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WOLF

Mary V. Hicks, Editor

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Study 14.0
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STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
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DIVISION OF WILDLIFE CONSERVATION
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CONTENTS

LOCATION

GAME MANAGEMENT UNITS: 1A and 2 (8,900 mi^2)

GEOGRAPHIC DESCRIPTION: Unit 1A - Unit 1 south of Lemesurier Point, including all drainages into Behm Canal and excluding all drainages into Ernest Sound.

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

BACKGROUND

Wolves live throughout the islands and mainland of Units 1A and 2, although densities on the mainland are generally lower than on maritime-influenced offshore islands. Wolves are capable swimmers and regularly travel between adjacent islands in search of prey.

Wolves feed primarily on deer in southern Southeast Alaska, particularly on islands in the area. On the mainland, where deer densities are generally lower than on islands, wolves prey on mountain goats and moose. Marine mammals, salmon, waterfowl, beavers, and small mammals supplement the diets of wolves in southern Southeast Alaska.

The coloration of Southeast Alaska wolf pelts varies; however, the brown/gray color variant is most common. During the past decade, white or near-white pelts have composed less than 1% of the harvest, while black pelts have composed 20% of the Unit 1A harvest and 14% of the Unit 2 harvest.

From 1915 through the early 1970s, a cash bounty was paid for wolves taken in Southeast Alaska, and in the 1950s federal agents poisoned wolves on many islands in Southeast in an effort to increase or maintain deer numbers. None of these programs had long-lasting effects on wolf abundance or distribution. However, as a result of extensive timber harvesting in the Tongass National Forest, in 1990 a USDA Forest Service-sponsored interagency committee identified wolves in Southeast Alaska as a species of concern with regard to viability and distribution. In 1993, the Biodiversity Legal Foundation (Boulder, Colorado USA) and an independent biologist from Haines, Alaska filed a petition with the U.S. Fish and Wildlife Service (FWS) requesting that wolves in Southeast Alaska be listed as a threatened subspecies pursuant to the Endangered Species Act of 1973, as amended. The FWS ruled that listing was not warranted at that time but indicated they felt it was clear that without significant changes to the existing Tongass Land Management Plan, long-term viability of the Alexander Archipelago wolf was seriously imperiled. A comprehensive conservation assessment about Southeast Alaska wolves was subsequently prepared through the USDA Forest Service (Person et al. 1996). The most important consideration identified in the assessment was the need to maintain long-term carrying capacity for deer, the principal prey for most of the wolf population. The authors suggested that a series of old-growth forest reserves might provide an effective strategy to increase the likelihood that wolves will persist in extensive timber harvesting areas.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

METHODS

We collect harvest information through a mandatory sealing program. Information from hunters and trappers includes the number and sex of harvested wolves, date and location of harvest, method of take, transportation mode, and pelt color. We gather anecdotal information about wolves from hunters, trappers, and department staff. Additional information is from trappers through an annual mail-out survey.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Using a simulation model based on data collected through a graduate research project in Unit 2, Person and Ingle (1995) estimated that 321 wolves (SE = 135) inhabited Prince of Wales and the Kosciusko Islands during autumn 1994 and 199 wolves (SE = 111) in spring 1995. The smaller spring estimate reflected overwinter mortality, primarily from trapping (Table 1). No current data of similar nature is available for Unit 1A, nor are subsequent estimates available for Unit 1A or Unit 2. However, based on the high harvest levels (Table 1) and high indices of abundance (I_A) reported by trappers (Table 2), wolves in Unit 1A appear to have increased during this report period. In Unit 2 consistently high harvests during the past 5 seasons (Table 1) indicate wolf numbers have remained relatively high, although declines in the indices of abundance indicate the population may have declined somewhat during the past 3 seasons (Table 2).

Pack sizes on Revillagigedo Island in Unit 1A averaged 5.4 wolves during the mid 1980s (Smith et al. 1987). Pack sizes on Prince of Wales and Kosciusko Islands were larger, averaging 7 to 9 wolves in early autumn before the trapping season (Person and Ingle 1995). All members of wolf packs are rarely observed together, except during winter; therefore, estimates of pack sizes are difficult unless derived from repeated, direct observations (Person et al. 1996).

Distribution and Movements

Smith et al. (1987) reported that home ranges of wolves on Revillagigedo Island averaged 108 mi^2 during the mid 1980s. On Prince of Wales and Kosciusko Islands, Person et al. (1996) similarly reported average home ranges of 109 mi^2. Core areas where wolf activity was concentrated averaged 48 mi^2, or 55 to 60% smaller than total home ranges.

Pups that survive to adulthood either remain in their natal packs or disperse. In wolf populations where mortality is high, lone wolves may be more successful in finding vacant territories in which to settle or in being accepted into other established packs (Ballard et al. 1987). Dispersing wolves are more vulnerable than nondispersers to hunting and trapping and are more likely to be killed by

other wolves (Peterson et al. 1984). Dispersing radiocollared wolves on Prince of Wales Island suffered 71% mortality between June 1993 and June 1994 and 67% between June 1994 and June 1995, compared to 50% and 14% for resident wolves during these same periods (Person et al. 1996).

Wolves usually disperse singly and may make several temporary forays from the main pack before leaving permanently (Fuller 1989). On Prince of Wales Island, the annual rate of dispersal was 39%, with adults (≥2 years old) composing 71% of dispersers (Person and Ingle 1995). The authors speculated the high rate of dispersal by adults may have been a response to human exploitation. Sexually mature wolves may be induced to disperse from natal packs because of availability of nearby vacant territories created by hunting or trapping pressure. Person and Ingle (1995) reported that 2 of 3 radiocollared wolves on Kosciusko Island (1 adult and 1 yearling) dispersed over 100 miles each, possibly because of low prey availability. Both of these wolves were eventually found dead, one after traveling to the southernmost tip of Dall Island and the other after traveling to Mallard Bay, located on the southeastern end of Prince of Wales Island. Although the cause of death for the wolf traveling to south Dall Island was never ascertained, the wolf found in Mallard Bay had succumbed to starvation.

MORTALITY

Harvest

Season and Bag Limit.

Hunting:	August 1–April 30;	5 wolves
Trapping:	November 10–April 30;	No limit

Board of Game Actions and Emergency Orders. No Game Board actions or emergency orders were made during this report period. However, in light of the petition to list the Alexander Archipelago wolf as a threatened subspecies, we anticipate the Board will soon entertain discussions about shortening the hunting and trapping seasons, at least in Unit 2.

Hunter/Trapper Harvest. Wolf harvest from Unit 1A reached an all time high of 49 in 1995–96 (Table 1). In Unit 2 wolf harvests surpassed 100 during 2 of the past 3 seasons. Approximately 70% of the wolves harvested during the past 3 seasons were caught in traps or snares, while almost 30% were shot (Table 1). The numbers of people that harvested wolves from Unit 1A increased markedly during 1995–96, although the average catch per person remained within historical limits (Table 3). In Unit 2 the number of people harvesting wolves remained stable during the past 3 seasons, as did the average catch per person.

Hunter Residency and Success. Local residents regularly compose 94–100% of hunters and trappers pursuing wolves in Unit 1A, while in Unit 2 nonlocal residents have composed 20–53% of the hunters and trappers pursuing wolves (Table 4). However, despite the high percentage of nonlocals taking wolves in Unit 2, unit residents regularly harvest most wolves. For example, during 1994–96 two local trappers accounted for over 40% of the Unit 2 wolf harvest.

Harvest Chronology. Wolf harvests are generally affected by local weather conditions. Persistent freezing often makes intertidal trapping sets inoperative and deep snow can bury snares and

render them useless. During the past 3 seasons, the highest wolf harvests in Unit 1A occurred during February (24%) and March (26%) (Table 5). In Unit 2, the highest harvests occurred during December (21%) and January (25%).

Transport Methods. Wolf hunters and trappers continue to prefer boats and highway vehicles in Units 1A and 2. During the past 3 seasons, boats accounted for 78% of the trips in Unit 1A, compared to 17% for highway and off-road vehicles (Table 6). In Unit 2 boats were used for 61% of trips during the same period, compared to 37% for highway and off-road vehicles.

Other Mortality

In exploited populations, mortality from natural causes (e.g., starvation, accidents, disease, fighting) is low, typically averaging 5 to 10% per year (Fuller 1989). People illegally killing wolves are a more substantial cause of mortality (Person et al. 1996). Of 17 radiocollared wolves on Prince of Wales Island that died during a 3-year study, 53% were legally killed by humans, 29% were killed by humans but not reported, and 18% died from natural causes (Person et al. 1996). Considering the additive effects of natural and unreported mortality, total mortality could be 35 to 50% higher than reported, although some bias may have existed against reporting legally killed wolves with radio collars. Regardless, reported mortality substantially underestimates total mortality, particularly in Unit 2.

We have received several public reports of wolves standing along the shoulder of the North Tongass Highway in Ketchikan during the past two years. In 1995 2 adult males were hit and killed by cars, one along the North Tongass Highway and one along the White River Road.

HABITAT

Assessment

As we have reported previously (Wood 1990, Larsen 1991) and as Person et al. (1996) reiterated recently, the expanding road system and increasing human population will continue to have a direct effect on wolves in Unit 1A and, more notably, in Unit 2. We expect long-term reductions in wolf numbers as a direct result of deer declines through habitat loss. As the uneven-aged, old-growth forest is logged, deer carrying capacity will be reduced and, consequently, wolf populations, supported by fewer deer, will decline. To help mitigate effects of habitat loss, Person et al. (1996) suggested maintaining large, unfragmented and unroaded blocks of habitat (reserves) within biogeographic areas where extensive timber harvesting has occurred or is planned. They believe that making reserves large enough to encompass core activity areas of at least 1 wolf pack would markedly increase the likelihood of their effectiveness and reduce the long-term risk to wolf viability.

CONCLUSIONS AND RECOMMENDATIONS

We believe that wolf populations increased slightly in Unit 1A and remained relatively stable in Unit 2 during this report period. Although we do not consider wolves threatened in southern Southeast Alaska at this time, we have conservation concerns stemming from long-term habitat changes, human population growth, and increased road access into once remote wolf habitats. We support the concept of establishing roadless reserves within logged areas, and we recommend

shortening the trapping season to coincide with the period of maximum pelt primeness; December 1–March 31. This change would also reduce wolf harvest by an estimated 12% annually and relieve some concern about harvesting beyond sustainable levels, particularly in Unit 2 where habitat changes and increased access are most notable.

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Table 1 Unit 1A and Unit 2 wolf harvests, 1985–1996

Season	Males	Females	Unk	Total	Method of Take			Pelt Color			
					Shot	Trapped	Unk	White	Grey	Black	Unk
Unit 1A											
1985-86	6	5	0	11	1	10	0	0	7	4	0
1986-87	11	10	0	21	3	18	0	0	16	5	0
1987-88	14	9	0	23	9	14	0	0	16	7	0
1988-89	13	8	0	21	10	11	0	0	14	7	0
1989-90	12	19	2	33[a]	14	19	0	0	25	8	0
1990-91	9	6	0	15	9	6	0	0	11	4	0
1991-92	15	16	0	31	12	19	0	0	29	2	0
1992-93	26	16	0	42	11	31	0	0	36	6	0
1993-94	18	14	0	32	6	26	0	0	24	7	1
1994-95	22	18	0	40	11	29	0	1	35	4	0
1995-96	24	25	0	49[b]	17	29	3	0	38	11	0
Totals	170	146	2	318	103	212	3	1	251	65	1
Unit 2											
1985-86	7	11	0	18	9	9	0	1	14	3	0
1986-87	22	16	1	39	16	23	0	0	32	7	0
1987-88	27	24	4	55	26	29	0	1	39	15	0
1988-89	27	16	2	45	31	14	0	0	41	4	0
1989-90	20	11	1	32	23	8	1	0	20	9	3
1990-91	36	29	1	66	44	21	1	0	50	15	1
1991-92	42	40	4	86	41	45	0	0	80	6	0
1992-93	59	46	0	105	26	79	0	0	93	11	1
1993-94	46	54	3	103	21	81	1	0	80	15	8
1994-95	50	32	3	85	21	64	0	0	82	2	1
1995-96	62	41	0	103	35	68	0	0	90	12	1
Totals	398	320	19	737	293	441	3	2	621	99	15

[a] Does not include 1 gray female killed by a car on South Tongass Highway, Ketchikan.

