reported higher ones; 5% (1) reported lower ones, and 42% (8) did not know. Results of this questionnaire indicate that wolf numbers are relatively low in Unit 14 and the population has either remained stable or slightly increased.

Population Size:

A population census of wolves in Unit 14 has never been conducted; therefore, a precise estimate of population size is not available. According to harvest information and recorded sightings of wolves, approximately 30 to 60 wolves inhabit Unit 14. Individual pack size is usually 6 wolves or less.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

During the 1987-88 hunting and trapping seasons, the reported harvest in Unit 14 was 3 wolves: two in Subunit 14A and one in Subunit 14C. No wolves were reported taken from Subunit 14B. By comparison, the harvest for the previous reporting period (1986-87) was 2 wolves; however, in 1983-84 and 1985-86, the annual harvest was 13 and 14 wolves, respectively. The mean harvest for the past 5 reporting periods (1983-84 to 1987-88) is 8 wolves (Table 1). The large differences in annual harvests may have been caused by several factors, but snow conditions was the most important one. In years with deep snow, the wolf harvest has been usually higher than harvests during years when snowfall has been below normal. Hunting and trapping conditions were generally superior during years with deep snow, and some wolf packs became more vulnerable to hunting and trapping when they followed prey species (i.e., particularly moose) to winter range areas on flood plains and valley bottoms where they were more likely to encounter hunters and trappers.

Harvest Chronology. During recent years in Unit 14, most of the annual harvest has been taken by hunters and trappers using ground transportation in late winter, rather than aircraft. Because use of ground transportation is usually spread throughout the season, the harvest tends to be fairly evenly distributed over time. The average chronology of the harvests by month during the hunting and

trapping seasons from 1983 to 1987 was as follows: November, 9%; December 18%; January, 26%; February, 21%; and March, 26% (Table 2). No wolves were reported taken before November or after March.

Game Board Actions and Emergency Orders

During the past 5 years the Board of Game has not changed the wolf hunting or trapping regulations in Unit 14.

CONCLUSIONS AND RECOMMENDATIONS

Reports from the general public, trappers, and Department staff indicate that wolves occur in relatively low densities throughout Unit 14; the population is about 30 to 60 wolves. Because of the difficulty and expense of censusing wolves in Unit 14, it has not been possible to obtain a precise population estimate; therefore, we cannot be certain that the population objective has been achieved. Annual harvests for the past 2 years have been low, and it is unlikely that sustained yield has been exceeded. No changes in seasons or bag limits are recommended.

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Table 1. Unit 14. Annual harvest of wolves by subunit, 1986-87.

Year	14A	14B	14C	Total
1983-84	10	1	2	13
1984-85	4	0	2	6
1985-86	4	2	4	10
1986-87	1	0	1	2
1987-88	2	0	1	3
Mean	4	1	2	7

Table 2. Harvest chronology by month from November through March in Unit 14 1983-87.

Year	Nov.		Dec.		Jan.		Feb.		Mar.		Total harvest
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
1983-84	1	(8)	3	(23)	6	(46)	3	(23)	0	(0)	13
1984-85	0	(0)	0	(0)	1	(17)	3	(50)	2	(33)	6
1985-86	2	(25)	1	(13)	0	(0)	1	(13)	4	(50)	8
1986-87	0	(0)	1	(25)	0	(0)	0	(0)	3	(75)	4
1987-88	0	(0)	1	(33)	2	(67)	0	(0)	0	(0)	3
Total and Average %	3	(9)	6	(18)	9	(26)	7	(21)	9	(26)	34

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. Although the moose population and other wildlife provide a prey base that could support higher densities, 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 the winter, where 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 were 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 of wolves in Unit 16 is approximately 60-75 animals. The population is considered stable and occupies the mountainous areas, with packs ranging into adjoining units.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Eight wolves (i.e., 7 males and 1 female) were harvested during this reporting period from Subunit 16B; aircraft was the

predominant method of transportation. Five wolves were shot, two were snared, and one was taken by trap. Seven wolves were taken during winter months and one in the spring (April). Harvests for previous years were as follows: 1986, 8 wolves; 1985, 3 wolves; 1984, 18 wolves; and 1983, 15 wolves.

CONCLUSIONS AND RECOMMENDATIONS

Harvest pressures by airborne hunters and trappers have regulated 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 optional tracking conditions in the winter. 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. Local residents support maintaining the wolf distribution and abundance at the present level. No changes in seasons or bag limits are recommended.

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STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Northern Bristol Bay

BACKGROUND

Few data are available on the status of wolves in Unit 17 prior to 1962. Bounty records from 1962 through 1971 are incomplete; however, they indicate wolf distribution and relative abundance during those years. A mandatory sealing requirement for all harvested wolves has been in effect since the bounty program was terminated. A trapper questionnaire program was implemented in 1988 to collect information on the relative abundance of furbearers, including wolves. No other data pertaining to abundance or population trends have been collected in Unit 17.

POPULATION OBJECTIVES

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

METHODS

Harvest data were collected from trappers when they brought their wolf pelts in for sealing. A questionnaire was sent to selected trappers to quantify their observations of furbearer populations during the trapping season. Observations of wolf sign were noted during aerial surveys of moose and caribou.

RESULTS AND DISCUSSION

Population Status and Trend

Although the density of wolves in this unit peaked from 1974 to 1977 and declined sharply in the early 1980's, it has continued to increase during this reporting period. A rabies epidemic in 1981 contributed to that decline. Densities are presently high in the Nushagak Hills area, particularly in the King Salmon River area and east toward Mosquito Creek. Two reports of wolf tracks in Subunit 17A were recorded in 1988.

Population Size:

Based upon harvest figures, personal contacts with hunters and trappers, and general observations during surveys, the 1987 fall wolf population in Subunits 17A, 17B, and 17C is approximately 7 to 15 wolves in 1 to 3 packs, 150 to 200 wolves in 20 to 25 packs, and 20 to 30 wolves in 4 to 6 packs, respectively. Wolf surveys

and radiotelemetry studies have not been conducted in Unit 17.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

The wolf harvest in Unit 17 increased dramatically during the 1987-88 season (Table 1). Nine trappers reported taking 79 wolves (48 males and 31 females) in Subunit 17B. Most of these (95%) were taken with firearms. Only 1 wolf had been trapped.

Harvest Chronology. Harvest chronology has been quite variable from year to year. During the 1987-88 season, 1 wolf was taken in December, eight were taken in January, 23 in February, and 34 in March. Harvest chronology generally reflects the suitability of snow conditions for tracking and landing, rather than the availability of wolves.

Game Board Actions and Emergency Orders

During this reporting period, the Alaska Board of Game made several changes to the definitions of furbearers and fur animals that will affect the legal methods and means of taking wolves in Unit 17. Beginning in the 1988-89 regulatory year, trappers can no longer legally take wolves with a rifle on the same day that they have been airborne. A provision was made in the hunting regulations to permit the hunting of wolves on the same day that hunters have been airborne (i.e., from 10 August to 31 March).

CONCLUSIONS AND RECOMMENDATIONS

Few data are available to interpret the status of the wolf population in Unit 17. It is apparent from general observations and public contacts that the wolf population is continuing to increase. Prey densities have been increasing steadily since the early 1980's, and it is logical to expect the predator densities to also increase. Wolf abundance appears to be greatest in Subunit 17B; aerial surveys should be conducted to better quantify its population density. Because nearly constant winds cause fresh snow to drift rapidly, good survey conditions seldom last more thane 1 day. Survey efforts should be coordinated with personnel from Unit 19 and Lake Clark National Park Service to maximize the area surveyed while good conditions last.

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

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	--	50
1967-68	13	11	0	24	4	4	96
1968-69	6	8	0	15	27	--	67
1969-70	3	0	0	3	--	7	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	--

STUDY AREA

GAME MANAGEMENT UNIT: 18 (42,000 mi²)

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim River Delta

BACKGROUND

Reported observations from trappers, fur buyers, and ADF&G biologists indicate that although few wolves occur in Unit 18 their numbers may be increasing. The distribution of wolves in Unit 18 appears to reflect the number and distribution of moose and caribou. Moose densities are growing in the Yukon drainage upriver from Ohogamuit; however, densities are low or nonexistent in the remainder of the unit. The Kilbuck Caribou Herd numbered at least 800 animals in the fall of 1987. Wolf predation was documented on Kilbuck caribou in early 1988. Substantial numbers of muskoxen have radiated from Nelson Island to the mainland in the last few years; however, wolf predation on these animals has not yet been reported. Although wolf and ungulate numbers are growing, their densities remain very low throughout the unit.

POPULATION OBJECTIVES

To maintain wolf densities at sufficiently low levels to allow for maximum growth of ungulate species and thereby increase the prey base available to wolves.

METHODS

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

RESULTS AND DISCUSSION

Population Status and Trend

Several wolf packs ranged along the lower Yukon River in Unit 18 in 1987-88. At least 1 other pack resided in the Kilbuck Mountains southeast of Bethel. Other packs remained on the periphery of Unit 18, principally moving between Unit 18 and Subunits 19A and 21E.

A wolf pack apparently moved southward across the tundra from the lower Yukon River in December 1987. This pack was observed south of Baird Inlet. Six wolves from the same pack were reported near Kwigillingok at the mouth of the Kuskokwim River in early January 1988. The wolves were observed on 3 separate occasions by 3 different trappers. An unverified report indicated that 1 wolf was apparently shot near the Kwigillingok dump. In January 1988 the

wolf pack was reported having crossed the Kuskokwim River and moving eastward. Reports from local residents and sealing records indicate that hunters from the village of Eek took 3 wolves from a pack of six at the middle fork of the Eek River in January 1988. No further reports are available on the status of this pack, although the animals are believed to have dispersed into the Ahklun Mountains.

Residents of Marshall and Russian Mission observed 4 wolves near Devil's Elbow along the Yukon River during December 1987 and January 1988. Trappers reportedly took several wolves along the Yukon from Paimuit to Mountain Village during this period.

Repeated observations indicated that another wolf pack ranged in the upper Kisaralik, Tuluksak, and Fog River drainages of the Kilbuck and southern Kuskokwim Mountains. Reported group size varied from 5 to 12 individuals. Department and U. S. Fish and Wildlife Service (USFWS) personnel observed 7 wolves on a moose kill in the Kisaralik drainage in late January 1988. A female caribou was killed by wolves of the same pack in the southern Kilbuck Mountains in Febuary 1988. This is the first documented occurence of wolf predation on the expanding Kilbuck caribou herd since intensive work began on this herd in 1985. Moose densities are low in the area, and caribou are probably an important prey source.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Sealing-certificate data indicate that the reported wolf harvest in Unit 18 was higher in 1988 than in previous years. Ten wolves were reported harvested in Unit 18 in 1988, compared with 2 wolves in 1987, 1 wolf in 1986, and 3 wolves in 1985. The larger documented harvest for 1988 was probably related to increased availability of wolves and to an active furbuyer who was offering good prices.

I believe that most of the wolves that are harvested are not sold and, therefore, not sealed. Wolf ruffs are highly prized as parka trim, and the domestic demand for wolf pelts is high. The actual wolf harvest is probably substantially larger than the documented one.

Six of the 10 wolves harvested in Unit 18 in 1988 were from the Yukon drainage, three were from the Kuskokwim drainage near the Eek

River, and one was from the upper Johnson River drainage. Two of the 6 wolves taken from the Yukon drainage were from the Andreafsky River area. The remainder were taken along the Yukon River from Paimuit to Mountain Village, including 1 wolf from the hills north of Marshall. The 3 wolves taken near the Eek River were probably from the pack of six previously discussed that moved south from the Yukon River and then eastward across the Kuskokwim.

Five of the 10 wolves reported taken in Unit 18 in 1988 were trapped, and the remainder were shot by ground-based hunters. Eight wolves were grey and two were black; four were males, four were females, and the sex of two was not reported. The reported number of animals in the packs from which animals were harvested ranged from 1 to 6 individuals.

Harvest Chronology. Five wolves were reported harvested in January 1988, three in February, and two in March.

Transport Methods. Nine wolves were harvested in Unit 18 using snow machines for transportation. One other wolf was taken in Unit 18 using a three- or four-wheeler.

Natural Mortality:

A fur buyer showed me several wolf pelts taken from the Holy Cross/Grayling area (Subunit 21E). These pelts exhibited marked guard hair loss, clumps of hair matted together with exudate from the skin, and strong odor. These pelts were forwarded to laboratory personnel at our Fairbanks and Anchorage offices for additional examination. These examinations revealed no lice infestations, as was originally suspected, and the underlying cause of the abnormalities could not be determined. Such hair loss must reduce survival under severe weather conditions.

Habitat Assessment

Extensive riparian habitat is available for further colonization by moose along the major rivers in Unit 18. Similarly, vast stretches of upland and montane tundra habitat are available to support much greater numbers of caribou in the Andreafsky and Kilbuck Mountains. Muskoxen are colonizing upland tundra between the Yukon and Kuskokwim Rivers and have been recently observed in the Andreafsky Mountains north of the Yukon River. All of these ungulate populations can be supported at far greater numbers by extant habitat. These ungulate populations could, in turn, support much larger populations of wolves.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers are increasing in Unit 18, presumably in response to moose, caribou, and muskox population growth and dispersal. Moose density has recently increased between Ohogamuit and Paimuit on the Yukon River, and wolf populations are expected to grow as a result. Similarly, the caribou population in the Kilbuck Mountains is

expanding in numbers and range. Wolf predation on Kilbuck caribou was documented in 1988. Muskoxen radiating from Nelson Island are colonizing upland tundra between the Yukon and Kuskokwim Rivers and have been recently observed in the Andreafsky Mountains north of the Yukon Rivers; however, wolf predation on muskoxen has not yet been documented. Compared with neighboring units, the absolute number of ungulates and wolves remains very low.

The reported harvest of 10 wolves sealed in 1988 is the largest yet documented. Although this is a substantial removal from a population estimated to number approximately 50 wolves, the harvest is considered acceptable, given the larger management goal of accelerated ungulate population growth. Changes in seasons and bag limits are not recommended at the present time.

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STUDY AREA

GAME MANAGEMENT UNITS: 19, 21A, and 21E (60,523 mi^2)

GEOGRAPHICAL DESCRIPTION: All drainages of the Kuskokwim River upstream of the village of Lower Kalsag, the drianages of the Yukon River between Paimut 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. On one hand, they have provided pelts for subsistence-based residents, and more recently, they have provided recreation (sport harvesting) and income from sale of their pelts. On the other hand, wolves have long competed with man 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. However, incidental observations by biologists, review of sealing documents, and informal interviews with wolf hunters and trappers have resulted in the collection of limited data on wolves in Unit 19 and Subunits 21A and 21E.

POPULATION OBJECTIVES

Strategic 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.

Proposed Objectives

To maintain a harvestable population of wolves capable of sustaining an annual havest of at least 100 wolves.

To reduce wolf numbers by encouraging public harvests 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 survey these respective areas beginning in March 1990.

METHODS

In an attempt to distribute wolf harvests throughout the entire area, especially where historic harvests have been low or where substantial ungulate predation is suspected, I have stayed in close contact with trappers and hunters in those areas and encouraged further harvests. Harvest statistics were gathered from sealing documents. In addition, letters were sent to sealing officers, asking them to gather additional information about harvest locations and pack territory boundaries. I listed packs of known size (minimum estimates), plotted harvest locations, and estimated territory boundaries. Based on trapper-hunter interviews and sealing documents, I then estimated mean pack and territory sizes for each subunit, arriving at a rough estimate of numbers of wolves occurring in each of these subunits (Table 1).

A Trapper Questionnaire was sent to 117 trappers who harvested furbearers in Units 19 and 21. Responses were obtained from 69 of those people. Trappers were asked to rate the current year's abundance of wolves in their respective areas as either abundant, moderate, or low. Additionally, they were asked whether the trend (relative to the previous year) was increasing, stable, or declining. Responses were assigned a numeric index value (high or increasing = 9.0, moderate or stable = 5.0, low or declining = 1.0), and a mean index value was calculated for the entire area. Based on harvest locations, incidental observations, and many discussions with local trappers and hunters, I was able to obtain a rough estimate of wolf numbers throughout Unit 19 and Subunits 21A and 21E.

RESULTS AND DISCUSSION

Population Status and Trend

According to the Trapper Questionnaire, the mean wolf abundance index was 5.14 (n = 58). This index suggests moderate wolf abundance, relative to historic impressions. For the comparison (trend) index, 42 responses gave a mean trend index of 6.14, indicating an increasing trend over the previous year. These data, coupled with the record 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 FY88, I roughly estimated total wolf numbers based on incidental observations, notes from and conversations with area trappers and hunters, and information from sealing documents. I estimated that 665-770 wolves probably occur in the 76-95 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 stable.

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. Those ratios in the harvest were not significantly different from 1:1, and I suspect the unitwide sex ratios are also equal. No information is available concerning age ratios in the population.

Distribution and Movements:

Only limited information is available on wolf distribution in Unit 19 and Subunits 21A and 21E. The harvest is well distributed, as are wolf tracks and incidental sightings. Because reasonably good wolf habitat exists throughout the area, I suspect wolves are present in varying densities throughout these areas.

Mortality

Season and Bag Limit:

Hunting. The open 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:

In Unit 19, 143 wolves were reported harvested during 1987-88. This is the highest reported harvest since inception of the sealing program during the 1971-72 season; however, the harvest locations of at least 26 of those wolves were questionable and may have been misrepresented. Regardless, the harvest was high, compared with past years, but certainly not excessive. Incidental observations and discussions with trappers and hunters after the season indicated relatively high postseason wolf abundance.

In Subunits 21A and 21E the harvests during the 1987-88 season was reported at 34 and 31 wolves, respectively. These harvest figures are also significantly higher than the 10-year means from these subunits.

The high 1987-88 wolf harvest was probably due to several factors. Good flying and tracking conditions existed sporadically throughout late winter and early spring. Prices for pelts stayed relatively high, with an average of $257 on the Canadian fur sales markets. It is also possible that the

upcoming (1988-89) regulation changes in the Southcentral Alaskan units also prompted aerial hunters and/or trappers to look to Units 19 and 21 as potential hunting areas. Wolf populations are also apparently high. Some combination of these factors undoubtedly contributed to the record harvests.

Although the trend in Unit 19 harvests declined during the period from 1971 to 1984 (Fig. 1), harvests largely rebounded during the next 4 years (from 1984 to 1988). With hunting and trapping regulations in southcentral Alaska becoming more restrictive, I suspect that additional effort and harvests will occur in Units 19 and 21 during the next few years.

Assuming the population and harvest estimates Unit 19 are accurate (i.e., 435-500 and 143 wolves, respectively), the harvest rate ranged from 29% to 33%. Again, at least 26 of those wolves may have come from other areas, lowering the unitwide harvest rate to between 23% and 27%. Combined Subunit 21A and 21E harvests of 65 wolves from estimated populations of 230-270 wolves indicates a harvest rate of 24-28% during the 1987-88 season.

Hunter Residency. Of 205 wolves harvested where the residence of the hunter was known, 92 (45%) were from Units 19 or 21; 110 (54%) of the harvested wolves were taken by residents of other Alaskan locations, notably hunters from Anchorage and the Matanuska-Susitna Valley. Only 2 wolves were reported taken by nonresidents of Alaska, and these were apparently incidentally harvested during other big game hunts.

Harvest Chronology. As with most previous years, the majority of the wolf harvest occurred during spring. During 1987-88 only 20 of 208 wolves (9.6%) were taken during the August-December period. March harvests for both units revealed a take of 92 wolves (44% of total), followed by 51 in February (25%), and 27 in January (13%)

Transport and Harvest Methods. Again, no significant differences were noted in wolf transport or harvest methods used in Unit 19 or Subunits 21A and 21E between the 1987-88 season and previous years. One hundred seventy-six wolves (of 208 total) were taken by shooting (85%), and 15 each were taken by trapping and snaring (7% each). Eighty-one percent (169 of 208) of the harvest was facilitated through aircraft transportation, while 13% (n = 28) were taken utilizing snowmachines.

Game Board Actions and Emergency Orders

Although no recent changes have been enacted for Unit 19 and Subunits 21A and 21E, changes throughout much of the rest of the state restricting "same-day-airborne" (land-and-shoot) practices will undoubtedly influence the harvest of wolves in this area. I assume that hunters and trappers who have

traditionally used the now-closed areas will redirect some of their efforts to Units 19 and 21, where it remains legal to take wolves by land-and-shoot methods. However, beginning in the 1988-89 season, there will be a limit of 10 wolves per hunter (trappers will still have no limits), which may result in a slight decline in harvests.

CONCLUSIONS AND RECOMMENDATIONS

Although reported wolf harvests in Unit 19 and Subunits 21A and 21E were at record levels during the 1987-88 season, indications were that wolf harvests were not high enough to cause declines in the population. Deliberate misrepresentation of harvest locations may have resulted in an inflated reported harvest. Close contact with area hunters and trappers will continue, and redistribution of harvest effort in lightly hunted areas will be encouraged. A trapper's seminar held in McGrath during late summer 1988 may result in increased efforts and efficiency by trappers in the area. Management strategies designed to maintain wolf harvests at 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.

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Table 1. Estimated wolf pack data from Game Management Unit 19 and Subunits 21A and 21E, Interior Alaska, 1987-88.

Subunit	Estimated wolves/pack	Estimated no. packs	10% loners	Estimated total wolves	Mean territory size
19A & B	9.2	22-26	22	225-260	1,910
19C	8.3	10-12	8	90-100	1,760
19D	7.4	16-22	12	120-140	2,000
21A	7.2	19-23	15	155-175	1,947
21E	7.8	9-12	8	75-95	2,043
Total/Mean	8.0	76-95	65	665-770	1,932

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Lower Tanana Valley, Middle Yukon Valley

BACKGROUND

In 1915 the 1st Territorial Legislature of Alaska adopted a bounty payment on wolves, initiating de facto management of wolves as predators. Bounties continued until 1969. Federal control agents poisoned, trapped, and hunted wolves until 1960, and the public hunted wolves from airplanes with minimal regulation until 1972. By statehood, public attitudes toward wolves were changing, and early state regulations classified wolves as fur animals. In 1963 the Board of Game additionally classified wolves as big game, recognizing their esthetic and economic values.

More recently, management of wolves in Interior Alaska has been increasingly conservative; however, since 1967 the Board of Game has authorized periodic wolf control programs to benefit specific prey populations. Successful programs conducted in this study area in the mid-1970's and early 1980's resulted in increased moose and caribou populations (Table 1). Currently, a wolf predation control program authorized by the Board of Game exists for Subunit 20B; however, no wolves have been taken under the current authorization and no plans are in effect to actively control wolves.

MANAGEMENT OBJECTIVES

To determine population size.

To estimate impact of current population on prey species.

To develop population objectives.

To improve the efficiency of wolf harvest by the public.

METHODS

In addition to providing harvest data, sealing certificates yielded estimates of wolf population size and pack distribution. Final compilation of pack size data required subjective evaluation of pack identity when different sources reported similarly sized packs in similar areas. In general, reports were compiled to produce the lowest population estimate from the available information.

In Subunits 20A and 20C known territories of radio-collared packs aided in making population estimates. Surveys specifically designed to produce population estimates based on track counts or wolf sightings were not conducted because of poor snow conditions. Reported observations by trappers, pilots, biologists, and hunters were used in estimating pack sizes and distribution.

RESULTS AND DISCUSSION

Population Status and Trend

Subunit 20A:

During the fall of 1987 an estimated 22 wolf packs occurred in Subunit 20A. Nine packs contained radio-collared wolves, and 13 packs were identified by tracks or direct observation. The home ranges of at least 2 additional packs overlapped the boundary between Subunits 20A and 20C and were included in the population estimate for Subunit 20C. Undoubtedly other unmarked packs or single wolves ranged along the Subunit 20A boundary. Assuming, as suggested by Stephenson (1978), that approximately 9% of the population consists of single wolves, the fall 1987 wolf population in Subunit 20A was estimated at 195 wolves (Table 2).