[b] Does not include 2 males (1 black, 1 gray) killed by cars on North Tongass Highway and White River Road, Ketchikan.

Table 2 Indices of wolf abundance reported by trappers, Unit 1A and Unit 2, 1991–1996

Season	Abundance[a]	
	Unit 1A	Unit 2
1991-92	86	59
1992-93	65	60
1993-94	57	25[b]
1994-95	93	37
1995-96	80	37

[a] Indices taken from Brand and Keith (1979). $I_A = [(\Sigma R_i - n)/2n] \times 100$ where: R_i = the numerical value assigned to the *ith* response ($R_i = 1$ when population level reported to be scarce, 2 when population level reported to be common, or 3 when population level reported to be abundant). n = number of trappers that responded. Data derived from 1991–96 Unit 1A and Unit 2 trapper questionnaires.

[b] Sample consisted of only 2 trappers.

Table 3 Numbers of hunters and trappers who harvested wolves in Unit 1A and Unit 2 and average catch per person, 1985–1996

Season	Nr harvesters		Average catch/person	
	Unit 1A	Unit 2	Unit 1A	Unit 2
1985-86	7	14	1.6	1.3
1986-87	10	27	2.1	1.4
1987-88	12	34	1.9	1.6
1988-89	15	31	1.4	1.4
1989-90	18	28	1.8	1.1
1990-91	13	42	1.1	1.6
1991-92	17	37	1.8	2.3
1992-93	19	35	2.2	3.0
1993-94	15	30	2.1	3.4
1994-95	17	37	2.3	2.3
1995-96	25	38	2.0	2.7

Table 4 Residency of Unit1A and Unit 2 wolf harvesters, 1990–1996

	Unit 1A			Unit 2		
Season	Local resident[a]	Nonlocal Resident[b]	Nonresident	Local resident[a]	Nonlocal resident[b]	Nonresident
1990-91	13	0	0	24	18	0
1991-92	16	1	0	19	15	3
1992-93	19	0	0	18	16	1
1993-94	15	0	0	24	6	0
1994-95	15	1	1	24	11	2
1995-96	25	0	0	18	20	0
Totals	103	2	1	127	86	6

[a] Local residents are those individuals living within the boundaries of Unit 1A or Unit 2.
[b] Nonlocal residents are Alaska residents living outside Unit 1A or Unit 2.

Table 5 Unit 1A and Unit 2 wolf harvest chronology, 1985–1996

Season	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Unit 1A												
1985-86	0	0	0	0	0	1	4	3	2	1	0	0
1986-87	0	1	0	0	1	2	3	11	2	1	0	0
1987-88	0	0	1	1	0	4	6	3	1	1	3	3
1988-89	0	1	2	1	3	2	4	0	3	4	1	0
1989-90	0	1	1	4	4	5	3	3	6	5	1	0
1990-91	0	0	2	1	4	0	2	2	0	2	2	0
1991-92[a]	0	0	0	4	3	2	2	4	9	6	1	0
1992-93	0	1	1	2	5	6	1	4	15	7	0	0
1993-94	0	2	0	0	0	3	6	5	13	2	1	0
1994-95	0	0	2	6	1	1	2	16	6	6	0	0
1995-96	0	2	3	2	6	5	4	8	12	6	1	0
Totals	0	8	12	21	27	31	37	59	69	41	10	3
Unit 2												
1985-86	0	0	4	1	2	2	3	4	1	1	0	0
1986-87	0	1	1	1	2	11	6	9	5	2	1	0
1987-88	0	1	1	7	7	11	3	11	8	1	4	1
1988-89	0	0	5	8	5	8	5	4	0	3	4	3
1989-90	0	2	3	3	2	5	3	2	2	2	4	4
1990-91	0	4	4	8	7	6	7	12	12	6	0	0
1991-92	1	2	7	1	8	20	18	7	7	11	2	2
1992-93[a]	0	1	3	8	10	19	15	16	28	4	1	0
1993-94	0	1	2	6	11	24	33	16	8	2	0	0
1994-95	0	1	2	4	4	22	18	19	12	3	0	0
1995-96	0	2	8	8	1	15	22	19	27	1	0	0
Totals	1	15	40	55	59	143	133	119	110	36	16	10

[a] Hunting season changed from year round, no limit, to August 1–April 30, 5 wolf limit.

Table 6 Unit 1A and Unit 2 wolf hunter/trapper transport methods, 1985–1996

Season	Air	Boat	Highway Vehicle	Walked	Unknown
Unit 1A					
1985-86	0	5	3	0	3
1986-87	10	11	0	0	0
1987-88	0	21	2	0	0
1988-89	0	16	5	0	0
1989-90	2	26	5	0	0
1990-91	1	10	2	0	2
1991-92	1	24	1	5	0
1992-93	2	30	3	3	4
1993-94	1	28	2	0	1
1994-95	1	32	6	1	0
1995-96	1	33	12	2	1
Totals	19	236	41	11	11
Unit 2					
1985-86	0	4	5	0	9
1986-87	0	14	25	0	0
1987-88	0	31	20	0	4
1988-89	2	25	15	0	3
1989-90	0	12	15	0	5
1990-91	2	15	40	1	8
1991-92	2	53	31	0	0
1992-93	1	68	32	0	4
1993-94	1	59	42	0	1
1994-95	1	57	25	2	0
1995-96	3	60	39	0	1
Totals	12	398	289	3	35

LOCATION

GAME MANAGEMENT UNITS: Unit 1B and Unit 3 (6,000 mi^2)

GEOGRAPHIC DESCRIPTION: The Southeast Mainland from Cape Fanshaw to Lemesurier Point and adjacent islands

BACKGROUND

Wolves inhabit the islands and mainland of Unit 1B and Unit 3. Wolves immigrated to this region after the postglacial immigration and establishment of deer populations. Deer are the primary food source for wolves in Southeast Alaska with moose and mountain goat important sources in some mainland areas.

Wolf densities are higher in Unit 1B and Unit 3 than in Interior Alaska, but due to the dense forest cover, viewing opportunities are infrequent.

Government wolf control programs and bounties were maintained into the 1970s in an effort to increase deer numbers. Today a few recreational trappers and opportunistic sport hunters harvest wolves.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

METHODS

We monitored the harvest through the mandatory pelt sealing program. We collected data on the number of wolves killed, sex, date and method of take, transportation mode, and the estimated number of wolves associated with those killed. We recorded observations by Forest Service biologists, trappers, hunters, and other members of the public. An annual statewide trapper survey supplies additional information.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We do not collect sufficient data to make a meaningful estimate of wolf populations. Conversations with trappers, hunters, pilots, other biologists and information from trapper questionnaires indicate the wolf population has increased in the 1990s.

MORTALITY

Harvest

Season and Bag Limit

Trapping:	November 10–April 30	No limit
Hunting:	August 1–April 30	5 wolves

Board of Game Actions and Emergency Orders. The Board of Game issued no actions or emergency orders for the units this reporting period.

Hunter/Trapper Harvest. Fifteen to 20 individuals harvested an annual average of 47 wolves in Unit 3 during this reporting period, with the most wolves (54) taken in the 1994–95 season (Table 1). In Unit 1B 17 and 16 wolves were taken by 9 and 8 individuals in 1993–94 and 1994–95, respectively. The harvest in 1995–96 dropped to 4 wolves taken by 4 individuals; this decrease in harvest was primarily due to 1 trapper not trapping that season.

Trapping continues to be the primary method of take. Deer hunters, and occasionally moose hunters, are generally responsible for shot wolves. Most of the wolf harvest takes place near local communities. Trappers do not harvest wolves on many islands and on much of the mainland.

Hunter/Trapper Residency and Success. Nonresidents harvest few wolves; their harvest is usually incidental to hunting other species. During 1993–1994 1 nonresident harvested a wolf in Unit 1B. In 1993–94, 1994–95, and 1995–96, nonresidents harvested 2, 2, and 3 wolves, respectively, in Unit 3. All nonlocal state resident harvesters were from communities adjacent to Unit 1B and 3.

Harvest Chronology. December, January, and February account for the highest percent of the harvest. Hunters taking wolves incidentally account for most of the remainder of the harvest (Table 2).

Transport Methods. Most of the wolf harvest is by trappers using small boats (Table 3). Some trapping occurs from the road system on Mitkof and Wrangell islands. Other forms of transportation are rarely used.

Other Mortality

In March 1996 a large male wolf was killed by a car in the Petersburg city limits.

HABITAT

Assessment

Clearcut logging and construction of logging roads affect wolf populations. Clearcut logging of old-growth forest can reduce the winter carrying capacity for deer, the primary food source of southeast wolves. Logging roads provide travel routes for wolves and increased access for wolf trappers, causing increased harvest.

CONCLUSIONS AND RECOMMENDATIONS

The wolf harvest has increased in recent years and information from trappers and biologists indicates an increasing population. Local trappers harvest most of the wolves, but much of Unit 1B and Unit 3 are not trapped. Continued clearcut logging and road building may affect future wolf populations by reducing prey species and providing trapper access. I recommend no change in regulations.

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Table 1 Unit 1B and Unit 3 wolf harvest, 1986–95

Regulatory Year	Unit	Reported Harvest				Method of Take			Successful Total Trappers/Hunters
		M	F	Unk	Total	Trap/Snare	Shot	Unk	
1986-87	1B	7	4		11	10	1		6
	3	6	3	1	10	9	1		4
1987-88	1B	8	6		14	11	3		6
	3	6	3		9	5	4		6
1988-89	1B	4	5		9	6	3		6
	3	5	5		10	5	5		6
1989-90	1B	12	7		19	14	5		8
	3	12	10		22	12	10		13
1990-91	1B	7	8		15	10	5		3
	3	11	7		18	15	3		10
1991-92	1B	4	6		10	7	3		7
	3	26	25		51	33	17	1	25
1992-93	1B	3	5		8	7	1		2
	3	12	14		26	19	7		13
1993-94	1B	9	8		17	11	6		9
	3	27	19	2	48	37	11		20
1994-95	1B	11	5		16	14	2		8
	3	31	23		54	38	16		15
1995-96	1B	1	3		4	3	1		4
	3	27	13		40	26	13	1	20

Table 2 Unit 1B and Unit 3 wolf harvest chronology percent, 1986–95

Regulatory Year	Unit	Harvest Periods													
		July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Unk	*n*
1986-87	1B			9		9	9	18	9	27	18				11
	3			10	10				70	10					10
1987-88	1B			7	7	50			29				7		14
	3				11		22		11		22	11	22		9
1988-89	1B		11		11	11	56	11							9
	3	10		10					50		20	10			10
1989-90	1B			11	11	16	32	26			15				19
	3		9	9	16		32	13	4	13	4				22
1990-91	1B				13		7	40	13	26					15
	3		6		6		11	28	22	16	11				18
1991-92	1B		10			10	20	60							10
	3			8	8	14	8	15	15	12	10	6	4		51
1992-93	1B					12	50	26			12				8
	3			15	4		12	35		15	19				26
1993-94	1B		6		6	17	36	12	17		6				17
	3		4	4	9	4	27	20	10	13	9				48
1994-95	1B		6			6	57	19	6	6					16
	3		2	4	2	11	15	20	7	11	9			19	54
1995-96	1B					25	25		25	25					4
	3		2	5	13	8	23	12	18	15	2	2			40

Table 3 Unit 1B and 3 wolf harvest percent by transport method, 1986–95

		Percent of Harvest							
Regulatory Year	Unit	Airplane	Boat	3- 4-wheeler	Snowmachine	ORV	Highway Vehicle	Other	*n*
1986-87	1B		82	18					11
	3		60				10	30	10
1987-88	1B		93					7	14
	3		89				11		9
1988-89	1B	11	78		11				9
	3	10	70				20		10
1989-90	1B		89		11				19
	3		77	5			18		22
1990-91	1B		73	7	13			7	15
	3		72		17		11		18
1991-92	1B		90		10				10
	3	4	69				22	6	51
1992-93	1B		100						8
	3	4	85				12		26
1993-94	1B	6	88		6				17
	3	4	81				13	2	48
1994-95	1B	6	94						16
	3		89		4		5	2	54
1995-96	1B		100						4
	3		85				13	2	40

LOCATION

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

GEOGRAPHIC DESCRIPTION: That portion of the southeast Alaska mainland from Cape Fanshaw to the latitude of Eldred Rock

BACKGROUND

Wolves are distributed throughout the mainland portion of Unit 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 unit.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management goals have been established for this area. A general management objective should be to regulate seasons and bag limits to maintain viewable and harvestable populations of wolves. Management should maintain wolf harvests at a level similar to the average over the previous 5 seasons, while monitoring the population through whatever means are available, including anecdotal reports, aerial survey sightings, and trapper interviews. No wolf control methods are contemplated for this area at this time.