At 195 wolves, densities in Subunit 20A were approximately 11 wolves/1,000 km^2, which is similar to the highest densities (10 wolves/1,000 km^2) reported for the Nelchina Basin between 1975 and 1982 by Ballard et al. (1987) but below those reported by Stephenson (1978) for Subunit 20A prior to wolf control in fall 1975 (13 wolves/1,000 km^2).

There is no evidence wolf numbers have changed significantly during the past 3 years. The 1985 estimate of 195 wolves was based on a thorough review of trapping records and telephone interviews of trappers conducted by ADF&G biologist Rod Boertje. Although the 1986 estimate was higher (200-240 wolves), it was based on assumed population growth and was not as rigorous as either the 1985 or 1987 estimates.

Subunit 20B:

Following the wolf control program of 1985 and 1986, Haggstrom (1987) estimated the fall 1987 population in Subunit 20B at 143-163 wolves, representing a decline from the 1984 population estimate of 180-220. Wolves are now increasing in western Subunit 20B and will probably be near precontrol levels by 1990. Wolf surveys were not conducted during the spring of 1988, but trappers reported size estimates for 10 packs (Table 3). One trapper, P. Valkenburg, reported a pack of 7 wolves on the Tatalina River near where ADF&G aerial gunners killed a pack of 9 wolves the previous winter.

Subunit 20C:

The National Park Service (NPS) has studied wolves in and near Denali National Park within Subunit 20C since 1986. The density of 10 collared packs ranging over 8,130 km^2 (3,127 mi^2) was 6.4 wolves/1,000 km^2 (1 wolf/60 mi^2) during the fall of 1987 (Mech 1987). Assuming that density throughout Subunit 20C, the population was approximately 200 wolves. Although ADF&G has not conducted aerial wolf surveys in Subunit 20C, trapper reports have identified at least 3 other packs north of the NPS study area (Table 4).

The NPS reported much lower densities of wolves (2.7 wolves/1,000 km^2) in their study area. Rather than reflecting an increase in wolf numbers, Mech (1987) felt the 1987 estimate reflected a more accurate assessment of wolf population size for both 1986 and 1987, and he concluded there had been no increase in wolf numbers between 1986 and 1987.

Subunits 20F and 25C:

Aerial wolf surveys were not conducted in Subunits 20F or 25C. Trapper reports were minimal (Table 5) and therefore not sufficient to generate a population estimate. Because habitat and prey densities in Subunit 20F and 25C are similar to those of Subunit 20C, wolf densities may also be similar. If so, wolf populations in the fall of 1987 were approximately 105 and 87 wolves in 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.

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

Human-induced Mortality:

Eighty-one wolves were reported harvested in the study area during the 1987-88 season (Table 6). That harvest represented 11% of the total estimated fall population. By subunit, harvests rates ranged from 5% to 18% of estimated fall populations (Table 7). Those harvests, by themselves, are insufficient to prevent wolf population growth.

Harvest Chronology. During the regulatory years 1983 through 1987 the chronology of the wolf harvest in the study area has not changed substantially. From 1983 to 1987, 52% of the harvest was taken in the November-January period and 41% 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. Since 1985 snow machines have consistently been reported as the most common method of transport. For the entire regulatory period 1985-87, 59% of the harvest was taken with the aid of snow machines, 21% with airplanes, 13% by dog teams or on foot, and 7% by other means (Table 8).

Land-and-shoot hunting of wolves has accounted for only 9% (16 of 175) of the reported harvest for which a transport method was listed since 1985 (Table 9). The incidence of land-and-shoot harvests have been low, because of the unsuitability of the terrain and vegetation.

Game Board Actions and Emergency Orders

In November 1987 the Board of Game voted to eliminate "same-day-airborne" harvesting of wolves in most subunits of the study area (i.e.,20A, 20B, 20C, and 20F). The regulation became effective on 1 July 1988; therefore it did not affect the harvest during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers appear to be stable in the study area, except in Subunit 20B where wolves declined following their removal by ADF&G during regulatory years 1983-84 and 1984-85. Wolves in Subunit 20B are not increasing; however, they are expected to be at precontrol levels by 1990.

Land-and-shoot hunting accounted for approximately 9% of the harvest of wolves in the study area during 1985-86 and 1986-87. The recent Board of Game action eliminating same-day-airborne hunting of wolves is inconsistent with the management objective of increasing public efficiency in harvesting wolves. Therefore, 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.

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Table 1. Wolves killed under public and aerial hunting and ADF&G wolf control programs, 1975-87.

Subunit	Regulatory year												
	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88
	Public aerial hunting wolf kill												
20A	a	a	a	a	0	2	7	4	a	a	a	a	a
20B	a	a	a	a	3	17	4	9	a	a	a	a	a
	Department of Fish and Game wolf control kill												
20A	67	27	39	18	3	0	20	b	b	b	b	b	b
20B	b	b	b	b	b	15	2	26	3	26	32	b	b

[a] Not open to public aerial hunting.

[b] Department personnel not involved in wolf control.

Table 2. General location and estimated size of wolf packs in Subunit 20A, fall 1987.

Pack location	Estimated pack size/color	Information source
Crooked Creek	4 unknown	Trapper reports
Wood River Buttes	8 mostly black	Trapper reports
Lower Tatlanika Creek	8 mostly black	Radiocollar
Rex Dome	1 gray, 1 black	Radiocollar
Totatlanika Canyon	3 gray, 2 black	Radiocollar
Upper Tatlanika	11 gray, 1 black	Radiocollar
Lignite Creek	9 gray, 4 black	Radiocollar
Moody Creek	12 gray	Aerial survey
Cody Creek	3 gray, 2 black	Radiocollar
Snow Mountain Gulch	7 black, 6 gray	Radiocollar
Dry Creek	11 gray	Radiocollar
Buchanan Creek	13 gray	Radiocollar
100 Mile Creek aerial survey	4 gray, 4 black	Trapper reports,
Blair Lakes	13 unknown	Trapper reports
Julius Creek	10 mixed	Trapper reports
Pan Creek	5	Trapper reports
Jarvis Creek	7	Trapper reports
Sevenmile Lake	5	Trapper reports
Gold King Creek	7	Trapper reports
Koole Lake	5	Trapper reports
Dean Creek	6 gray	Trapper reports

Table 3. General location and estimated size of wolf pac reported by trappers in Subunit 20B, fall 1987.

Pack location	Estimated pack size
35 mi Chena Hot Springs Road	12
Ninetyeight Creek	9
Tatalina River	7
Salcha River	5
32 mi Elliott Highway	5
North Fork Salcha River	5
Democrat Creek	4
Anaconda Creek	4
Fairbanks Creek	3
Minto Flats	3

[a] This does not constitute a total population estimate, but only those packs which were reported by trappers.

Table 4. General location and estimated size of wolf
Park Service and reported by trappers in Subunit 20C, fal

Pack location	Estimated pack size	Information sourc
Totek Hills	15	Radiocollar (NPS)
Twin Lakes	12	Trapper report
Birch Creek	11	Radiocollar (NPS)
Bear Paw	10	Radiocollar (NPS)
McKinley River	10	Aerial survey
East Fork	8	Radiocollar (NPS)
Ewe Creek	8	Radiocollar (NPS)
Windy Creek	8	Raddiocollar (NPS
McLeod Lake (NPS)	7	Radiocollar (NPS)
Kantishna River	4	Trapper report
Tanana River	2	Trapper report
Park headquarters	2	Radiocollar (NPS)

[a] This does not constitute a total population estimate only those packs reported by trappers and additional pack National Park Service.

Table 5. General location and estimated sizes of wolf pa Subunit 20F and Subunit 25C, fall 1987.[a]

Subunit	Pack location	Estimated pack size
25C	Coal Creek	7
20F	Tozitna River	3
20F	Tozitna River	8
20F	Ray River	8

[a] Does not constitute a total population estimate, but reported by trappers.

Table 6. Reported wolf harvests Subunits 20A, 20B, 20C, 1987-88.

Year	20A	20B	20C	20F	25C	Tot
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	12[b]	5	10	81

[a] Includes wolves killed by ADF&G in wolf control progr and 32 in 1985-86.

[b] One additional wolf was sealed from Subunit 20C that

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

Subunit	Estimated fall population	Reported harvest	Estimated harvest rate (%)
20A	195	36	18
20B	150	18	12
20C	200	12	6
20F	105	5	5
25C	90	10	11

Table 8. Reported method of take, method of transport, and harvest chronology of wolf harvest in Subunits 20A, 20B, 20C, 20F, and 25C, 1983-87.

Year	Subunit	Method of take					Method of transport				Harvest chronology		
		Ground shoot	Trap	Snare	Other	Wolf control	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	2	3	--	--	--	--	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	0	26	--	--	--	--	1	7	4
	20C	4	0	0	0	--	--	--	--	--	1	0	3
	20F	4	0	2	0	--	--	--	--	--	0	2	4
	25C	0	4	1	0	--	--	--	--	--	0	0	5
1985	20A	7	8	9	0	--	7	8	5	0	2	10	11
	20B	5	7	13	0	32	5	1	14	2	1	9	15
	20C	0	4	4	0	--	0	3	2	1	0	3	3
	20F	0	2	0	0	--	0	0	0	0	0	1	1
	25C	0	2	0	0	--	0	1	0	1	0	1	1
1986	20A	3	6	27	1	--	5	0	26	0	0	16	9
	20B	1	2	3	0	--	2	0	4	0	0	5	1
	20C	2	0	1	1	--	0	1	1	1	0	3	0
	20F	0	1	1	0	--	0	2	0	0	0	1	1
	25C	1	0	0	0	--	0	0	0	1	0	0	1

Table 8. Continued.

Year	Subunit	Method of take					Method of transport				Harvest chronology		
		Ground shoot	Trap	Snare	Other	Wolf control	Air-plane	Dogsled/ on foot	Snow machine	Other	Aug-Oct	Nov-Jan	Feb-Apr
1987	20A	5	16	14	1	--	9	1	24	2	3	22	11
	20B	1	9	8	0	--	2	0	16	0	0	9	9
	20C	3	2	6	2	--	3	0	5	5	2	8	3
	20F	4	1	0	0	--	3	1	1	0	0	2	3
	25C	0	10	0	0	--	0	4	6	0	0	4	1
% of total reported 1983-87[a]		27	35	36		2	21	13	59	7	7	52	41

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

Table 9. Reported harvest of wolves where both method of "airplane" and method of take as "ground shooting" for re

Subunit	1985-86	1986-87	1987-88
20A	3	2	3
20B	3	0	1
20C	0	0	1
20F	0	0	3
25C	0	0	0

[a] These data represent best available estimates of land

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; their primary prey are moose and caribou. Wolf and prey populations were high in Subunit 20D during the 1960's; e.g., 200-250 wolves. Moose populations began to decline in the mid-1960's, and a wolf reduction program was authorized in 1979 (ADF&G 1984). Permits were issued for aerial shooting of wolves. From the fall 1979 to the spring of 1983, 105 wolves were removed from Subunit 20D 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). The last population estimate for wolves in Subunit 20D was 68-86 wolves in the spring of 1987 (Crain 1988).

MANAGEMENT OBJECTIVES

To maintain a wolf:prey ratio of >30 wolves:1 moose equivalent.

METHODS

Wolves harvested by trappers and hunters were sealed.

RESULTS AND DISCUSSION

Mortality

Season and Bag Limit:

Hunting. The open hunting season is from 10 August to 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 1987-88 totaled 10 wolves: 2 males, 4 females, and 4 unspecified ones (Table 1). This is the smallest harvest since 1981-82. Six different trappers reported taking wolves. Four wolves were trapped in Subunit 20D south of the Tanana River, and six were taken north of the Tanana River.

Harvest Chronology. Three wolves were killed during November 1987, one was killed during January 1988, two were killed during February 1988, and four were killed during March 1988.

Transport Methods. Snowmachines were the most commonly used method of transportation for accessing wolves. Eight wolves were captured by trappers using snowmachines. One wolf was taken by a trapper using a dog team, and 1 wolf was taken by a trapper using a highway vehicle.

Natural Mortality:

No reports of wolves dying from diseases or parasites were received during this reporting period.

Game Board Actions and Emergency Orders

No regulatory proposals by the Board of Game or emergency orders affected wolves in Subunit 20D during this reporting period.

CONCLUSIONS AND RECOMMENDATIONS

Because of the small wolf harvest during 1987-88, it is assumed the wolf population grew beyond the spring 1987 estimate of 68-86 wolves. Aerial wolf surveys and trapper interviews should be conducted during 1988-89 to estimate the current number of wolves in Subunit 20D.

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Table 1. Annual reported harvest of wolves in Subunit 20D from 1981 through 30 June 1988.

Year	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

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 to the south bank of the Yukon River downstream from Eagle. The Bureau of Land Management manages the Fortymile Wild and Scenic River corridor that was also created in 1980. The remainder of Subunit 20E is made up largely of unreserved federal, Native corporation, and state lands.

Wolf numbers have fluctuated widely in Subunit 20E over the years, in response to both large 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 an intensive wolf control effort in 1948 that continued, with minor interruptions, until 1959. This control effort (i.e., using poison, killing pups at dens, year-round trapping, and aerial shooting by federal predator control agents) reduced the wolf population to low levels, resulting in dramatic increases in numbers of caribou and moose that, in turn, caused rapid increases in wolf numbers during the 1960's (Fig. 1).

In the mid-1960's, caribou and moose populations began to decline steadily. The caribou and moose declines continued 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). The FCH decline stopped, and the herd began to increase as wolf numbers declined (Valkenburg and Davis 1987). However, the effects of grizzly bear and wolf predation on moose are believed to have maintained the moose population decline into the 1980's (Boertje et al. 1987).

A great many incidences of interpack strife and cannibalism were noted and reported by trappers in the area, supporting the hypothesis that food stress caused the dramatic wolf

population decline. Within only 1 or 2 years (i.e., 1974-76), the wolf population plummeted to only one-third or less of its pre-1974 level (W. Gasaway, 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). During 1981-82, wolves existing in Subunit 20E had an estimated 6,900-kilogram prey biomass available per wolf, but after the wolf population reductions the estimated prey biomass available per wolf had increased 43% by the fall of 1982 (Table 1). According to W. Gasaway and R. Boertje (AGF&G files), comparative ovarian activity among female wolves suggested greater fertility after the ADF&G wolf control program than before.

Caribou censuses after the wolf control effort in southern Subunit 20E indicated the FCH had increased its growth rate (Valkenburg and Davis 1987). Moose in the control area stopped declining after wolf reduction, but they have increased only about 5% annually during the period 1981 to 1988 (Fig. 1). However, wolves in the control area rapidly increased to 90% of their precontrol numbers by the fall of 1987, despite heavy annual harvests. Across Unit 20, estimates of wolf numbers were greater in the fall of 1986 than before the wolf control efforts, presumably because of the increased available biomass.

Subunit 20E is becoming an increasingly popular moose and caribou hunting area, despite the shortage of moose. Local (i.e., 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 (ANILCA) of 1980 has raised the profile of Subunit 20E. In spite of 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 and contribute 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 viewing FCH caribou during their concentrated road crossing in October and November (when virtually no tourists are present), opportunities for nonconsumptive enjoyment of wildlife are extremely limited in Subunit 20E.

POPULATION OBJECTIVES

To monitor wolf numbers, population characteristics, and harvests.

To temporarily reduce wolf numbers from an estimated 217 to less than 100 by 1993.

To allow wolf numbers to increase with available prey after moose numbers have increased to desired level; i.e., approximately 275 to 300, or a 28% to 40% increase over present numbers.

To maintain ungulate population size and sustained-yield objectives.

METHODS

Estimating Wolf Population Size

Extensive aerial wolf surveys were conducted 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 whose territories are wholly or partially located in Subunit 20E were included in the estimate. Previous attempts to adjust the estimate for "border" packs was unproductive.

Estimates of the population size for the previous fall were adjusted to reflect an increase in late-winter estimate that was based on (1) wolves harvested during the October-February portion of the trapping season (2) observed fall pack sizes, and (3) reliable pilot and trapper reports. During previous years, many of the packs counted in the spring had also been counted during the previous fall and early winter. Therefore, pack size changes for these packs were known, and a mean percentage of change for such "known" packs was calculated. This mean percentage was used to estimate the fall population by applying it as a correction factor for those packs not previously observed.

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 throughout the year. Observations allowed more accurate determinations of seasonal pack size, territory and location, and pup survival. Only 2 packs 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 harvest estimates for this species.

RESULTS AND DISCUSSION

Population Status and Trend

Wolves occur throughout all of Subunit 20E (Fig. 3). Aerial surveys (55 hours flight time) resulted in a population estimate of 150 wolves in 32 packs, including the assumed 10% increment for single wolves. Pack sizes ranged from 2 to 9 wolves and averaged 4.3. The earlier (fall 1987) estimate was 217 wolves in 32 packs, including the 10% increment for single wolves. Pack sizes ranged from 2 to 13 and averaged 6.2 wolves. Attrition from the fall of 1987 to the spring of 1988 was estimated to be 31%, because of human-induced mortality, natural mortality, and any net difference between immigration and emigration due to dispersal. Therefore, the wolf density in Subunit 20E in the fall of 1987 and spring of 1988 were approximately 1 wolf/46 mi^2 (7.6 wolves/1,000 km^2) and 1 wolf/67 mi^2 (5.3 wolves/1,000 km^2), respectively.

The wolf population in Subunit 20E has exhibited an increasing trend; i.e., from a minimum fall population of approximately 165 wolves in the fall of 1982 (following the 1st winter of wolf control) to a high of 235 in the fall of 1986. The future trend of the wolf population in Subunit 20E and the ultimate population level to be sustained are linked to the moose and caribou populations. The short-term control of wolf numbers would assure continued growth and greater ultimate numbers of prey populations as well as restoration of a moderate-to-high wolf population. Conversely, continued growth of the present wolf population at recently observed rates 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 these species.

Population Composition:

Based upon observed changes in the size of the wolf population from fall to spring and it's apparent trend (i.e., stable to increasing), pups probably compose at least 30% of the fall population (i.e., assuming that immigration equals emigration).

Mortality

Season and Bag Limit:

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

Trapping. The open season 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 April and October with a steel trap or snare smaller than 3x. Only land-and-shoot trapping and snaring with 3x or larger snares are legal during these months).

Human-induced Mortality:

Forty wolves (14 males, 24 females, 2 unspecified) were sealed in Subunit 20E during this reporting period (Table 2). This harvest represented 18.4% of the fall 1987 population estimate (i.e., 217 wolves). This level of harvest is far below the 30-40% deemed necessary to stabilize wolf numbers. Four wolves (19%) were shot by hunters, and the remainder were taken by trappers. This harvest, representing 54% above the 5-year-mean of 26 wolves, was attributed primarily to a 124% increase in the number of wolves taken by land-and-shoot trappers. Harvests in recent years have remained far below those of the early to mid-1970's, but poor reporting at that time prevents an accurate assessment of the relative decline in harvests throughout the Subunit.

Harvest Chronology. Four wolves (10%) were harvested by hunters in September. Trappers harvested 2 wolves (5%) in October, two (5%) in November, six (15%) in December, eight (20%) in January, three (7.5%) in February, eight (20%) in March, and seven (17.5%) in April. Twelve (80%) of the 15 wolves taken in March and April were harvested by land-and-shoot trappers.

Transport Methods. Of the 40 wolves harvested by the 21 successful hunters and trappers during the 1987-88 seasons, 17 (43%) were taken with aircraft for access, eight (20%) with dog sleds, one (3%) with a boat, six (15%) with snow machines, and five (13%) with highway vehicles; the method of transportation was not indicated for three (8%) of the wolves taken. Most of the wolves taken by the use of aircraft were shot, rather than trapped or snared. Aircraft access is needed to reach 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. Good wolf habitat is determined by the distribution and abundance of ungulate prey, rather than vegetative characteristics. In this regard, the better wolf habitat occurs where there is a greater ungulate prey base year round, which in Subunit 20E occurs in the northern and northwestern portion because of the seasonal distribution of the FCH. The FCH seldom spends time in southern Subunit 20E. Even though moose densities are 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 become 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; e.g., 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 amply and evenly distributed, and moose tend to be evenly distributed throughout them. In unburned areas, seasonal forage tends to be concentrated in riparian and subalpine zones, resulting in concentrations of moose in these areas. 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, and at least 60% of it is classified as a limited suppression area. This classification should assure a near-natural wildfire regime and increase habitat diversity that, in turn, will benefit prey species and ultimately wolves, if the present predation limiting factor can be addressed.

Game Board Actions and Emergency Orders

This year the Board of Game deleted land-and-shoot as a legal method for trapping wolves in Subunit 20E. During the past 5

years, the percentage of the wolf harvest taken by land-and-shoot trappers has averaged 28%, indicating that the average harvest will decline by about that same percentage in future years.

CONCLUSIONS AND RECOMMENDATIONS

Wolves occur at low densities but are well distributed throughout Subunit 20E. This low-density wolf population is being 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 the wolf and grizzly bear populations. Associated populations of avian and mammalian scavengers are also believed to be limited by low ungulate biomass and low numbers of wolves; consequently, most large mammalian species in Subunit 20E exist at levels far below the potential carrying capacity. Associated beneficial human-use opportunities are limited by the scarcity of moose and caribou.

Since 1948 the only time moose and caribou have flourished has been after either natural (1974-76) or human-caused (1948-59, 1981-83) reductions in wolf numbers. Then, as prey numbers increased because of wolf population reductions, so did wolf numbers.

Harvests of wolves by the public in Subunit 20E have been low; with only a few highly localized exceptions, these harvests have not affected wolf population trend. Compared with other furbearers, wolves are extremely difficult to trap. The recent action by the Alaska Board of Game, which prohibited the taking of wolves in Subunit 20E by the land-and-shoot method, reduced wolf harvests.

At present rates of population growth, neither the FCH nor the Subunit 20E moose population are likely to attain stated population objectives within specified time frames. If the wolf population increases even modestly in response to initial increases in prey populations, recent 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 goals. Strategic human-use goals cannot be met if this situation occurs and population objectives are not achieved.

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 20,000 caribou, 2,400 moose, 400 grizzly bears, and 220 wolves that, in turn, provide annual harvests of 350, 50, 20, and 26, respectively. There is no biological reason why this area could not support at least 50,000 caribou, 8,000-10,000 moose, 400-450

grizzlies, and 300 wolves as well as the associated increases in human-use opportunities.

To effect these increases, I recommend the following actions:

1. Maintain conservative harvests of moose and caribou.

2. Maintain liberal grizzly bear hunting seasons.

3. Restore maximum opportunities 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 ADF&G efforts outside the Yukon-Charley Rivers National Preserve to increase both moose and caribou population growth rates until population objectives are achieved.

5. Discontinue wolf control when population objectives have been achieved to allow wolf numbers to increase to the point that ungulate harvest objectives and desired wolf population levels can be maintained.

6. Encourage a near-natural wildfire regime in the area and discourage incompatible human development of wildlife habitat.

Obviously, the intent of these population objectives is to increase standing crops of ungulate prey species so that greater numbers of predators and scavengers as well as increased human use of all species can be realized. These objectives are consistent with guidelines established by the International Union for the Conservation of Nature and Natural Resources' (IUCN) "Manifesto on Wolf Conservation". 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."

The only population objectives met since 1983 were monitoring wolf numbers, population characteristics, and harvests. Continuation of only these minimally effective management practices could prevent the attainment of the stated objectives. Future reductions in wolf harvests resulting from the prohibition on the land-and-shoot method will further aggravate the present management and human-use problems.

Either management of this game-depleted ecosystem should commence or strategic and population management objectives restated. If they are to be restated, new objectives should reflect the intent to provide only custodial management of

Subunit 20E as a low-density area for game incapable of satisfying even moderate demands for human-use opportunities.

The potential benefits of 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.

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

Year	No. caribou	No. moose	No. wolves	Prey biomass[a] (kg)	Prey biomass per wolf (kg)
1960	60,000	12,000	100	10,368,000	103,680
1965	40,000	15,000	380	9,775,000	25,724
1967	30,000	12,500	600	7,842,500	13,071
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	220	2,801,600	12,735
1990	24,000	2,500	250	3,206,500	12,826

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

Table 2. Wolf harvest characteristics, Subunit 20E, 1983-87.