METHODS

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

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Based on harvest data, discussions with trappers and other observers, and incidental sightings during flights for other purposes, I believe the population is stable or slowly increasing throughout the unit. During the reporting period, we have received reports of packs in the Berners Bay, Nugget Creek, Taku River, St. James Bay/Point Couverden, Snettisham, and Endicott Arm areas.

Population Size

No quantitative data on wolf numbers in Unit 1C are available. Based on available habitats and locations where wolves have been sighted, it is estimated that 70 wolves in 10 packs use the area.

MORTALITY

Harvest

Seasons and Bag Limits

Hunting:	August 1–April 30	5 Wolves
Trapping:	November 10–April 30	No Limit

Hunter/Trapper Harvest. A total of 7 wolves (3 males, 4 females) were taken in Unit 1C in 1993 (Table 1). This compares to the previous 5-year mean of 6.6 (range = 5–12). Three wolves were snared and 4 were trapped. All 7 wolves were black.

Again in 1994 7 wolves (4 males, 1 female, and 2 of unknown sex) were killed, equaling the 5-year mean. Four animals were gray and 3 were black. Four of these wolves were trapped; the remainder were taken with snares.

In 1995, 5 wolves (2 males and 3 females) were harvested, compared to a 5-year mean of 6. Three were gray and 2 were black. Two were taken with snares and 3 were shot.

Hunter/Trapper Residency and Success. In 1993, 3 local residents took wolves within the unit. In 1994 successful wolf hunters included 5 local residents. In 1995, 3 local residents took the entire harvest. Throughout the period harvesting of wolves was distributed throughout the unit. One trapper took 4 wolves at Pt. Bishop in 1994, but other animals were taken singly.

Harvest Chronology. Trapping harvest is spread throughout the year, with the exception of summer months, and is not consistent from year to year (Table 2). In general, wolves are harvested opportunistically with little directed effort.

Transport Methods. Boats were the primary access for wolf hunters and trappers, although ORVs and highway vehicles were also popular (Table 3).

Other Mortality:

No natural mortality was documented during the report period.

CONCLUSIONS AND RECOMMENDATIONS

Little is known about wolf populations within Unit 1C. Reports from people afield and incidental observations by departmental staff indicate that wolves are common in some areas and may be more plentiful than we previously thought. With mountain goats the most common big game prey species in the area, the effect of wolves upon goat populations may be considerable in some areas (e.g., Endicott Arm). Low deer densities on the mainland portions of the unit are undoubtedly partially due to pressure from wolves.

Wolf harvests are stable, but low. Little effort is exerted towards taking wolves in this unit, and the harvest remains well below the level that would exert significant pressure on the wolf population. No changes in seasons or bag limits are recommended at this time.

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SUBMITTED BY:
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Management Coordinator

Table 1 Unit 1C wolf harvest, 1988–1995

Year	Males	Females	Unknown	Total
1988	3	2	0	5
1989	4	7	1	12
1990	4	2	0	6
1991	1	4	0	5
1992	3	2	0	5
1993	3	4	0	7
1994	4	1	2	7
1995	2	3	0	5

Table 2 Unit 1C wolf harvest chronology, 1988–1995

Regulatory Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1988									5			
1989				1	1	5	3	1		1		
1990			1			3				1	1	
1991			2							2	1	
1992					1		1		2	1		
1993							2	3	1	1		
1994			2	2		1		1	1			
1995		1		1		2			1			

Table 3 Unit 1C harvest percent by transport method, 1988–1995

Regulatory Year	Airplane	Dogsled Skis Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown
1988			50		50			
1989			83		8		8	
1990			83				17	
1991	40		60					
1992			80				20	
1993			100					
1994		14	86					
1995			20			40	40	

LOCATION

GAME MANAGEMENT UNIT: 1D (2,700 mi^2)

GEOGRAPHIC DESCRIPTION: That portion of the southeast Alaska mainland lying north of the latitude of Eldred Rock, excluding Sullivan Island and the drainages of Berners Bay

BACKGROUND

We have not conducted wolf investigations in the area, and population estimates have been based upon anecdotal information, sightings during aerial moose surveys, and interviews with hunters and trappers during sealing. This subunit differs from other areas in Southeast Alaska in that both deer and beaver, usually reliable prey bases, are nearly absent. Both moose and mountain goats inhabit the area, but their numbers are limited partly by predation.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management goals for wolves have been established for this area. A general management objective should be to regulate seasons and bag limits to maintain viewable and harvestable populations of wolves. Management should sustain wolf harvest at a level similar to the average over the previous 5 seasons, while monitoring the population through whatever means are available, including anecdotal reports, aerial survey sightings, and trapper interviews. No wolf control methods are planned for this area at this time.

METHODS

The mandatory sealing of wolf hides taken by successful trappers provided information on date and method of take, sex, and transportation means. Discussions with hunters and trappers during sealing and with hikers and other observers provided additional population data. Wolves were sealed by ADF&G and Fish and Wildlife Protection staff in Haines.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Based on harvest reports and limited trapper interviews, the population of wolves in the subunit appears to have increased during the report period. This may reflect an actual increase or may instead reflect an increased awareness by a growing population in the Haines area. Numbers may also rise temporarily when packs from Canada cross the border and seek prey in the Chilkat Valley. Because moose numbers have declined since the mid 80s, it may be that fewer than 35 wolves use the subunit.

MORTALITY

Harvest

Seasons and Bag Limits

Hunting:	August 1–April 30	5 Wolves
Trapping:	November 10–April 30	No Limit

Hunter/Trapper Harvest. One black male wolf comprised the entire harvest in Unit 1D in 1993 (Table 1). This compares to the 5-year mean of 2 (range = 0–5). A nonlocal resident hunter using a boat for access shot this wolf.

In 1994, 2 wolves (1 black male, 1 gray female) were reported shot in Unit 1D. One trapper took both animals and used a highway vehicle for access.

During 1995, 3 wolves (1 gray male, 1 gray female, and 1 black female) were taken. All were taken by local residents with firearms.

Harvest Chronology. Most harvest took place in midwinter (Table 2), but numbers are so low that any individual could change the harvest pattern by taking a few wolves at a different time.

Transport Methods. Access methods used by trappers and hunters who took wolves during the report period show little consistency year to year (Table 3). Because the harvest is small and few hunters and trappers are represented in more than a single year, inconsistency is not surprising. Again, 1 or 2 individuals focusing on wolf trapping in the subunit would dominate the harvest data.

Other Mortality

No natural mortality was documented during the report period.

CONCLUSIONS AND RECOMMENDATIONS

The current status of the Unit 1D wolf population is uncertain. Little effort is made to take wolves in the area, but with low moose numbers in the Chilkat Valley, any noticeable predation raises public concern. Balanced against this are the nonconsumptive values that wolves offer ecotourism operations for many unit residents. Wolf management planning in 1991 and 1992 showed most local respondents preferred no wolf control and some even recommended no harvest of wolves be allowed. No changes in seasons or bag limits are recommended at this time.

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Table 1 Unit 1D wolf harvest, 1988–1995

Regulatory Year	Males	Females	Unknown	Total
1988	0	1	0	1
1989	3	1	1	5
1990	0	1	0	1
1991	0	0	0	0
1992	0	3	0	3
1993	1	0	0	1
1994	1	1	0	2
1995	1	2	0	3

Table 2 Unit 1D wolf harvest chronology, 1988–1995

Regulatory Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1988						1						
1989				3		1			1			
1990					1							
1991												
1992						1	2					
1993				1								
1994					1				1			
1995				1					1	1		

Table 3 Unit 1D harvest percent by transport method, 1988–1995

Regulatory Year	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snow-machine	ORV	Highway vehicle	Unknown
1988			100					
1989				20	20		60	
1990							100	
1991								
1992	67						33	
1993			100					
1994							100	
1995					33		33	33

LOCATION

GAME MANAGEMENT UNIT: 5 (5,800 mi^2)

GEOGRAPHIC DESCRIPTION: Cape Fairweather to Icy Bay, eastern Gulf coast

BACKGROUND

Lifelong residents of Yakutat indicate that wolves were present in the Yakutat Forelands area prior to the immigration of moose in the early 1930s (ADF&G files). No reports of wolves exist for the west side of Yakutat Bay (Unit 5A) before 1971 (well after moose were established), and viable wolf populations were probably established by 1976. Klein (1965) suggests that wolves gained access to the Yakutat Forelands through the Alsek/Tatshenshini River valley.

In 1964 area biologist L. Johnson commented on an apparent increase in wolf numbers since he had begun conducting moose surveys. By 1967 we documented 23 different animals during moose surveys. Area biologist D. Johnson documented 44–50 wolves during 1973–74 on an aerial count. In the winter of 1977, area biologist R. Quimby estimated a minimum of 6 discrete packs in Unit 5A; Situk, Ahrnklin, Dangerous/Italio, Akwe, Tanis Mesa/East Alsek, and Doame/Clear. Minimum pack sizes were estimated at 9, 7, 6, 3, 5, and 6, respectively, for a total of 36. He extrapolated this to a minimum of 45–50 animals (pre-pupping) at a density of 1 wolf/15 mi^2. The presence of a breeding population of wolves in Unit 5B was undetermined at that time. In winter of 1979 area biologist R. Ball estimated the Unit 5A and 5B populations at 35 and 10 (minimum), respectively. By 1980 he felt wolf numbers were stable or increasing in Unit 5A, with a population estimate of 50 animals. By 1982 Ball suggested there might be a minimum of 12 wolves in Unit 5B in 2 packs. In 1985 B. Dinneford reported an increased number of reports from local residents of moose mortality in winter months. These reports have reflected an increasing wolf population, responding to a larger moose population. In 1983, he noted wolf harvests were above the long-term average.

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

Wolves played a role in the reduction of moose numbers, especially in Unit 5A, in the mid-1970s. We considered severe winter weather the most important factor depressing the moose population then, but wolves, hunting, and reduction of browse quality (due to overbrowsing by moose populations above carrying capacity) contributed to the decline. An attempt was made to reduce wolf numbers from 1974–76, with only 1 wolf taken during 31 hours of aerial hunting. Bad weather, rough terrain, and dense forest prevented a higher take.

During the reporting period interest in taking wolves in the subunit has increased somewhat, based largely upon the efforts of a single trapper. New wolf hunting seasons restrict the opportunity for guided nonresident hunters to take wolves during spring bear hunts.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management goals have been established for this area. A general management objective should be to regulate seasons and bag limits to maintain viewable and harvestable populations of wolves. Management should.maintain wolf harvest at a level similar to the average over the previous 5 seasons, while monitoring the population through whatever available means, including anecdotal reports, aerial survey sightings, and trapper interviews. No wolf control methods are contemplated for this area at this time.