Year	Total trapping	Total hunting	Total taken	Method of Take: Land-shoot n(%)	Method of Take: Trap-snares n(%)	Method of Take: Unk n	Sex: M n(%)	Sex: F n(%)	Sex: Unk n
1983	24	4	28	3(13)	20(87)	1	13(46)	15(54)	0
1983[a]	--	--	7	--	--	--	5(71)	2(29)	0
1984	10	1	11	9(90)	1(10)	0	5(50)	5(50)	1
1985	14	2	16	4(29)	10(71)	0	11(69)	5(31)	0
1986	20	2	22	0(0)	20(100)	0	12(55)	10(45)	0
1986[b]	--	--	6	--	--	--	4(67)	2(33)	0
1987	36	4	40	13(36)	23(64)	0	14(37)	24(63)	2
Mean	20.8	2.6	26[b]	5.8(28)	14.8(72)		12.8(50)	12.6(50)	

[a] ADF&G take: control 1983; scientific collection 1986.

[b] Includes ADF&G take.

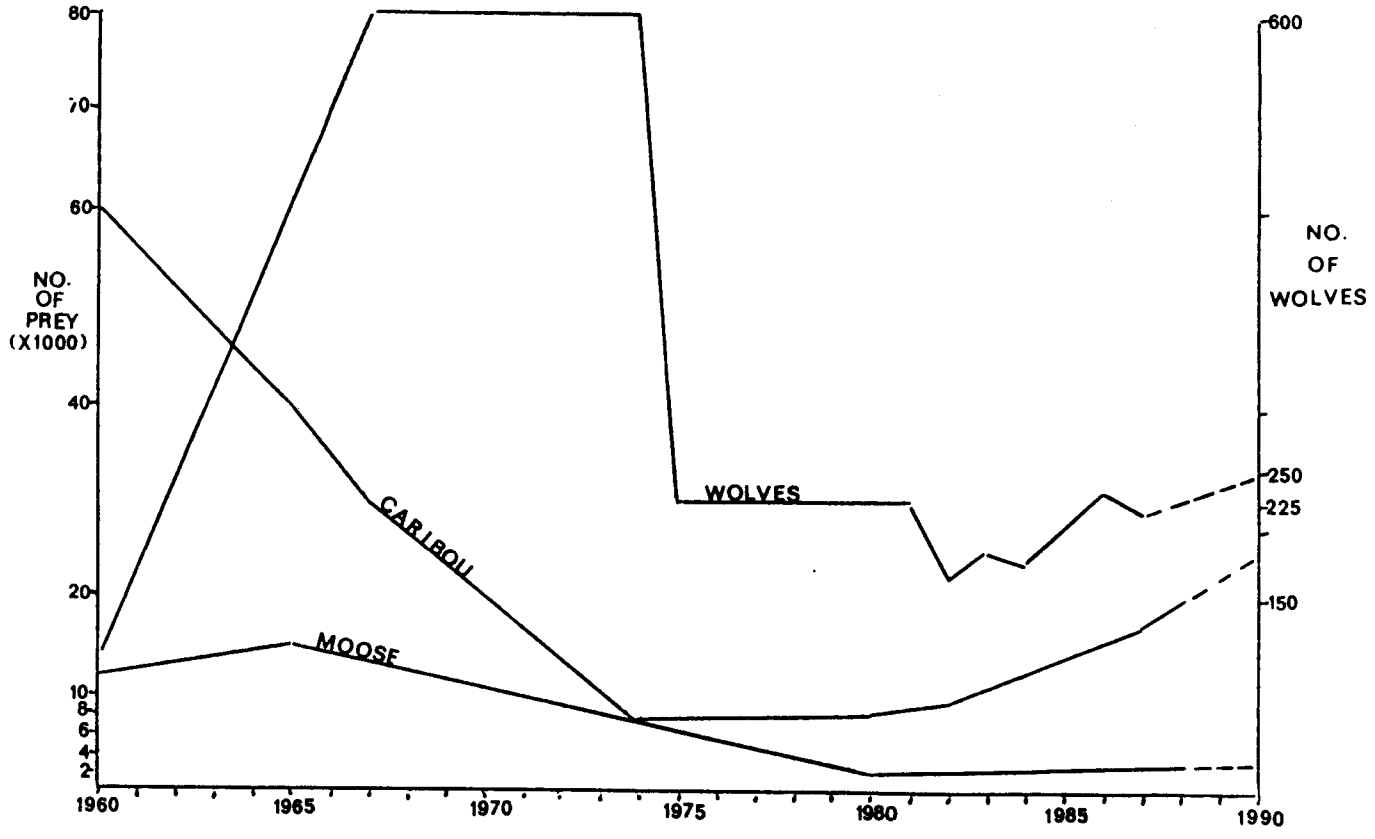

Figure 1. Estimated and projected numbers of wolves, caribou, and moose in Unit 20E, 1960-1990.

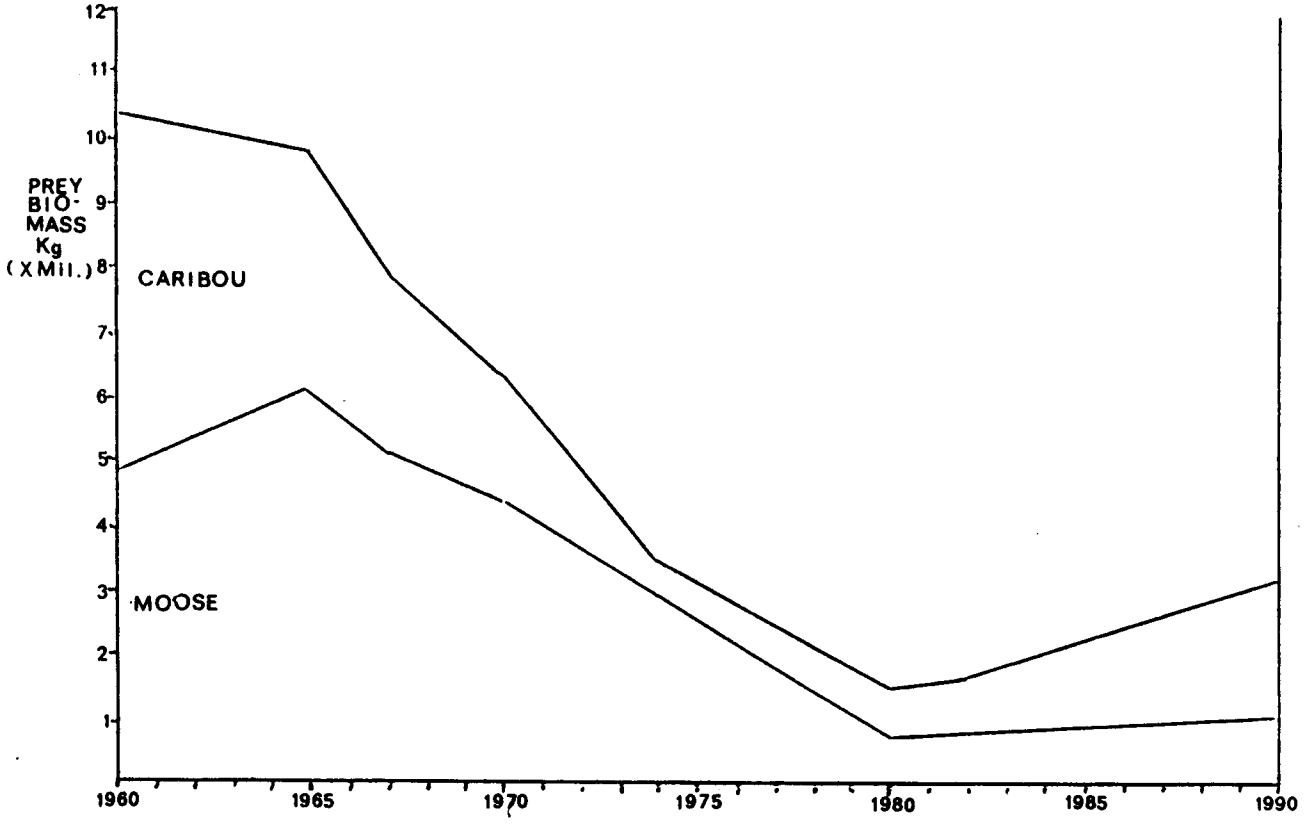

Figure 2. Estimated and projected biomass of caribou and moose available to wolves in Unit 20E, 1960-1990.

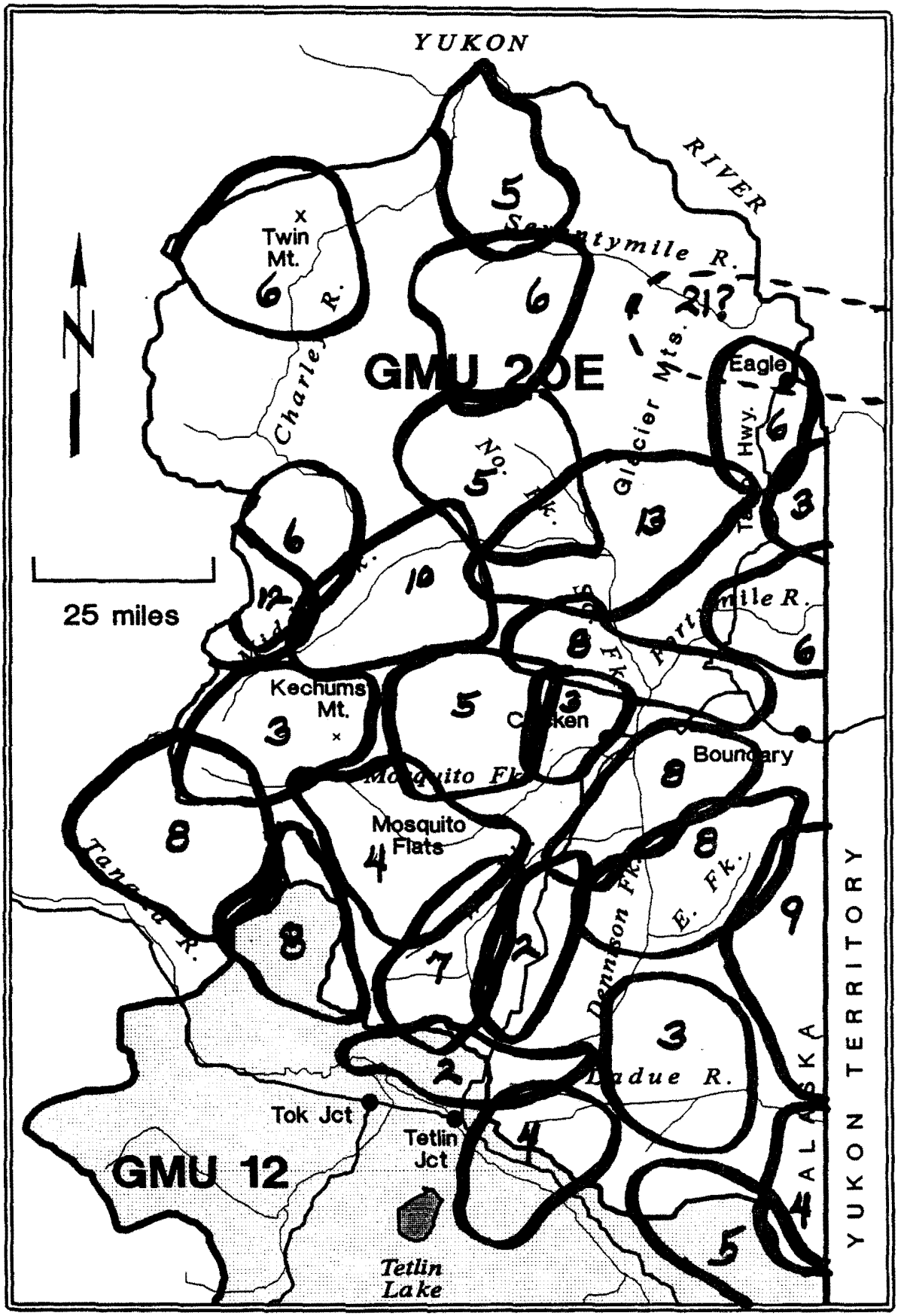

Figure 3. Approximate wolf pack territories and pack sizes during winter 1987-88, Unit 20E.

STUDY AREA

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

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

BACKGROUND

Wolves have been part of the human environment and culture in this area for millennia. 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 probably lower prior to the early 1940's. Because moose were absent and caribou populations were subject to fluctuations, wolves did not have a stable prey base. The coinciding of moose immigration and federal wolf control produced a rapid increase in the moose population. In the mid-1950's the moose population was estimated at 3 to 9 moose/mi^2 in the Koyukuk lowlands near Three-day Slough. With cessation of wolf control, wolf numbers increased beyond past historic levels. In Subunits 21B and 21C wolf populations may be lower than those in the early 1900's, because the moose populations in those areas are lower.

Harvests have ranged from 45 to 130 wolves per year and averaged about 52 per year. The local demand for wolf pelts for 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 harvest when moose numbers appear to be lower.

MANAGEMENT OBJECTIVES

To manage a stable fall wolf population at a density of approximately 1 wolf/50 mi^2.

To sustain an annual harvest of 45-130 wolves, while maintaining a 50 moose:1 wolf ratio in Subunit 21B.

METHODS

Wolf pack numbers and their distribution were determined by aerial surveys during winter in cooperation with U.S. Fish and Wildlife Service (USFWS) and U.S. Bureau of Land Management (USBLM) as well as by interviews with wolf trappers and light-aircraft pilots. Five wolves were radio-collared, relocated, and tracked in a cooperative USFWS and USBLM study. Harvests were monitored by pelt-sealing requirements. 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 population in Subunit 21B is 80-95 wolves in 13-16 packs, and the trend is toward increasing numbers. The population in Subunit 21C 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 and 50% of Subunits 21C and 21D. Within the remaining area, wolf numbers are unknown; thus the total unit population is undoubtedly higher.

During the reporting period 5 wolves with radio-collars were followed. One wolf (W-7, Fig. 1) from the Bonanza Creek pack, which we assumed had been wearing a nonfunctional radio, turned out to be alive with a functional radio. This female wolf had traveled over great distances. She was relocated in October 1987 on the Lupine River ($69^{\circ}05'N$, $148^{\circ}44'W$), 400 miles northeast of where she had been last seen in April 1987. She was relocated in May 1988 on the Sheenjek River (145 miles ESE) and again in September 1988 near Cache One Lake on the northern slope of the Brooks Range (150 miles WNW); each time this wolf has been alone.

Another wolf (W-6) from the Bonanza Creek pack was located 9 times between March and May 1987 (Fig. 1). The animal either had a radio malfunction or dispersed after May 1987. Two other collared wolves from the North Creek pack on the Kaiyuh Flats were also radio-tracked. Wolf W-3 (Fig. 1) was located 16 times (from April 1986 to May 1987) within a 272-mi^2 area until it was harvested in March 1988. Wolf W-5 (Fig. 1) was collared in March 1987 and located 5 times before May 1987; on four of these times it was with W-3, and both wolves were harvested in March 1988.

A male (W-4) from the Bear Creek pack collared in March 1987 was located 8 times within a 101-mi^2 area (Fig. 1); it was harvested in March 1988. All the wolves had been collared with a red visual tag; however, the tags wore off and the hunters were unable to see the collars before shooting them. At the end of the reporting period, the only living wolf from Unit 21 had moved into Unit 26 on the "North Slope."

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Hunters and trappers reported harvesting 51 wolves during the period: 26 males, 23 females, and 2 unspecified. The harvest by subunit was 11, 9, and 31 wolves in Subunits 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 seasons and bag limits have not changed during the past 10 years, and no Emergency Orders have been issued.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate in Unit 21 will increase because of the increasing populations of prey species and information concerning pack distribution. Presently only 50% of the unit has been surveyed for wolf distribution; its population is probably much higher. Present population levels are stable or increasing throughout the unit.

I recommend that seasons and bag limits remain unchanged and that more radiotelemetry studies will 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.

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SUBMITTED BY:

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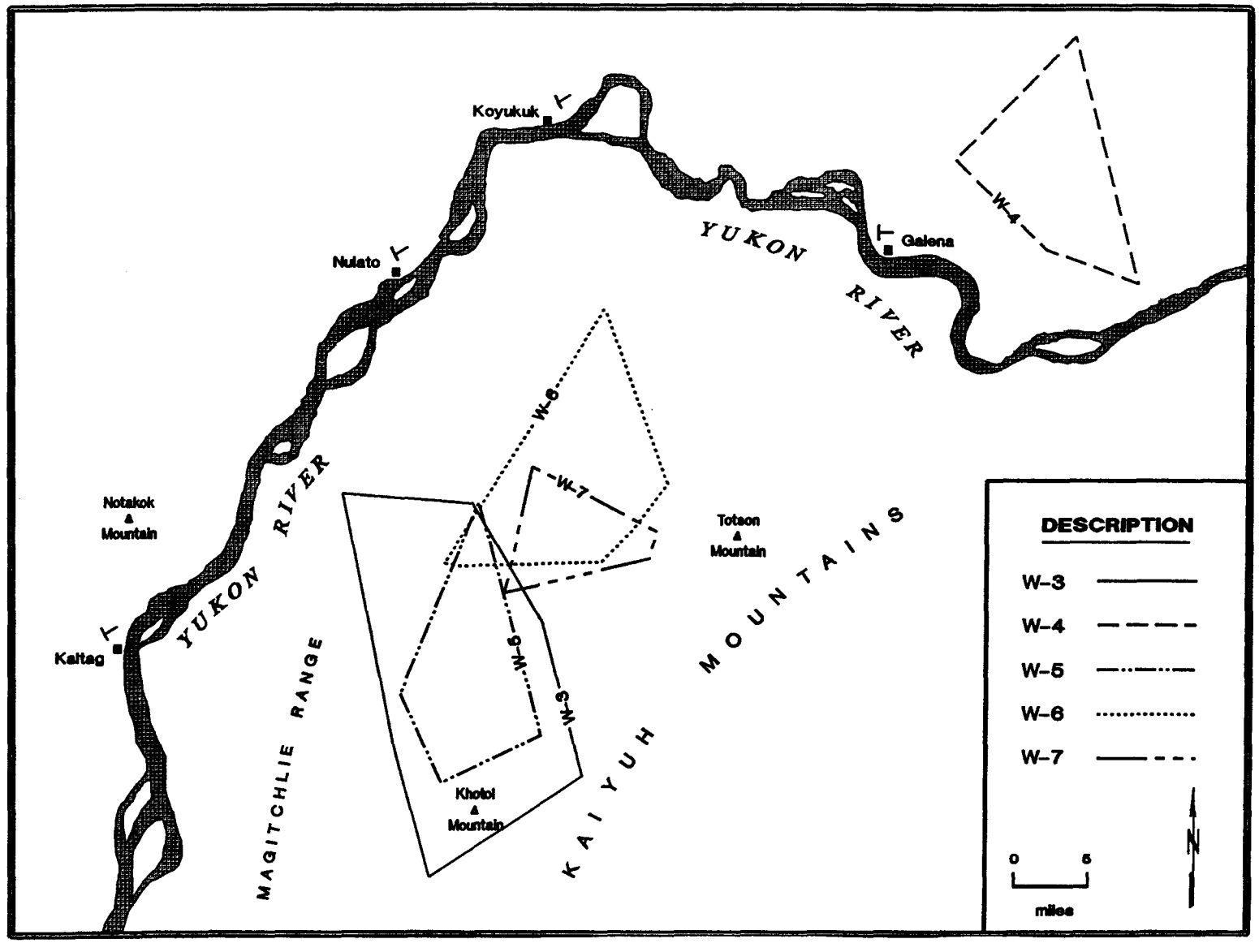

Figure 1. Home range polygons for 5 radio-collared wolves from March 1986 through February 1988 in Subunit 21D. Although the number of relocations are inadequate to depict actual pack territories, the home range polygons are based on present information.

STUDY AREA

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

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

BACKGROUND

Quantitative historical data on wolf densities, distribution, and movements within Unit 22 are lacking. Information provided by long-term local residents indicate that wolf numbers have been low or nonexistent throughout much of the unit, particularly in Subunits 22C, 22D and 22E, for at least 50 years. Some wolves are known to inhabit portions of Subunits 22A and 22B, and their numbers may be increasing, especially during the winter months when Western Arctic Caribou Herd are seasonally present.

Reindeer herders, especially those residing in Subunits 22A and 22B, regard wolves as nuisances because they prey on reindeer, particularly during the winter months. Wolf pelts are highly valued by skin sewers because they are used in the domestic manufacture of garments, primarily parka ruffs.

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

Limited information on wolf distribution, densities, harvest and human use were obtained from observations provided by agency personnel, reindeer herders, and other local residents, from an annual Trapper Questionnaire, and from sealing certificate data. Surveys or censuses specifically for wolves were not conducted in Unit 22.

RESULTS AND DISCUSSION

Population Status and Trend

Although wolf numbers are low throughout the unit, their numbers appeared to be increasing in portions of Subunits 22A and 22B, possibly in relation to increased numbers of reindeer and caribou occurring in the area.

Population Size:

Because censuses or surveys have never been conducted in Unit 22, the size of the wolf population is unknown. Estimates provided in the past by staff indicated that the population may have ranged in size from 50 to 150 animals.

Mortality

Seasons and Bag Limits:

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

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

Human-induced Mortality:

Sealing-certificate data indicate that 22 wolves (6 males, 6 females, and 10 unspecified sex) were taken in the unit during the 1987-88 season (Table 1). This is the highest harvest of wolves reported from Unit 22 since sealing was initiated in 1971. Eighty-two percent of the reported harvest came from Subunit 22A. The remainder of the harvest (18%) came from Subunit 22B.

The illegal and unreported harvests of wolves remain a problem. Many harvested wolves are not sealed because they are used in the local manufacture of parka ruffs and other garments. The magnitude of this unreported harvest is unknown; however, reports from the public indicate that the unitwide harvest of wolves during the reporting period was at least 30 animals.

Hunter Residency and Success. Sealing-certificate data indicate that the current harvest was taken by 7 hunters/trappers, all of whom were residents of Unit 22. Four were residents of a village located in Subunit 22A. The other three were residents of a village in Subunit 22B. One individual from Subunit 22B reportedly took 50% of the harvest.

Responses from the Trapper Questionnaire indicate that very few trappers in Unit 22 specifically targeted wolves; rather, they caught them in traps set for other furbearers or shot them on an opportunistic basis. Sealing data indicate that 10 wolves were taken by ground shooting and 12 were taken with traps (Table 1).

Harvest Chronology. The reported wolf harvest occurred during a 5-month period (Table 1). The greatest number (8) was taken during December 1987. The chronological distribution of harvest was longer than reported in past years and may be attributable to last winter's mild weather and increased snowfall.

Transport Methods. Snow machines were the only method of travel used for taking wolves in Unit 22 during the reporting period.

Game Board Actions and Emergency Orders

During the fall of 1987, the Board of Game enacted regulations prohibiting the practice of locating wolves with aircraft and hunting them with firearms on the same day. A number of units throughout Alaska were affected, including Unit 22. This regulatory change does not affect trappers who use aircraft strictly for transportation, and they are still permitted to dispatch a wolf caught in a trap or snare with a firearm on the same day they had been airborne. Because most wolves harvested in Unit 22 are taken using snow machines, this regulatory change is not likely to affect the size of the harvest.

CONCLUSIONS AND RECOMMENDATIONS

A long-term management plan should be prepared and implemented. It is currently unclear whether we are managing for high or low densities of wolves in Unit 22.

The annual Trapper Questionnaire continued to indicate that compliance with our sealing requirements is poor. Some village residents seal only those pelts that are commercially tanned or sold to furbuyers. Improving the accuracy of our harvest data may be accomplished by a more active information and education program as well as more active enforcement of our sealing regulations.

Quantitative information on wolves in Unit 22 are lacking. Research to improve our understanding of wolf population dynamics and the impacts of wolf predation on local ungulate populations in Unit 22 is recommended. No changes in the Unit 22 wolf seasons and bag limits are recommended at this time.