METHODS

We monitored the harvest through mandatory pelt sealing. Wolves were sealed by ADF&G and Fish and Wildlife Protection staff in Yakutat. We collected data on the number of wolves killed, sex, date and method of take, and method of transportation. Trappers and hunters shared field observations and opinions about wolf numbers. We also recorded incidental observations of wolves by department personnel and the public.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

An estimated minimum wolf population of at least 50 (pre-pupping), in 5 to 7 different packs, occupies the Yakutat and Malaspina Forelands. No quantitative data is available, but based on anecdotal reports, wolf numbers may be increasing in the area. Moose numbers are probably no longer increasing in the Unit 5A moose population, but moose still represent a reliable food source for wolves. Reports of increased sightings of wolves suggest wolf numbers may still be climbing.

MORTALITY

Harvest

Seasons and Bag Limits

Hunting:	August 1–April 30	5 Wolves
Trapping:	November 10–April 30	No Limit

Hunter/Trapper Harvest. A total of 9 wolves (6 males, 3 females) were taken in Unit 5 during the 1993 regulatory year (Table 1). This compares to the prior 5-year mean of 9 (range = 4–13). Four wolves were killed in the Situk–Ahrnklin area, 3 in the Italio–Dangerous area, 1 in Dry Bay, and 1 on the west side of Yakutat Bay in Unit 5B. Six gray and 3 black wolves were taken. Five wolves were shot, 1 was taken with a trap, and 3 were snared.

In 1994 15 wolves (10 males, **Error! Not a valid link.** females, and 3 of unknown sex) were killed. Four were taken along the Alsek River, 5 near Yakutat or along the Situk River, 5 from the

Ahrnklin River, and 1 from Unit 5B. Six wolves were white, 8 were gray, and 1 was black. Five were shot, 4 were trapped, 5 were snared, and 1 was taken by other means.

In 1995, 9 wolves (6 males and 3 females) were harvested. Four were taken along the lower Alsek River, 4 in the Situk River area, and 1 on the Italio River. Two of these animals were white, 5 were gray, and 2 were black. Two were shot, 2 were trapped, and the remainder snared.

Hunter/Trapper Residency and Success. Two local residents, 1 nonlocal Alaska resident and 4 nonresidents took wolves in Unit 5A in 1990. The following year, 3 local residents, 1 nonlocal Alaskan and 5 nonresidents were successful. In 1992 no local residents reported taking wolves, while 2 nonlocal residents and 2 nonresidents reported success.

Harvest Chronology. Trapping harvest occurs throughout the winter months (Table 2). Hunting harvest of wolves by guided hunters during spring bear seasons has stopped since the wolf hunting season was shortened. In the Yakutat area difficult travel conditions (heavy snows, rain) restrict trapping harvest.

Transport Methods. During the report period successful trappers and hunters used varied transport modes, showing little consistency year to year (Table 3). Because of the small harvest, 1 or 2 serious trappers using consistent transport methods could dominate this category.

Other Mortality

No natural mortality was documented during the report period

CONCLUSIONS AND RECOMMENDATIONS

The status of the Unit 5A moose population is probably between 800 and 1000 animals and stable. Although this population may no longer be increasing, the moose provide a reliable food source for wolves, and wolves are probably as numerous as they were at the beginning of the reporting period. Hunters observe wolves near groups of moose near the Italio and Alsek Rivers during fall hunting seasons, and packs are commonly viewed during aerial moose surveys in the unit. Some local residents feel that wolf numbers are still increasing on the Yakutat Forelands. The wolf population can easily withstand present low levels of harvest, which may decline further since spring bear hunters can no longer take wolves in May. No changes in seasons or bag limits are recommended at this time.

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Table 1 Unit 5 wolf harvest, 1988–1995

Regulatory Year	Males	Females	Unknown	Total
1988	3	5	0	8
1989	7	6	0	13
1990	4	3	0	7
1991	8	3	0	11
1992	2	2	0	4
1993	6	3	0	9
1994	10	2	3	15
1995	6	3	0	9

Table 2 Unit 5 wolf harvest chronology, 1988–1995

Regulatory Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1988			2	1	1	1		2			1	
1989			4	1	1				1	2	4	
1990			1	1	1		1			1	2	
1991		2	1			1		3	3	1	2	
1992			1	1						2		
1993		1				1	2	1		4		
1994			2		1	3		3	3	2		
1995			1			1	2	1	3	1		

Table 3 Unit 5 wolf harvest percent by transport method, 1988–1995

Regulatory Year	Airplane	Dogsled Skis Snowshoes	Boat	3 or 4-Wheeler	Snow-machine	ORV	Highway vehicle	Unknown
1988	88			12				
1989	38		8	15		8	31	
1990	43		43		14			
1991	46	8		38			8	
1992	75		25					
1993	44		22				33	
1994	7		2				5	
1995	44			11			33	11

LOCATION

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

GEOGRAPHIC DESCRIPTION: Prince William Sound and North Gulf Coast

BACKGROUND

The wolf population in Unit 6 was low during the early and mid-20th century (Griese 1989). Heller (1910) reported tracks in Nelson Bay in Subunit 6D, and locals indicated wolves were present east of Nelson Bay. Significant ungulate prey became available in the mid 1900s as a result of successful Sitka black-tailed deer and moose introductions. However, increases in the wolf population may have been prevented by federal control efforts in the 1940s and 1950s. By the 1970s numbers began to increase, particularly in Subunits 6A, 6B, and 6C, where moose were well established. They probably peaked in the mid 1980s. Population trend in the late 1980s and early 1990s is unclear. Fewer wolves than in the mid 1980s were estimated due to an actual decline in numbers or to improved estimates from use of radio telemetry.

Wolves inhabit the mainland throughout Unit 6. However, they have not become established on the major islands in Subunit 6D, where deer would be adequate prey.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

METHODS

No systematic wolf surveys were completed. I estimated population size and distribution before the trapping season, using U.S. Forest Service data and incidental observations by staff and the public. Forest Service data were collected during 1992–96 in Units 6A, 6B and 6C using radiotelemetry (Stephenson et al. 1993, Carnes et al. 1996).

We collected harvest data by sealing hides of wolves taken by trappers and hunters. We recorded location and date of harvest, method of take, transportation mode, sex, and pack size.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The wolf population was 47–61 in 1995–96 (Table 1). Eight packs were present. Numbers were probably stable over the past 5 years. We made small adjustments in 1995–96 based on Carnes et al. (1996).

Distribution

Numbers varied among subunits in 1995–96. Unit 6A contained 21–28 wolves with 3 packs present. Unit 6B had 14–15 with 2 packs. Unit 6C contained 2–3 lone wolves, and Unit 6D had 10–15 wolves with 3 packs.

MORTALITY

Harvest

Season and Bag Limit. The hunting season was from 10 August to 30 April, with a bag limit of 5 wolves. The trapping season was 10 November to 31 March, with no bag limit.

Board of Game Actions and Emergency Orders. The Board of Game took no actions and no emergency orders were issued during this reporting period.

Hunter/Trapper Harvest. Reported annual harvest during this reporting period was 0–5 (Table 2), with female take of 0–2 and male kill of 0–3. Total estimated unreported and illegal harvest was 3–6. There was no significant change in harvest characteristics over the past 5 years.

Hunter Residency and Success. The number of successful hunters and trappers was 0–5.

Harvest Chronology. Wolves were taken during September–November and January–March (Table 3). Harvest was concentrated during fall months during this reporting period. Harvest was spread over both fall and winter months during the previous 2 years.

Transport Methods. During this reporting period airplanes, boats, snowmachines and highway vehicles were used for transportation. Before this period, hunters harvested most wolves (67%) using highway vehicles for transportation.

CONCLUSIONS AND RECOMMENDATIONS

The population objective was achieved. Number of packs exceeded the minimum of 5. The 40–60 wolves in the population were lightly harvested and could sustain the take of 10 animals specified in the objective. No management changes are recommended.

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Table 1 Unit 6 fall wolf population estimates[a], 1991–95

Regulatory Year	Population estimate	Number of packs	Basis of estimate
1991/92	40-60	9	b,c
1992/93	40-60	9	b,c
1993/94	40-60	9	b
1994/95	40-60	9	b
1995/96	47-61	8	b,d

[a] Pre-trapping season.

[b] Incidental observations.

[c] Radio telemetry (Stephenson et al. 1993).

[d] Radio telemetry (Carnes et al. 1996).

Table 2 Unit 6 wolf harvest, 1991–95

Regulatory	Reported harvest				Estimated harvest		Method of take			Successful
year	M	F	(%)	Total	Unreported	Illegal	Trap/snare	(%)	Shot	Total trap/hunt
1991/92	2	4	(67)	6	1	1	3	(50)	2	4
1992/93	2	1	(33)	3	1	2	1	(33)	2	3
1993/94	2	0	(0)	2	1	2	0	(0)	2	2
1994/95	0	0	(0)	0	1	3	0	(0)	0	0
1995/96	3	2	(40)	5	2	4	1	(20)	4	5

Table 3 Unit 6 wolf harvest chronology percent, 1991–95

Regulatory Year	Harvest periods						
	September	October	November	January	February	March	*n*
1991/92	33	17	0	17	33	0	6
1992/93	0	33	0	0	33	33	3
1993/94	0	50	50	0	0	0	2
1994/95	0	0	0	0	0	0	0
1995/96	40	20	0	20	20	0	5

Table 4 Unit 6 wolf harvest percent by transport method, 1991–95

Regulatory Year	Percent of harvest						
	Airplane	Dogsled skis snowshoes	Boat	Snow-machine	ORV	Highway vehicle	*n*
1991/92	0	17	0	0	17	67	6
1992/93	0	0	0	0	33	67	3
1993/94	100	0	0	0	0	0	2
1994/95	0	0	0	0	0	0	0
1995/96	40	0	20	20	0	20	5

LOCATION

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

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

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

The high density of moose and severe winters from 1971 through 1975 made moose easily available prey. In less than 15 years, wolves repopulated most suitable habitat. Peterson and Woolington (1981) estimated wolves annually killed 9–15% of the moose calves and 5–7% of adult moose on the Kenai Peninsula.

Aerial track counts and observations by trappers conducted from 1975 to 1996 indicated the Kenai Peninsula wolf population increased rapidly during the early 1970s, then remained relatively stable at 200 animals. 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. Natural mortality rates were low, despite the 1970s growth rate of the wolf population. However, mortality rates may be increasing due to the dense population of wolves and declining prey.

Regulated wolf harvests on the Kenai Peninsula began with a permit hunt during the winter of 1973–74; 2 wolves were harvested. During the winter of 1974–75, 6 were harvested. Hunting and trapping were allowed the following season (1975–76), and the harvest increased to 19, 12 by trappers and 7 by hunters. Although the 9-month season was liberal, the harvest of wolves increased slowly until 1978–79, when 55 wolves were taken. The harvest from 1978–79 to 1988–89 ranged from 25 to 64 wolves, averaging 49. This mean annual harvest indicated 25% of the estimated population was removed annually from 1978 to 1989.

In 1987 the Kenai National Wildlife Refuge imposed a 4-day trap check for trappers using refuge-managed lands and the season was reduced by 15 days. These restrictions reduced the harvest that over the next 5 years ranged from 9 to 42 wolves and averaged 24 animals, 12% of the estimated population.

Historically, most of the wolf harvest has been during trapping season, while most nonconsumptive uses were in summer and early fall. Almost all wolves have been taken for recreational purposes; the dollar value received for pelts has been a secondary benefit. Although some hunters have used aircraft to locate wolves, trappers and hunters operating from the road system have killed most wolves. In the spring of 1986, the Board of Game prohibited the use of aircraft to locate wolves for the purpose of landing and shooting them. The land-and-shoot

method was responsible for only 6% of the annual harvests from 1973 to 1985, occurring in only 5 of the 12 years. The low harvest was attributable to poor tracking and landing conditions in heavily forested areas, and the refuge was closed to aircraft.