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Table 1. Historical reported wolf harvest within Unit 22 from 1971 through 1988.

	Sex				Harvest Chronology								Subunit					Method of take[a]				
Year	M	F	Unk	Total	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	A	B	C	D	E	1	2	3	4	5
1971-72	9	2	0	11	0	8	1	0	1	1	0	0	0	0	0	0	0	3	0	0	8	0
1972-73	3	2	0	5	0	2	0	0	0	3	0	0	0	0	0	0	0	3	2	0	0	0
1973-74	4	2	1	7	1	0	0	1	2	2	1	0	0	0	0	0	0	7	0	0	0	0
1974-75	12	8	1	21	0	0	1	11	7	2	0	0	0	0	0	0	0	16	0	0	0	0
1975-76	1	1	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0
1976-77	7	3	0	10	0	0	0	0	0	4	6	0	0	0	0	0	0	10	0	0	0	0
1977-78	1	1	1	3	0	0	0	2	0	1	0	0	0	0	0	0	0	2	1	0	0	0
1978-79	4	1	0	5	0	0	1	0	1	3	0	0	2	1	1	1	0	4	0	0	1	0
1979-80	2	2	0	4	0	0	1	0	0	2	0	1	0	0	0	0	0	4	0	0	0	0
1980-81	2	3	2	7	0	0	0	0	0	6	0	1	2	5	0	0	0	7	0	0	0	0
1981-82	1	1	2	4	0	0	2	2	0	0	0	0	2	2	0	0	0	3	0	0	0	0
1982-83	3	2	0	5	0	2	0	1	1	1	0	0	0	5	0	0	0	4	1	0	0	0
1983-84	3	2	0	5	1	0	0	4	0	0	0	0	0	4	0	1	0	1	4	0	0	0
1984-85	5	6	1	12	0	2	0	1	1	2	0	6	4	8	0	0	0	7	0	5	0	0
1985-86	0	1	2	3	0	0	2	0	0	1	0	0	0	3	0	0	0	3	0	0	0	0
1986-87	4	2	2	8	0	0	6	0	0	2	0	0	5	3	0	0	0	7	0	1	0	0
1987-88	6	6	10	22	0	3	8	3	5	3	0	0	18	4	0	0	0	10	12	0	0	0

[a] 1 = Ground shot
2 = Trapped
3 = Snared
4 = Shot same day airborne
5 = Unknown

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 for their pelts. Inupiat people in this region have traditionally used wolf pelts in the manufacture of fur garments. Currently, the high monetary value and aesthetic appeal of wolf hides have maintained a demand for wolves in this area.

Until 1987 no systematic research was conducted on wolves in Unit 23. Data consisted of infrequent track surveys and opportunistic observations of wolves, wolf tracks, and possible kills. 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 other factors thwarted this effort (James 1984).

In 1987 the Department initiated a cooperative research study with the National Park Service and U.S. Fish & Wildlife Service in Unit 23. The objectives of this investigation are to estimate the number of wolves occurring in the range of the WAH, to determine the spatial relationships among wolf packs on caribou winter range, to develop and test accurate and effective census methods for wolves on caribou winter range, and to estimate the impacts of wolf predation on the WAH (W. B. Ballard, unpubl. data).

POPULATION OBJECTIVES

To maintain a healthy, viable population of wolves.

To develop a cost-effective technique for assessing population trend.

METHODS

Surveys to estimate wolf numbers in Unit 23 were not conducted during 1987-88. Harvest information was obtained from wolf sealing certificates. Data on distribution, movements, productivity, mortality of wolves, and their predation rates on caribou are being collected using conventional and satellite radiotelemetry techniques (W. B. Ballard, unpubl. data). To date, 18 wolves in 7 packs have been radio-collared; four of them were equipped with satellite transmitters. The study will attempt to determine what proportion of the Unit 23 wolf population is nonterritorial (migratory). Also, by employing satellite telemetry techniques, the study should accurately estimate the number of territorial wolves residing in at least a portion of Unit 23. Feeding habits

of wolves will be determined from carcasses observed during telemetry relocation flights and from scats collected at dens. Scats from 4 packs were collected at 6 sites. Measurements of each den have been recorded for site descriptions. Results of this study will be presented in future research and survey-inventory progress reports.

RESULTS AND DISCUSSION

Population Status and Trend

Current estimates of wolf population size and composition are not available for Unit 23. During the reporting period, most hunters and trappers reported that wolves were abundant. This view was supported by harvest data (Table 1) and by opportunistic observations of wolves and tracks reported by Department personnel. Observations of radio-collared wolf packs suggest that initial productivity of pups was favorable (W. B. Ballard, pers. commun.).

Population Composition:

Mean pack size determined from sealing certificates was 6 wolves (SD = 5.7, n = 50, range = 1-20+). For packs located opportunistically by Department personnel, mean pack size was 4 wolves (SD = 3.0, n = 6, range = 1-8).

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Ninety-three wolves (52 males, 33 females, and 8 unspecified) were reported taken by hunters and trappers in Unit 23 during the 1987-88 season. One additional male wolf was inadvertently killed by Department personnel during collaring operations. The 1987-88 harvest is substantially higher than any reported harvest since 1977-78, and it is over twice the 11-year-mean harvest of 43 wolves per year (SD = 23, n = 11, Table 1). The large reported harvest for 1987-88 probably reflects, in part, an abundance of wolves in Unit 23. It may also reflect better compliance with sealing requirements. Because some wolves taken in Unit 23 are never sealed, this figure represents a minimum estimate of harvest.

Since the 1977-78 reporting period, data have indicated male wolves consistently composing over 50% of the total reported harvest (mean = 64%, SD = 5%, n = 9, range = 56-70%), excluding data where sex was unspecified. This may indicate a sex ratio skewed toward

males, a higher susceptibility of males, or most likely, selectivity by hunters for male wolves.

Transport Methods. Of the 93 wolves harvested in Unit 23 during 1987-88, 49 (53%) were taken using aircraft as transportation, 40 (42%) using snow machines, one (1%) using off-road vehicle, one (1%) using dog team, and three (3%) using unknown means (Table 2). Eighty-nine of the 93 wolves (97%) were shot, and three (3%) were trapped.

Harvest Chronology. Most wolves were harvested between January and April 1988, and the highest monthly harvest occurred during March (Table 2). The period of maximum harvest was somewhat earlier for hunters using snow machines, compared with hunters using aircraft.

Hunter Residency. Residents of Unit 23 took 47 of the 93 wolves (51%) sealed from Unit 23. Alaskan residents living outside of Unit 23 took 41 wolves (44%); nonresidents took 5 wolves (5%).

CONCLUSIONS AND RECOMMENDATIONS

Intensive management of wolves has not been necessary in Unit 23 because harvests have been minimal; however, as hunting technologies improve and harvest effort increases, wolf populations may become more susceptible to over-exploitation. Quantitative indices of wolf abundance would help prevent localized extirpation and aid in understanding fluctuations in ungulate populations.

Using harvest data as a sole indicator of population trend is fraught with problems. The number of wolves sealed in any year is highly dependent upon a number of variables unrelated to wolf population size. Hunter effort is influenced by snow and weather conditions and the availability of wage employment. The degree of public compliance with sealing requirements is also subject to variation. Because hunters using aircraft are more likely to have their wolves sealed, compared with hunters using snow machines, the proportion of hunters using aircraft will affect the magnitude of the reported harvest. Compliance with sealing regulations also varies among the different communities in Unit 23. Also, there is an inherent lag between harvest period and when the summarized sealing data are available. Harvest data is an essential component of the information required for management, and we should continue to collect it. The Department should continue efforts to improve compliance with sealing requirements through public relations efforts and streamlined regulation booklets. However, sealing data alone is inadequate for monitoring population status and for making complex management decisions that may arise in the future.

Assuming that funding and staff for conducting research studies on wolves in Unit 23 will not last indefinitely, we need to develop economical techniques for estimating wolf numbers and evaluating population status. One goal of the wolf telemetry investigation currently being conducted is to evaluate the applicability of the track count technique developed by Golden (1987) for estimating

wolf numbers (W. B. Ballard, unpubl. data). If track counts do not appear to be a valid, economically feasible technique for Unit 23, alternative techniques should be developed while the telemetry project is underway. If track counts appear to be a valid technique for estimating wolf numbers or evaluating population trend in this unit, we should consider establishing trend count areas and conducting annual track counts.

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

LITERATURE CITED

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

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Table 1. Reported wolf harvest from Unit 23, 1977-1988.

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

Table 2. Chronology of wolf harvest in Unit 23 during 1987-88 in relation to method of transport.

	Method of Transport			
	Aircraft	Snowmachine	Other[a]	Total
September	0	0	2	2
October	0	0	0	0
November	0	1	0	1
December	0	3	0	3
January	0	14	1	15
February	3	10	0	13
March	35	10	0	45
April	11	1	1	13
Unknown	0	0	1	1
Total	49	39	5	93

[a] Includes dog team, off-road vehicle, etc.

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Koyukuk River drainage above Dulbi River

BACKGROUND

Wolves and humans have shared Unit 24 for millenia. 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. Near the end of the 19th century the numbers of Dall sheep, moose, and caribou were very scarce in the Brooks Range (Campbell 1974) and the number of wolves was also low. Since that time prey populations have recovered and wolf numbers are more numerous than during the early 1970's; however, they are not as abundant as they had been during the 1940's and 50's (R. Stephenson, pers. commun.)

Before 1940 in the southern part of the unit wolf numbers were lower because there was no stable prey base; i.e., moose were absent and caribou were subject to fluctuation. An immigration of moose that coincided with federal wolf control produced a rapid increase in the moose population. The mid-1950's moose population was estimated to be as dense as the present population, which ranges from 3 to 6 moose/mi^2 in the Koyukuk lowlands near Huslia. With cessation of wolf control, wolf numbers increased and are presently as high as any historic level.

Harvests have ranged from 30 to 100 wolves per year and average about 52 wolves annually. The local demand for wolf pelts used as parka ruffs and gifts at funeral potlatches is higher than the harvest. The local residents around Huslia and Hughes recognize the predator-prey relationship between moose and wolves and make a conscious effort to increase their wolf harvest when they perceive lower moose numbers.

MANAGEMENT OBJECTIVES

To maintain a stable fall wolf population at a density of approximately 1 wolf/50 mi^2, while sustaining an annual harvest of 30 wolves in the 6,150-mi^2 areas south of Hughes.

To decrease the wolf population to 1 wolf/100 mi^2 and increase the moose:wolf ratio to 50:1 in the central part of the unit from Hughes to Bettles.

To sustain a stable fall wolf population at a density of approximately 1 wolf/50 mi^2 and an annual harvest of 30 wolves, while providing for nonconsumptive uses in the northern part of the unit, including Gates of the Arctic National Park (GAAR).

METHODS

In cooperation with the U.S. Fish and Wildlife Service (USFWS) and U.S. National Park Service (USNPS), wolf pack numbers and distribution were determined by aerial surveys during winter 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 by pelt-sealing requirements, 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 varies, 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 400-440 wolves in 55-60 packs. The estimate was derived by plotting known pack locations. These packs only occupy 70% of the unit; because wolf numbers are unknown in the remaining 30% of the area, 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 observed with the collared ones. During the early winter of 1987, 122 other wolves were seen with the marked wolves (Adams and Stephenson 1988). The density of wolves within GAAR, is estimated at a minimum of 1 wolf/55 mi^2 (R. Stephenson, pers. commun.). Based on observations of radio-marked packs in GAAR, the proportion of pups in the winter population was approximately 41% (Adams and Stephenson 1988).

Two wolves collared within GAAR dispersed after May 1987 and were subsequently relocated in October 1987, 500 kilometers east of GAAR in the Old Crow Flats of the Yukon Territories, Canada (Adams and Stephenson 1988). Because both wolves came from different packs and were found in separate areas, their movements may have been independent of each other.

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

Mortality

Season and Bag Limit:

Hunting. The open 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:

Hunters and trappers reported harvesting 67 wolves during the period: 34 males, 32 females, and 1 unspecified. Pelt coloration was 3 white, 39 gray, 19 black, and 6 unspecified. By region the harvest was 32 in the south, 22 central, and 13 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 seasons and bag limits have not changed during the past 10 years, and no Emergency Orders have been issued. In March 1987 the Board of Game deleted a requirement that the long bones of the left front leg (radius and ulna bones) must be left attached to the hide until after it had been sealed. The regulation was to provide age information to the Department; however, during the preceding 7 years no wolves were presented for sealing with the leg bone attached.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate in Unit 24 is much higher than previous estimates because (1) of an increase in wolf populations and (2) the cooperative USNPS and USFWS studies have enabled us to more accurately determine wolf population sizes through the radiotelemetry of packs. Present population levels are stable or increasing.

I recommend that seasons and bag limits remain unchanged and more wolves be harvested 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.

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STUDY AREA

GAME MANAGEMENT UNITS: 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 their use of caribou, moose, Dall sheep, and other prey within this area, wolves are relatively scarce in this area.

Little is known about wolf populations or of their influence on ungulate populations in northeastern Alaska. 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) conducted aerial wolf surveys in Subunit 25D (West) during March 1984. Wolf surveys have not been conducted in the remainder of the Yukon Flats.

Management goals for wolves in the study area are to (1) protect, maintain, and enhance the wolf population and its habitat in concert with other components of the ecosystem; (2) provide for continued subsistence use of wolves by rural Alaskan residents who have customarily and traditionally used the population; (3) provide the greatest sustained opportunity to participate in hunting and trapping wolves; and (4) provide for commercial use of wolves.

MANAGEMENT OBJECTIVES

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

To establish accurate wolf harvest estimates by 1990.

METHODS

Population data were extrapolated from survey estimates made in 1984-85 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 1987-88. 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) in 1987-88. An estimated 50-60 wolves among 10-12 packs occur in Subunits 26B and 26C, for a density of 1 wolf per 400-520 mi^2. These density estimates are similar to those for northern ANWR, excluding the arctic 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 River, Sadlerochit River, Aichilik River, Kongakut River, Hulahula River, Egakserak River, Drain Creek, and Malcolm Creek (Garner and Reynolds 1986). Several lone wolves were also radio-collared. Relocations indicated wolves did not follow caribou to their winter ranges; rather, they generally remained within the same pack territories all year, preying on caribou from spring to fall and taking alternate prey (Dall sheep, moose, or small game) during winter. Several wolves, however, dispersed widely; i.e., a maximum of approximately 500 miles (Garner and Reynolds 1986).

Mortality

Season and Bag Limit:

Hunting. The open season in Units 25 and 26 is from 10 August to 30 April; there is no bag limit.

Trapping. The open season in Unit 25 is from 1 November to 31 March. The open season in Unit 26 is from 1 November to 30 April. There are no bag limits for either unit.

Human-induced Mortality:

More wolves were reported harvested in Subunit 25A than in the other subunits (Table 1). Most of the wolf harvest occurred in western and southeastern Subunit 25A, northeastern Subunit

25B, and northern Subunit 25D. Hunter-trapper success averaged 1.7, 1.3, and 1.0 wolves/reporting user in Subunits 25A, 25B, and 25D, respectively. Wolf harvests in Subunits 26B and 26C were about the same as those in past years (Table 2); harvests were not concentrated in a particular area. Hunter-trapper success averaged 1.0 wolf/reporting user in both Subunits 26B and 26C. Harvest of males and females was nearly even in the study area during 1987-88, and most wolves taken were either gray or black (Tables 1 and 2). Average pack sizes of harvested wolves by subunits in 1987-88 were as follows: 25A = 4.0, 25B = 2.8, 25D = 0.8, 26B = 2.7, and 26C = 4.0.

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

Harvest Chronology. Most of the reported wolf harvest occurred in March 1988 in Subunit 25A and from December through February in Subunits 25B and 25D (Table 3). Wolves in Subunits 26B and 26C were taken mostly from February through April (Table 4). Chronology of harvests in all subunits was similar among years.

Transport Methods. Most harvested wolves were taken by shooting in Subunit 25A and by snaring in Subunits 25B and 25D during FY 1988 (Table 5), although shooting occurred in these latter subunits more frequently than in recent years. Ground shooting was the only method of reported harvest in Subunits 26B and 26C (Table 6).

Aircraft were the most common transport method in Subunit 25A, but snowmachines were used most in Subunits 25B and 25D (Table 5). Half of the wolves taken in Subunits 26B and 26C were transported by 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 rate.

Game Board Actions and Emergency Orders

The Board of Game has made no regulatory changes concerning wolf harvests since the 1984-85 season, when it prohibited hunters from shooting wolves (i.e., as a trapping method) on the same day they had been airborne in Unit 26.

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. While populations appear to be fairly stable, that assumption is based on scant data. I recommend that the Department allocate more funds to conduct surveys in the study area and to cooperate with the USFWS and National Park Service.

The next priority is to improve documentation of the hunter and trapper harvest of wolves. People throughout the study area and especially those in Subunits 26B and 26C must be educated about the requirement to seal the wolves they harvest. 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.

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Table 1. Number, sex, and pelt color of harvested wolves in Unit 25, 1983-88.

Subunit/ Year	Sex				Color			
	Male	Female	Unk.	Total	White	Gray	Black	Unk
25A								
1983-84	8	6	2	16	--	--	--	--
1984-85	25	14	10	1	3	14	6	2
1985-86	6	8	0	14	0	10	2	2
1986-87	6	3	0	9	0	5	3	1
1987-88	14	16	0	30	1	13	12	4
25B								
1983-84	4	5	0	9	--	--	--	--
1984-85	4	4	7	15	0	8	6	1
1985-86	11	9	0	20	0	13	6	1
1986-87	5	4	4	13	0	4	8	1
1987-88	4	1	1	6	0	2	4	0
25D								
1983-84	8	4	2	14	--	--	--	--
1984-85	9	10	5	24	0	17	5	2
1985-86	8	5	2	15	0	6	9	0
1986-87	25	5	4	34	1	23	9	1
1987-88	2	2	2	6	0	5	0	1
Total								
1983-84	20	15	4	39	--	--	--	--
1984-85	27	24	13	64	3	39	17	5
1985-86	25	22	2	49	0	29	17	3
1986-87	36	12	8	56	1	31	20	3
1987-88	20	19	3	42	1	20	16	5

Table 2. Number (N), sex, and pelt color of harvested wolves in Unit 26, 1984-88.

Subunit/ Year	N	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
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
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

Table 3. Wolf harvest chronology for Subunits 25A, 25B, and 25D, 1984-85 to 1987-88.

Subunit/Year	Aug.	Sept.	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
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
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
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

Table 4. Wolf harvest chronology for Subunits 26B and 26C, 1985-86 to 1987-88.

Subunit/Year	Aug.	Sept.	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
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
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

Table 5. Harvest methods and transportation means during open wolf hunting and trapping seasons in Subunits 25A, 25B, and 25D, 1983-84 to 1987-88.

Subunit/ Year	Method of Take[a]				Method of Transportation[b]							
	1	2	3	4	1	2	3	4	5	6	7	8
25A												
1983-84	10	7	1	0								
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
25B												
1983-84	3	8	2	0								
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
25D												
1983-84	0	9	7	0								
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
Totals												
1983-84	13	24	10	0								
1984-85	36	20	8	0								
1985-86	29	9	9	2	27	7	0	0	12	0	0	3

(continued)

Table 5. Continued.

Subunit/ Year	Method of Take[a]				Method of Transportation[b]							
	1	2	3	4	1	2	3	4	5	6	7	8
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

[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, and (8) unknown.

Table 6. Harvest methods and transportation means during the open wolf hunting and trapping seasons in Subunits 26B and 26C, 1984-85 to 1987-88.

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
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
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

[a] Method of Take: (1) ground shooting, (2) trapping, (3) snaring, and (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, and (8) unknown.

STUDY AREA

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

GEOGRAPHICAL DESCRIPTION: Western North Slope

BACKGROUND

Surveys for developing meaningful estimates of wolf numbers in Subunit 26A have never been conducted. Spring track counts conducted in 1982, 1986, and 1987 provided minimum counts for a small portion of the subunit and a population size extrapolation for the entire Subunit (James 1982, Trent 1988).

POPULATION OBJECTIVES

To provide maximum harvest opportunities within sustained-yield limits.

METHODS

No surveys to evaluate wolf numbers were conducted during the reporting period. Harvest data were obtained from sealing-certificate records.

RESULTS AND DISCUSSION

Population Status and Trend

No current data are available to estimate wolf numbers or the trend in numbers in Subunit 26A. The most recent survey was conducted during April 1987 (Trent 1988). An 8,226-mi^2 area was surveyed in the southeastern corner of the subunit, an estimated 11 to 12 packs (i.e., 57-69 wolves) were tentatively identified, and a density of 1 wolf/119-114 mi^2 was estimated. The most recent estimate of population size for the entire subunit was made by James (1982). Approximately 20% of the subunit was surveyed, and an overall population estimate of 144-310 wolves was extrapolated. Because the southeastern portion where the surveys were conducted has the highest densities of wolves in the subunit, extrapolating that data to the remainder of the subunit may not have been justifiable.

Distribution and Movements:

Most of the wolves in Subunit 26A are found in the southeastern corner near the Brooks Range and along the Colville River. Wolves commonly move out onto the extensive coastal plain and are highly vulnerable to harvest during the winter.

Mortality

Season and Bag Limit:

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

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

Human-induced Mortality:

Eleven wolves (8 males and 3 females) were reported harvested during the reporting period. Ten of the wolves were greys, and one was black. Nine wolves were taken using firearms, and two were trapped. The actual harvest is probably much larger in size, because compliance with sealing requirements in Subunit 26A was minimal. The magnitude of the unreported harvest is unknown.

Hunter Residency and Success. Four of the wolves reported harvested were taken by residents of Subunit 26A. Six were taken by Alaskan residents from outside the subunit, and one was taken by a nonresident.

Harvest Chronology. Ten wolves were taken in March and April 1988, and one was taken in August 1987.

Transport Methods. Seven of the wolves sealed were taken using aircraft as transportation, and four were taken by hunters using snow machines.

Game Board Actions and Emergency Orders

In 1987 the Board of Game enacted regulations for the 1988-89 season prohibiting hunters and trappers from killing a wolf with a firearm on the same day they had been airborne. Because 7 of the 11 wolves reported harvested were taken using aircraft, the initial effect of this regulatory change will be to reduce the reported harvest. The long-term impact on the actual harvest is unknown.

CONCLUSIONS AND RECOMMENDATIONS

The prey base in Subunit 26A is capable of supporting significantly more wolves than currently exists. The Western Arctic Caribou Herd, which numbers over 250,000 animals, occupies the area seasonally, and significant numbers of caribou are found in the subunit throughout the year. The resident Teshekpuk Lake Caribou Herd probably numbers more than 15,000 animals. There are over 1,500 moose in the subunit, mostly along the Colville River. These ungulate populations are lightly harvested by humans and could support more wolves than are presently found in the subunit. Wolves are considered valuable animals by most residents of the North Slope, and wolf pelts command prices well above those of the

established market. The demand for wolf pelts and the vulnerability of wolves on the barren coastal plain to hunters using snow machines or aircraft have resulted in extremely low numbers of wolves in much of the subunit. Wolves were abundant in this area in the early 1960's, and it is highly probable that if hunting pressure were reduced their numbers would increase. However, several factors would likely frustrate management efforts if this goal were adopted:

1. Compliance with hunting regulations and reporting requirements by many residents in Subunit 26A is poor. There is reason to believe that some hunters from outside the subunit may also not universally comply with regulations or provide accurate reports of their harvest. Therefore, a change in regulations may not produce a change in actual harvest.

2. Methods to efficiently evaluate wolf numbers and population trends do not exist. Although wolf studies have been conducted in portions of the subunit, they are not generally applicable to the entire subunit.

3. The personnel needed to develop management strategies, work with the public, assess the effect of management on wolves, and enforce regulations is inadequate.

4. Probably the most apparent shortcoming of current wolf management in Subunit 26A is the lack of any definable management objectives. Until these have been developed, coherent wolf management is not possible, and I recommend that future work on wolves focus on developing these goals with the participation of the public.

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Federal Aid Project
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