An infestation of biting lice (*Trichodectes canis*) was identified from 2 packs of wolves during 1982–83. Wolves from these packs in Subunit 15A were brought in for sealing by local trappers, and department and refuge personnel initiated a control program to treat all infested wolves. Wolves were either captured and treated, or a medication (Ivermectin) was injected into moose recently killed by wolves or placed in treated baits near kills. Both methods proved unsuccessful, and the incidence of infestation spread rapidly across the Kenai. Infested wolves are common; using acceptable means, we have little chance to control the parasite.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

- To maintain a postseason population of 25–35 wolves in Subunit 15A, excluding the Indian and Quartz Creek–Mystery creek packs.

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

METHODS

Experienced pilots and observers conducted aerial surveys during November and December but only under suitable snow and tracking conditions. Local trappers provided additional information concerning wolf pack distribution and size for unsurveyed areas. We monitored harvest by sealing the pelts of harvested wolves.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolf surveys were not conducted over the entire Kenai Peninsula because of unfavorable snow conditions during early winter. Harvest data, observations by department staff, and reports from trappers indicated the number of wolves had not changed from previous years. The estimated population for Units 7 and 15 was 200 wolves in 20 packs (Tables 1 and 2).

MORTALITY

Harvest

Season and Bag Limits. The hunting season in Units 7 and 15 was 10 August to 30 April. The bag limit was 1 wolf in 1991–92; this was increased to 5 in 1992–93, except on the Kenai National Wildlife Refuge where the bag limit was 2 wolves.

The wolf trapping season in Units 7 and 15 was 10 November to 28 February, and there was no bag limit.

Board of Game Actions and Emergency Orders. The Board of Game did not take action on trapping or hunting of wolves on the Kenai Peninsula during this reporting period.

Hunter/Trapper Harvest. Twenty-eight wolves were killed during the hunting and trapping seasons in 1993–94, 20 wolves were taken in 1994–95, and 42 in 1995–96 in Units 7 and 15 (Table 3). The sex ratio was 15 (54%) males and 13 (46%) females in 1993–94, 8 (42%) males and 11 (58%) females in 1994–95 and 22 (54%) males and 19 (46%) females in 1995–96 (Tables 4 and 5). The mean annual harvest (30) for these 3 years represented an annual harvest rate of 15% of the estimated population.

The combined harvest for 1993–1996 was 90 wolves, comprising 54 (60%) taken by trapping or snaring and 36 (40%) by ground shooting.

Harvest Chronology. The combined harvest chronology for 1993–1996 was August, 7 (8%); September, 8 (9%); October, 2 (2%); November, 6 (7%); December, 20 (23%); January, 15 (17%); February, 20 (23%); March, 10 (11%), and April, 0. Thirty-one percent (27) of the harvest occurred before or after trapping season (Table 6).

Transport Methods. Transportation methods used to access traplines varied each year, depending on snow and ice conditions. Combined methods (n = 73) for 1993–1996 were aircraft 16 (22%); horse/dog team 6 (8%); boat 6 (8%); ATV 2 (3%); snowmachine 25 (34%), and highway vehicle 18 (25%).

CONCLUSIONS AND RECOMMENDATIONS

A mean annual harvest of 30 wolves during the past 3 years represents 15% of the early winter population estimate of 200 for Units 7 and 15. With this low rate of harvest, the wolf population will probably be controlled by prey abundance, increased dispersal, and natural mortality.

The department and U S Fish and Wildlife Service (FWS) signed an agreement in 1988 to manage wolves in Unit 15A using a harvest quota system. Terms of this agreement were based on continuing the current level of harvest opportunity while protecting the wolf population from overharvest. In addition to this agreement, the FWS implemented several new restrictions on trappers using the refuge. These restrictions included a mandatory trapper orientation course before obtaining a permit, closures to trapping (except mink and muskrat) within 1 mile of a road and 2 miles from a trailhead or campground, prohibition of toothed traps and the requirement that traps be tagged by the owner. These new permit conditions to trap on the refuge, a complete closure on lynx harvest by the Board of Game, and the poor quality of lice-infested wolf pelts have reduced trapper effort and opportunity. Additionally, wolves taken in Unit 15A had to be sealed within 5 days to maintain an early harvest record for the quota system.

To maintain reliable counts, the department and refuge staff have maintained radiocollared wolves in each pack in Unit 15A since the early 1980s. Maintaining collared wolves has been expensive. Although some useful management data has been collected, I recommend that we discontinue the

costly collaring program in Unit 15A and request the Board repeal the 5-day sealing requirement because it does not now serve a useful purpose. I also recommend that we discontinue the quota system for Unit 15A. With low effort and harvest, it is not warranted or cost effective. The management strategy for Unit 15A essentially mandates we manage wolves pack by pack. I recommend we consider the entire wolf population on the Kenai Peninsula as one population, accepting the fact that a couple packs living close to developed areas will sustain heavy harvests in some years. Allowable harvest should not exceed 35% or a 3-year mean annual harvest of 70 wolves.

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Table 1 Unit 7 fall wolf population estimate[a], 1991–1995

Year	Population estimate	Number of packs	Basis of estimate
1991/92	45	6	b
1992/93	45	6	b
1993/94	45	6	b
1994/95	45	6	b
1995/96	45	6	b

[a] Fall estimate = pretrapping season population.
[b] Estimates derive from incidental observations of staff, sealing records, and reports from public.

Table 2 Unit 15 fall wolf population estimates[a], 1991–95

Year	Population estimate	Number of packs	Basis of estimate
1991/92	155	14	c
1992/93	155	14	c
1993/94	155	14	c
1994/95	155	14	c
1995/96	155	14	c

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

Table 3 Known wolf mortality in Units 7 and 15, 1991–1995

	Unit/Subunits				
Year[a]	7	15A	15B	15C	Total
1991/92	2	2	0	5	9
1992/93	3	8	2	6	19
1993/94	6	6	9	7	28
1994/95	7	7	3	3	20
1995/96	17	6	10	9	42

[a] Trapping season 10 November–28 February.

Table 4 Unit 7 wolf harvest, 1991–95

Regulatory	Reported Harvest			Method of Take			Total Successful
year	M	F (%)	Unk.	Trap/snare (%)	Shot	Unk.	Trappers/hunters
1991/92	1	1(50)	0	2(100)	0	0	2
1992/93	0	3(100)	0	3(100)	0	0	3
1993/94	4	2(33)	0	4(67)	2	0	6
1994/95	3	4(57)	0	3(43)	4	0	6
1995/96	11	5(31)	1	11(65)	6	0	12

Table 5 Unit 15 wolf harvest, 1991–95

Regulatory year	Reported Harvest			Method of Take			Total Successful
	M	F (%)	Unk.	Trap/snare (%)	Shot	Unk.	Trappers/hunters
1991/92	5	2(29)	0	2(29)	5	0	5
1992/93	10	6(38)	0	7(44)	9	0	13
1993/94	11	11(50)	0	15(68)	7	0	15
1994/95	5	7(67)	1	9(69)	4	0	9
1995/96	11	14(56)	0	12(48)	13	0	17

Table 6 Harvest chronology for wolves in Units 7 and 15, 1993–1996

	Month									
Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Other	Total
1993-94	3	1	1	1	3	6	9	2	2	28
1994-95	0	5	0	1	5	1	7	1	0	20
1995-96	4	2	1	4	12	8	4	7	0	42

LOCATION

GAME MANAGEMENT UNITS: 9 (33,638 mi^2) and 10 (1,586 mi^2)

GEOGRAPHIC DESCRIPTION: Alaska Peninsula and Unimak Island

BACKGROUND

Wolves are throughout the Alaska Peninsula (Unit 9) and on Unimak Island (Unit 10) in low-to-moderate densities. Specific data on historic wolf abundance are lacking, but the population probably was reduced by wolf control work during the 1950s. After the end of the federal wolf control program, wolves increased and thereafter were primarily affected by prey abundance and periodic outbreaks of rabies. Conditions favorable for land-and-shoot and ground-based trapping have been rare over the past 20 years, so harvests have had relatively little influence on wolf numbers.

Prey abundance has varied during the past 30 years. Moose densities decreased during the 1970s in all areas north of Port Moller but have stabilized during the past 15 years. The Mulchatna caribou herd increased from about 14,000 in 1974 to over 200,000 in 1996. The Northern Alaska Peninsula Caribou Herd (NAPCH) increased from about 13,000 in the mid-1970s to about 20,000 in 1984. During the next 10 years, the NAPCH remained relatively stable at 15,000–18,000. During the 1993–94 regulatory year, it declined to about 12,500, where it remained during the rest of this reporting period. Caribou decreased dramatically on Unimak Island from a peak of 5000 in 1975 to only a few hundred by 1977. No change in caribou numbers on Unimak Island has been noted in the past 10 years. The mainland segment of the Southern Alaska Peninsula Caribou Herd peaked at over 10,000 in 1983, and then declined to 2000 by 1995. Wolf numbers generally parallel changes in prey populations.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

METHODS

Specific data were not collected on wolf densities in Units 9 or 10. We monitored trends through observations during other fieldwork, reports from hunters and guides, and responses to the annual trapper questionnaire. We monitored harvests from mandatory pelt-sealing reports.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

By piecing together observations of wolf packs and general knowledge of territory size, I estimate that Units 9 and 10 contain at least 250 wolves. This is a conservative estimate, but it cannot be

refined without considerable expense, combined with abnormally good snow and flying conditions.

Wolf numbers generally parallel changes in prey populations and appear stable or increasing in all areas except Subunit 9D and Unimak Island. Changes in wolf abundance were not apparent with an average of only 6 trapper questionnaires per year returned this reporting period.

MORTALITY

Harvest

Season and Bag Limits. The hunting season in Units 9 and 10 was 10 August to 30 April, and the bag limit was 5 wolves. The trapping season in Units 9 and 10 was 10 November to 31 March with no bag limit.

Board of Game Actions and Emergency Orders. Beginning in the 1993–94 season, trappers were permitted to take wolves on the same day they were airborne, providing they were at least 300 feet away from the aircraft before they shot.

Hunter/Trapper Harvest. The wolf harvest for 1993–94, 1994–95 and 1995–96 were 71, 29, and 31, respectively, in Unit 9 (Table 1). No wolves were sealed from Unit 10 during this reporting period.

Hunter Residency and Success. Furbearer harvest records from sealing certificates do not contain information on individual hunters or trappers, so no information on residency or success is available.

Harvest Chronology. Harvest chronology continues to peak December–March (Table 2).

Transport Method. Inaccurate reporting of the method of transportation used for harvesting wolves hampers analysis; however, most harvesters used aircraft or snowmobile (Table 3).

Other Mortality

No mortalities other than legal harvests were recorded during this report period.

HABITAT

Assessment

No significant alteration to habitats occurred in Units 9 and 10 during this report period.

CONCLUSIONS AND RECOMMENDATIONS

The wolf harvest in Unit 9 varies widely, depending on weather conditions and the activity of several individuals who use aircraft. Harvest has had little effect on the wolf populations in Units 9 and 10. For practical and budgetary reasons, it is unlikely that more accurate estimates of population size will be possible. Sealing data on sex composition of harvest and methods of take and transportation do not seem reliable; analyses using these data are not recommended. I recommend no regulatory changes.

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Table 1 Units 9 and 10 wolf harvest, 1991–1995

Regulatory	Reported harvest				Method of take			Successful
Year	M	F	Unk	Total	Trap/Snare	Shot	Unk	Trappers/Hunters
1991/92	36	32	26	94	45	49	0	38
1992/93	8	12	13	33	17	16	0	18
1993/94	37	21	13	71	23	44	4	21
1994/95	16	13	0	29	14	14	0	14
1995/96	20	10	1	31	10	21	0	19

Table 2 Units 9 and 10 wolf harvest chronology percent, 1991–1995

Regulatory Year	August	September	October	November	December	January	February	March	April	*n*
1991/92	2	0	5	2	32	5	39	14	0	93
1992/93	0	9	0	3	3	39	6	39	0	33
1993/94	1	1	6	0	20	62	1	7	1	71
1994/95	0	14	7	14	0	24	7	34	0	29
1995/96	3	6	16	3	6	45	16	3	0	31

Table 3 Units 9 and 10 wolf harvest percent by transport method, 1991–1995

Regulatory Year	Airplane	Dogsled Skis Snowshoe	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway Vehicle	Unknown	*n*
1991/92	32	0	0	6	45	0	4	13	94
1992/93	9	0	3	6	73	0	9	0	33
1993/94	59	0	0	0	38	0	3	0	71
1994/95	21	0	3	0	45	0	0	31	29
1995/96	58	0	0	16	16	0	0	10	31

LOCATION

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

GEOGRAPHIC DESCRIPTION: Wrangell Mountains

BACKGROUND

Wolf population estimates and trends are unavailable for Unit 11 before the 1950s. Skoog (1968) assessed that wolf numbers were low from 1900 to the 1930s, then increased, according to written accounts by settlers. In 1948 the U.S. Fish and Wildlife Service initiated an extensive wolf control program that lasted until 1953. Following termination of the control program, wolf numbers increased and probably peaked during the mid-1960s. In the early 1970s, wolves were still abundant (McIlroy 1974); that is, 1 wolf/80 mi^2 or a unit population of 100–125 animals. Population estimates were not made until 1985.

Although the size of wolf harvests before mandatory sealing is unknown, they were probably similar to harvest levels reported during the early 1970s because trapping seasons were comparable and there were no bag limits. Wolf harvests since 1972 have averaged 25 wolves per year, ranging widely from 6 to 51 wolves/year. Population estimates were not made until 1985.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

To maintain a minimum posthunting and trapping season population of 75 wolves.

The human-use objective is to allow limited human harvests when they do not conflict with management goals for the unit or objectives for the population.

METHODS

We monitor the annual wolf harvest by sealing the hides of all wolves harvested in the unit. We collected information on wolf numbers and distribution from interviews with hunters and trappers when pelts were sealed and from incidental observations while conducting surveys for other species. In addition to the traditional means for determining wolf numbers, the National Park Service (NPS) collared 10 wolves in February 1996. Collared wolves included individuals representing 6 packs and have given improved data for determining wolf distribution and numbers in the northern portion of the unit.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The spring 1996 population estimate for Unit 11 was 80–100 wolves in 11–13 packs, which exceed spring estimates from the past 3 years (Table 1). Wolf numbers were above the 5-year

(1991–95) mean population estimate of 80 wolves in Unit 11. Using survival rates for exploited wolf populations (Ballard et al. 1987), the estimated fall 1995 wolf population in Unit 11 was between 95 and 115 wolves.

Distribution and Movements

Wolf numbers were higher in the northern portions of the unit, especially from the Dadina River northeast to the Copper River. Caribou were available to wolves at least part of the year in this area, and moose were more abundant than in the southern portions of the unit. Telemetry data during the winter of 1996–97 showed some wolves were using the higher elevations, indicating they may have been targeting sheep as prey. Wolf numbers in the lower Chitina river valley have increased somewhat in recent years, but densities will probably remain lower than in the northern portion of the unit because caribou are absent and moose less abundant. Wolves heavily utilized sheep and mountain goats in the lower Chitina Valley, but because of their smaller body size and difficult terrain, these prey did not support as large a wolf population.

MORTALITY

Harvest

Season and Bag Limit. The hunting season in Unit 11 was from 10 August to 30 April and the bag limit was 5 wolves. Trapping season was from 10 November to 31 March and there was no bag limit.

Board of Game Actions and Emergency Orders. Effective with the 1990–91 season, the Board opened Unit 11 to same-day-airborne (SDA) hunting of wolves with a bag limit of 10. However, all National Park/Preserve lands within Unit 11, virtually the whole unit, were subsequently closed to same-day-airborne hunting of wolves. In 1992 the Board closed same-day-airborne hunting for wolves in Unit 11 and reduced the hunting bag limit to 5 wolves to align state and federal regulations. In 1993 the Board of Game passed a regulation allowing trappers to shoot wolves same-day-airborne, if the trapper was 300 feet away from the aircraft before shooting.

Hunter/Trapper Harvest. Hunters and trappers harvested 11 wolves from Unit 11 during the 1995–96 season (Table 2). Harvest has been relatively low in Unit 11 for the past 3 years, averaging 21 wolves a year, compared to an average of 30 during the 5-year period between 1988 and 1992. Males composed 64% of the take in 1995–96. Between 1991 and 1995 males accounted for 57% of the harvest. The 1995–96 harvest was not distributed evenly throughout the unit. Hunters and trappers reported taking most of the wolves from either the Nabesna Road or along the Copper River. This harvest pattern was similar to past years when harvests were near areas with easy access.

The harvest methods for wolves killed in Unit 11 over the past 8 years are provided in Table 2. Over the period 1991–95, trapping and snaring accounted for 90% of the harvest for which the method of take was known. Before 1987, when land-and-shoot was legal, the effect of this harvest method on the legal take varied from year to year. The greatest percentage (57%) of the annual harvest taken by same-day-airborne was in 1981; however, this take included only 8 wolves. Between 1980 and 1987, same-day-airborne hunting accounted for 25% of the wolf harvest. Unreported and illegal harvests were minimal during the reporting period.

Hunter/Trapper Residency and Success. During the 1995–96 season, 6 individuals sealed an average of 1.8 wolves from Unit 11. During the preceding 5 seasons, the average harvest was 2.9 wolves per individual. In 1995–96, 1 nonresident took 1 wolf, while 5 trappers living in or adjacent to Unit 11 took 10 wolves.

Harvest Chronology. Table 3 presents the harvest chronology for wolves over the past 5 years. The proportion of the harvest by month has varied yearly but December, January and February had the highest harvest. The annual harvest chronology for trapped wolves probably reflected conditions for snowmachine travel (snow depth, river ice, and weather conditions), rather than any pattern of trapper effort or success. The number of wolves taken during the fall months, presumably by big game hunters, has ranged from 1 to 4 since 1985 and includes most of the nonresident take.

Transport Methods. The method of transport used in harvesting wolves has only been recorded on sealing certificates since 1985. In Unit 11, most wolves have been taken with the use of snowmachines (Table 4).

The use of aircraft has declined since land-and-shoot became illegal. Trappers who utilize aircraft to fly out and make sets have taken very few wolves; however, this trapping method may increase. Aircraft can be used effectively to find wolf kills, and a trapper can land and set snares for returning wolves at the kill site. Most aircraft use was by hunters who took a wolf incidentally while on fly-in hunting trips for other big game.

Nonregulatory Management Problems/Needs

Wolf estimates are difficult to assess in Unit 11. All wolf estimates for the unit are based on pack or track sightings by department staff, hunters, trappers, and the public. Track surveys have been done only periodically and in different locations since 1978. The lack of a systematic survey method hampers efforts to estimate wolf numbers. Even establishing a yearly trend area will not assure yearly population estimates. The occurrence of high winds in Unit 11 often obscures tracks or blows snow to the extent that surveys may not be feasible. The recent effort by the Park Service to radiocollar wolves has provided more accurate information for wolf numbers in the northern portion of the unit, but we need to radiocollar wolves in the southern portion to provide an accurate unitwide assessment of the wolf population.

CONCLUSIONS AND RECOMMENDATIONS

The number of wolves estimated to inhabit Unit 11 has increased throughout this report period and is approaching the number of wolves estimated in the late 1980s. Wolf population estimates in Unit 11 fluctuate yearly as a direct result of survey effort and snow conditions that affect survey results. In the past few years, radiocollared wolves have improved our wolf survey data. However, wolf estimates are considered a minimum because of the limited data available for many large areas in the unit.

Harvest rates have varied over the last 3 years in Unit 11. The wolf harvest rate for this period was 20% of the estimated fall population, down from 27% during the previous report period. Most wolf harvest in Unit 11 is concentrated near inhabited areas where trappers live and near

access points. High harvest rates concentrated in these areas could result in localized population declines. In vast portions of the unit, however, wolves are not hunted or trapped. The reasons are that aircraft use is illegal, much of the unit is without roads, and physical barriers such as large rivers and mountains limit snowmachine and ORV travel. I assume there has been immigration of wolves from untrapped areas in Unit 11 and adjacent Unit 13 to trapped areas of Unit 11.

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Table 1 Unit 11 fall and spring wolf population estimates[a], 1991–96

Year	Population estimate		Packs (nr)	Basis of estimate
	Fall	Spring		
1991/92	130-135	85-95	11	b, c
1992/93	120-130	58-78	9	b, c
1993/94	91-110	65-85	11	b, c
1994/95	105-125	65-80	11	b, c
1995/96	95-115	80-100	11-13	b, c

[a] Fall estimate = pretrapping season population.

[b] Fall estimates based on known spring pack sizes, mean birth rate of 5–6.5 pups/pack, a pup survival rate of 0.82 and fall sightings.

[c] Basis of spring estimate is from limited track surveys, incidental observations, reports from public, and sealing records.

Table 2 Unit 11 wolf harvest, 1991–96

Regulatory Year	Reported harvest							Estimated harvest		Method of Take								Successful trappers/ hunters
	M	%	F	%	Unk	%	Total	Unreported	Illegal	Trap/ snare	%	Shot	%	L&S	%	Unk.	%	
1991/92	19	(64)	10	(33)	1	(3)	30	2	3	27	(90)	3	10)	0	(0)	0	(0)	12
1992/93	17	(52)	12	(36)	4	(12)	33	2	3	31	(94)	2	(6)	0	(0)	0	(0)	8
1993/94	11	(65)	6	(35)	0	(0)	17	2	3	15	(88)	1	(6)	0	(0)	1	(6)	7
1994/95	17	(49)	18	(51)	0	(0)	35	2	3	32	(91)	3	(9)	0	(0)	0	(0)	12
1995/96	7	(64)	4	(36)	0	(0)	11	2	3	9	(82)	2	18)	0	(0)	0	(0)	6

Table 3 Unit 11 wolf harvest chronology percent, 1991–96

Regulatory Year	Harvest periods									
	August	September	October	November	December	January	February	March	April	*n*
1991/92	0	7	0	23	7	33	23	7	0	30
1992/93	0	6	0	9	39	12	18	15	0	33
1993/94	0	6	0	0	41	35	12	6	0	17
1994/95	3	3	3	3	6	48	20	14	0	35
1995/96	0	9	0	9	27	27	27	0	0	11

Table 4 Unit 11 wolf harvest percent by transport method, 1991–96

Regulatory year	Percent of Harvest								
	Airplane	Dog sled skis/ Snowshoes	Boat	4-wheeler	Snowmachine	ORV	Highway vehicle	Unknown	*n*
1991/92	3	13	0	0	70	0	7	7	30
1992/93	0	6	0	0	94	0	0	0	33
1993/94	12	18	0	0	71	0	0	0	17
1994/95	9	3	0	0	85	0	3	0	35
1995/96	0	0	0	0	91	0	9	0	11

LOCATION

GAME MANAGEMENT UNIT: 12 (9978 mi^2)

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

BACKGROUND

Historically the Unit 12 wolf population fluctuated dramatically in response to federal and state predator control programs, ungulate prey abundance, and harvest by the public. During the 1940s wolves were abundant, but numbers were reduced by a federal control program between 1948 and 1960. Also, before 1960 local residents commonly killed wolf pups at dens which maintained wolf populations at low levels near human settlements. After 1960 the wolf population increased rapidly and remained high until the mid-1970s. About 1975 the wolf population declined substantially due to prey shortages (DV Grangaard, pers observ). Between 1975 and 1990 the moose and wolf populations in Unit 12 remained at a low-density equilibrium (Gasaway et al. 1992).

During most years since 1960 the Unit 12 wolf population has been lightly harvested. Rarely has annual harvest approached or exceeded sustainable rates. Few local trappers select for wolves as most trappers concentrate on marten and lynx. However, during years when marten and lynx pelt price are low and wolf prices are adequate, more trappers concentrate on catching wolves. Also, when land-and-shoot taking of wolves was legal, harvests were higher, especially in the southern portion of the unit.

Historically moose have been the most important subsistence species in Unit 12 (Haynes et al. 1984, Halpin 1987), but since the mid-1970s unit moose densities have been low. In response, most local residents favored wolf management to benefit depressed moose populations. However, most of the unit's lands (about 65%) are included in either the Wrangell-St Elias National Park and Preserve or the Tetlin National Wildlife Refuge. Federal policy on those lands has not included predator management programs. On the remaining Unit 12 lands, primarily the northwest portion, local people still support wolf management to benefit the moose population and the subsistence user.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered

incompatible with department management policies.

Management may include social manipulation of wolf population size and protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game (BOG) 30 October 1991 and revised 29 June 1993. These goals are listed.

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.
- Increase public awareness and understanding of the uses, conservation and management of wolves, and their prey and habitat in Alaska.

Management Objectives

Current management objectives are based on discussions between the Alaska Wolf Management Planning Team, BOG, Alaska Department of Fish and Game (ADF&G), and many members of the public during 1990–1993. Because of land ownership patterns, most of Unit 12 is managed to maintain relatively natural ecosystems. The northwestern portion of Unit 12, because of its importance to the subsistence hunter, was designated as an area that may receive intensive wolf management in the future, but we have no current plans.

- Provide opportunity to participate in hunting, trapping, and viewing wolves.
    - Monitor harvest through sealing records and trapper questionnaires.
    - Temporarily close wolf trapping if the unit population declines below 100 wolves.
- Monitor wolf numbers and population characteristics.
    - Estimate wolf pack sizes and number of packs in selected areas within Unit 12.
    - Cooperate with ongoing U.S. Fish and Wildlife Service wolf studies in Tetlin National Wildlife Refuge.

METHODS

Estimating Wolf Population Size

Since 1980 the late winter wolf population estimates were based upon sightings of wolves and wolf tracks observed during aerial surveys (Stephenson 1978, Gasaway et al. 1983). Trapper and pilot reports and trapper questionnaire results were compiled and contributed to population

estimates where complete aerial surveys were not flown. Estimates of wolf numbers were increased by 10% to account for lone wolves present but not found (Mech 1973). Wolf packs having territories wholly or partially in Unit 12 were included in the estimate.

Autumn wolf population estimates were calculated by adjusting the late winter estimate upward, based on the number of wolves harvested before surveys. Each year many wolf packs observed in March and April were also observed during the previous autumn and early winter. Therefore, we knew changes in pack size for those packs.

Determining Wolf Population Characteristics

We did not conduct wolf research in Unit 12 during the report period.

Harvest Monitoring

An ADF&G representative or an appointed fur sealer must seal wolves taken in Alaska. During the sealing process, we collected data on the date and specific location of kill, method of take, sex, pelt color, transport mode, and estimated size of the wolf pack.

RESULTS AND DISCUSSION

Population Status and Trend Population Size

Between 1988 and 1992 Unit 12 wolf numbers increased by an estimated 26.7% (Table 1). Autumn pack size and number of packs increased, indicating improved recruitment and, possibly, adult survival. The population seemed to decline in 1993 following an estimated 36% harvest and has remained relatively stable due to moderate harvest rates. Area trappers selected for wolves during this period because wolf pelt prices were high until 1995 and marten and lynx prices were low.

The wolf population increase between 1988 and 1992 can be attributed to the tens of thousands of Nelchina and Mentasta caribou that have traveled through or wintered in Unit 12 since 1988. Large numbers of caribou have been available to Unit 12 wolves between October and April, except during 1992, 1995, and 1996 when most of the caribou traveled through Unit 12 and wintered in Unit 20E or returned to Unit 13. The timing of Unit 12 wolf population growth closely corresponds to the Nelchina and Mentasta caribou herd range extension into Unit 12 wintering areas.

The seasonal, high caribou density benefited the area's wolf population and subsistence caribou hunters. However, the increase in wolf numbers occurred during the same period the unit's moose population stabilized, following a growth period during most of the 1980s (Gardner 1995). Since large numbers of caribou are in portions of Unit 12 only during winter, the wolf population necessarily depends upon moose as their primary prey during the remainder of the year.

MORTALITY

Harvest

Season and Bag Limit

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Unit 12		
Regulatory year 1993-1994		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. No same-day-airborne shooting of wolves except wolves caught in a trap or snare. Use of a steel trap or snare smaller than 3x prohibited during October, March, and April.	1 Oct–30 Apr	1 Oct–30 Apr
Regulatory year 1994-1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 ft from airplane. No trapping with a steel trap or a snare smaller than 3/32 inch in diameter during April or October.	1 Oct–30 Apr	1 Oct–30 Apr
Regulatory year 1995-1996		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 ft from airplane. No trapping with a steel trap or a snare smaller than 3/32 inch in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr

Board of Game Actions and Emergency Orders. In June 1993 the BOG adopted a regulation that allowed harvest of wolves by trappers the same-day-airborne if the person is over 300 feet from the airplane at the time of taking. The BOG also extended the use of steel traps for the taking of wolves to the end of March and set a minimum snare cable diameter of 3/32 inches for wolf trapping during October and April. During spring 1994 the BOG delayed the opening of the wolf trapping season to 15 October because few trappers participated in the early season, wolf pelts were not prime, and nontarget species were vulnerable to being caught. In 1994 the Alaska Legislature passed a bill requiring intensive management if an ungulate population important to consumptive users were depleted, resulting in significant reduction in harvest, and could be enhanced with prudent management techniques. Wolf control was identified as one of the preferred management techniques to meet the intent of this law. The Board of Game also extended the season steel traps could be used for wolves to include March. In fall 1996 there was an initiative put to Alaskan voters which prohibited same-day-hunting of wolves, fox, lynx, and coyotes. This initiative was passed and became effective on 25 February 1997.

Hunter/Trapper Harvest. The regulatory year 1993, 1994, and 1995 wolf harvests in Unit 12 were 71, 31, and 46 wolves, respectively (Table 2). The 5-year average harvest was 47 wolves ($\bar{x}$ harvest rate = 23%, range = 18% to 36%). This level of harvest was near the estimated sustainable harvest rate of 25% and has caused the population to stabilize. The response of the Unit 12 wolf population to harvest by hunters and trappers was similar to that documented in other wolf populations. Numerically stable wolf populations throughout North America have sustained harvests of 20% to 40% (Keith 1983). Harvests of greater than 40% generally result in declining wolf populations, and those populations harvested at less than 20% generally increase. Those effects of exploitation seem consistent across a broad range of reported wolf densities in Alaska, Canada, Michigan, and Minnesota.

During the past 5 years, the primary methods used to harvest wolves in Unit 12 were traps and snares ($\bar{x}$ = 83%). Same-day-airborne hunting accounted for an average take of 5.2% (range = 0% to 13%). Little change in total wolf harvest in Unit 12 is expected due to the ban of same-day-airborne hunting. Most Unit 12 trappers are ground-based, and primarily the number of wolves they catch is a function of the fur market and prevailing weather conditions during the season.

Harvest Chronology. Since the changes in season dates for snaring and trapping (1994–1995) in Unit 12, the chronology of wolf harvest (Table 3) reflects a low incidental harvest of wolves (5.2%) during the August and September hunting seasons, 3.9% and 0% harvest during the snaring-only seasons in October and April, respectively, and the highest harvest (90.1%) between November and March when all harvest methods and means are allowed. The greatest harvest during 1994 and 1995 was in January.

Transport Methods. During the report period most successful wolf trappers in Unit 12 (71%) used snowmachines (Table 4). In 1989 successful wolf trappers using primarily traps and snares increased their use of airplanes and since 1989 have averaged 21.6%. Trappers using airplanes are able to search more area to find good places to set for wolves. Because of the high costs associated with using an airplane for trapping, area trappers who use this transportation method only select for wolves if pelt prices are cost efficient. During years of low wolf pelt prices, little

harvest is expected from trappers using aircraft.

HABITAT

Assessment

Only about 7000 to 8000 mi^2 of Unit 12 is considered normal wolf habitat. Wolves seldom use the remaining 2000 to 3000 mi^2 of glacial ice fields and high rocky terrain. Good wolf habitat is determined more by ungulate prey abundance than by vegetative characteristics. Using this criterion, the better wolf habitat in Unit 12 is found along the foothills of the Wrangell, Mentasta, and Nutzotin Mountains and the eastern Alaska Range where either resident or migratory moose are available to wolves year-round. Even though mountainous areas support dense populations of Dall sheep, wolves apparently cannot thrive on sheep alone as a primary prey species (Sumanik 1987). The nonmigratory Chisana caribou herd has provided a reliable food source for wolves in eastern Unit 12, but is declining rapidly and includes only 600 caribou. Caribou from the Mentasta, Nelchina, and Macomb herds also used portions of Unit 12 in recent years. It seems the use of Unit 12 during the winter by these herds, especially the Nelchina Herd, allowed the wolf population to grow during the late 1980s and early 1990s by increasing the unit's prey base.

Approximately 30 years of wildfire suppression in Unit 12 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 vicinities of communities and have had a minor effect on wolves in Unit 12.

Enhancement

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

During June–September 1990 a wildfire burned approximately 97,000 acres of primarily decadent black spruce muskeg in the Tetlin Hills and the adjacent Tok River lowlands. This fire is expected to improve moose winter browse supplies continually for the next 15 to 20 years to the benefit of both moose and wolves. By 1994 moose densities in this area increased from 0.2 to 0.7 moose/mi^2; the area now supports at least 2 wolf packs of 6 to 11 wolves.

CONCLUSIONS AND RECOMMENDATIONS

Between 1988 and 1992 the wolf population in Unit 12 increased by an estimated 25% to 27%. The increase in wolf numbers was probably due to an increase in the winter prey base as thousands of Nelchina and Mentasta Herd caribou have traveled through or wintered in Unit 12 since 1988. During this period pack size increased, indicating improved recruitment. In 1993 the wolf population declined due to high harvest (harvest rate = 36%) and has remained relatively

stable due to moderate harvest rates (18 to 24%).

The Unit 12 moose population stabilized during the period of wolf population growth. Moose are the only ungulate prey available to much of the Unit 12 wolf population between late April and mid October. Before the arrival of wintering Nelchina and Mentasta herds and the increase in the unit's wolf population, the moose population in Unit 12 was increasing at about 5% annually.

During the 1980s the Unit 12 wolf population was lightly harvested. Beginning in 1990 wolf harvests increased and harvest rates were near sustainable in most years. Harvest rates are primarily dependent on fur price, weather conditions, and wolf movement patterns in relationship to the road system.

Most of the area residents prefer a wolf control program designed to benefit depressed Unit 12 moose populations. Moose are the most important subsistence species in Unit 12, and the present population levels are not meeting subsistence demands. However, because land ownership policies in most of the unit prohibit wolf control and because the moose population is growing in an area accessible to most of the villages and communities in Unit 12, the BOG did not identify this area to receive intensive management. Ungulate and wolf densities are expected to remain within a low-density equilibrium under current management.

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Table 1 Unit 12 autumn[a] wolf population estimates, 1988-1995

Year	Population estimate[b]	Number of packs	$\bar{x}$ pack size[c]	Basis of estimate
1988	136	21	5.8	Spring survey, reports, observations, sealing records
1989	172-188	27	6.0	Spring survey, reports, observations, sealing records
1990	220-236	29	7.1	Spring survey, reports, observations, sealing records
1991	198-239	29	6.8	Spring survey, reports, observations, sealing records
1992	230-243	29	7.4	Spring survey, reports, observations, sealing records
1993	180-216	29	6.2	Reports, observations, sealing records
1994	159-183	29	5.4	Reports, observations, sealing records
1995	183-206	29	6.1	Reports, observations, sealing records

[a] Autumn estimate = pretrapping season population.

[b] Includes 10% estimated number of single wolves present.

[c] Calculated using mean population estimate x 0.9 divided by number of packs.

Table 2 Unit 12 wolf harvest, 1988–1995

Regulatory year	Reported harvest						Method of take							Successful	
	M	(%)	F	(%)	Total[a]	% autumn population[b]	Trap or snare	(%)	Shot	(%)	SDA[c]	(%)	Unk	trappers and hunters	Wolves /person
1988	6	(40)	9	(6)	17	12	12	(75)	4	(25)			0	8	2.0
1989	15	(83)	3	(1)	20	11	7	(89)	2	(11)			0	10	1.9
1990	45	(63)	27	(3)	74	32	56	(77)	7	(10)	10	(14)	0	26	2.8
1991	19	(59)	11	(4)	34	15	20	(63)	8	(25)	4	(13)	0	16	2.0
1992	26	(52)	24	(4)	54	22	51	(98)	1	(2)			0	15	3.5
1993	37	(57)	28	(4)	71	36	54	(78)	6	(9)	9	(13)	2	24	3.0
1994	18	(58)	13	(4)	31	18	26	(84)	5	(16)	0	(0)	0	16	1.9
1995	25	(69)	11	(3)	46	24	42	(91)	4	(9)	0	(0)	0	15	3.1

[a] Total harvest includes animals of undetermined sex.

[b] Proportion of the estimated autumn population harvested by the end of the season in Apr. If a range estimate was given in Table 1 the proportion taken is given as the harvest divided by the mean estimate.

[c] SDA - wolf harvest taken by hunters and trappers same day airborne.

Table 3 Unit 12 wolf harvest chronology by time period, 1988–1995

Regulatory year	Harvest periods																				
	Aug	(%)	Sep	(%)	Oct	(%)	Nov	(%)	Dec	(%)	Jan	(%)	Feb	(%)	Mar	(%)	Apr	(%)	May	(%)	Unk
1988	1	(6)	0	(0)	0	(0)	3	(19)	3	(19)	3	(19)	3	(19)	1	(6)	2	(13)	0	(0)	0
1989	1	(5)	0	(0)	0	(0)	1	(5)	7	(37)	3	(16)	3	(16)	4	(21)	0	(0)	0	(0)	0
1990	3	(4)	1	(1)	0	(0)	1	(1)	6	(8)	15	(21)	27	(37)	16	(22)	4	(5)	0	(0)	0
1991	1	(3)	3	(10)	0	(0)	2	(7)	4	(13)	3	(10)	7	(23)	4	(13)	6	(20)	0	(0)	2
1992	1	(2)	0	(0)	0	(0)	3	(6)	13	(25)	14	(27)	2	(4)	15	(29)	4	(8)	0	(0)	0
1993	1	(2)	3	(4)	1	(2)	5	(7)	16	(24)	8	(12)	15	(22)	14	(21)	4	(6)	0	(0)	4
1994	0	(0)	1	(3)	2	(6)	1	(3)	9	(29)	9	(29)	4	(13)	5	(16)	0	(0)	0	(0)	0
1995	0	(0)	3	(7)	1	(2)	3	(7)	5	(12)	14	(33)	12	(29)	4	(10)	0	(0)	0	(0)	4

Table 4 Unit 12 wolf harvest by transport method, 1988–1995

Regulatory year	Airplane	(%)	Dogsled, skis, or snowshoes	(%)	Boat	(%)	3- or 4-Wheeler	(%)	Snowmachine	(%)	ORV[a]	(%)	Highway vehicle	(%)	Unk	*n*
1988	1	(6)	0	(0)	0	(0)	0	(0)	13	(81)	0	(0)	2	(13)	0	16
1989	5	(26)	0	(0)	0	(0)	0	(0)	13	(68)	1	(5)	0	(0)	0	19
1990	14	(20)	4	(6)	0	(0)	1	(1)	48	(69)	0	(0)	3	(4)	3	73
1991	6	(24)	0	(0)	0	(0)	0	(0)	19	(76)	0	(0)	0	(0)	7	32
1992	14	(27)	0	(0)	0	(0)	0	(0)	38	(73)	0	(0)	0	(0)	0	52
1993	27	(39)	3	(4)	0	(0)	1	(1)	30	(43)	0	(0)	8	(12)	2	71
1994	2	(6)	0	(0)	0	(0)	0	(0)	27	(87)	0	(0)	2	(6)	0	31
1995	4	(9)	0	(0)	0	(0)	0	(0)	38	(82)	0	(0)	0	(0)	0	46

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

LOCATION

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

GEOGRAPHIC DESCRIPTION: Nelchina and Upper Susitna Rivers

BACKGROUND

Wolf numbers in Unit 13 were low from the late 1900s until the early 1930s, reflecting corresponding low prey densities (Skoog 1968). Wolf numbers increased after this period, and by the mid-1940s wolves were considered common (Ballard et al. 1987). As a result of predator control by the U.S. Fish and Wildlife Service (FWS) between 1948 and 1953, wolf numbers declined dramatically. Based on estimates in Rausch (1967), as few as 12 wolves may have remained in the unit in 1954. Following cessation of wolf control, wolf numbers increased rapidly. A population of 350 to 450 wolves was estimated in 1965, and fall population estimates in subsequent years exceeded 300 wolves through the 1970s (Ballard et al. 1987). During the early to mid 1980s, wolf estimates were lower, averaging 275 wolves during the fall.

Before statehood (i.e., 1959) wolves were harvested under FWS regulations that provided year-round seasons and no bag limits. Denning and aerial shooting were legal, and bounties were paid. Beginning with statehood in 1959, the wolf season was closed in Unit 13 for a 5-year period. In 1965, a short season was held. By the late 1960s seasons approximating current dates were established with no bag limits. In 1971 mandatory sealing was established and aerial shooting without a permit was prohibited (Harbo and Dean 1983). Harvest levels prior to mandatory sealing are unknown. Between 1971 and 1991, an average of 91 (range = 32–145) wolves per year were sealed in Unit 13.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Determine wolf population estimates yearly. Regulate wolf harvests yearly to prevent overharvesting yet maintain adequate harvests to assure that management objectives for wolves in Unit 13 are met.

MANAGEMENT OBJECTIVES

To achieve and maintain a posthunting and trapping season population of 135 to 165 wolves (3–4 wolves/1,000 km^2) distributed proportionally among subunits.

METHODS

We conducted aerial track surveys to estimate the wolf population in Unit 13 during late fall and again in late winter. Biologists flew surveys in a systematic manner in an attempt to locate wolf tracks, then follow tracks to determine the size and color composition of the pack. Additional information on wolf numbers and distribution was collected by trapper surveys and incidental sightings by department personnel and the public. This information was combined with survey

data to extrapolate a unit population estimate. We monitored harvest by requiring sealing of all wolves taken in the unit.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The spring 1996 wolf population estimate was 200 (4.7 wolves/1000 km^2) wolves (Table 1). The highest spring population estimate was in 1990 at an estimated 285 wolves (6.7 wolves/1000 km^2). Spring population estimates have fluctuated the last 5 years, reflecting differences in harvest rates (Table 2). An overall trend is not evident in the Unit 13 wolf population at this time.

During February 1996 we conducted a wolf census in portions of Units 13A and 13B. In 13A West Intensive Management Area, the wolf estimate was 48–54 animals (80% CI) in 10 packs or a density of 10–11 wolves/1000 km^2. The overall density estimate for the surveyed portions of 13A and B was 3–7 wolves/1000 km^2.

Population Composition

Sex composition data for wolves in Unit 13 are not available. Age composition data are inferred by comparing fall population estimates to the previous spring. The fact that fall estimates are appreciably higher than spring estimates indicate pup production and survival is high in Unit 13.

Distribution and Movements

Distribution and movement patterns of wolves in Unit 13 are dependent on prey availability (Ballard et al. 1987). In Unit 13 wolf territory size and productivity are primarily functions of moose densities. Locations of radiocollared wolves indicate wolves do not follow caribou that are migrating out of a wolf pack territory. As in other areas in Alaska, a certain percentage of Unit 13 wolves are observed as singles and may be dispersing. Immigration into Unit 13 is relatively common as radiocollared wolves from the Kenai Peninsula, Denali National Park, and Units 20 and 12 have been observed or harvested in Unit 13.

MORTALITY

Harvest

Season and Bag Limit. Wolves are harvested under hunting and trapping regulations. Wolf trapping season prior to 1994–95 ran from 10 November until 31 March with no bag limit. In the 1994–95 regulatory year, the trapping season was extended to 10 November–30 April with no bag limit. Wolf hunting season was from 10 August to 30 April with a bag limit of 5 wolves. In 1990 and 1991, the hunting bag limit was 10 wolves; same-day-airborne hunting was allowed by registration permit from 10 August to 31 March. In 1992, the bag limit was reduced to 5 wolves and same-day-airborne hunting was prohibited. Beginning in 1994 trappers could shoot wolves same-day-airborne if trappers were 300 feet from the aircraft.

Board of Game Actions and Emergency Orders. During November 1992 the Board adopted a wolf management objective of maintaining a posthunting and trapping season spring wolf population between 175 and 225 wolves. The BOG designated Unit 13 an intensive management area in 1995. Increased human harvest of moose and caribou became the primary objective for the unit. As a result, the Board reduced the wolf population management objective to between 135 and 165 wolves postharvest in the spring. Methods and means for wolf hunting and trapping remained unchanged until a statewide vote on proposition 3 in the November 1996 general election passed that eliminated the taking of wolves the same-day-airborne as of 25 February 1997.

Hunter/Trapper Harvest. Hunters and trappers harvested 122 wolves in Unit 13 during the 1995–96 season (Table 2). Wolf harvests have fluctuated during this reporting period from a low of 93 wolves to a high of 179, the largest wolf harvest reported in Unit 13 in over 25 years. When harvests for this reporting period are compared to those before 1991, a definite increase is evident in the number of wolves harvested every year in Unit 13. Harvest composition data indicate a slight overall predominance (52%) of males in the harvest, but this is variable from year to year (Table 2).

Trapping and snaring accounted for only 37% of the take in 1991–92 when same-day-airborne permit hunting was legal. Snaring and trapping have become the most successful methods of taking wolves since land-and-shoot permit hunts ended; snaring and trapping accounted for 74% of the 1995–96 harvest. Before this reporting period, ground trappers did not generally take as many wolves as land-and-shoot hunters.

Permit Hunts. During 1991 same-day-airborne hunting of wolves was allowed by registration permit only. Permits for Unit 13 were available only through the Glennallen office. Successful permittees had to report wolves killed and harvest locations to the Glennallen office within 5 days of take. Harvest quotas for same-day-airborne hunts were established by subunits, which were closed to same-day-airborne hunting as we met quotas. In 1991, 31 hunters received permits for same-day-airborne wolf hunting in Unit 13.

Hunter/Trapper Residency and Success. During the 1995–96 season, 58 hunters and trappers harvested an average of 2.1 wolves in Unit 13; the average take per trapper during the previous 4 years (1991–95) was 2.3 wolves per year. In 1995–96 nonresidents took 5 wolves, local residents killed 59 wolves, and nonlocal Alaska residents took 58 wolves.

Harvest Chronology. Harvest chronology varies somewhat during the last 5 years (Table 3). In 1992 and 1993, March had the highest reported wolf take. During the last 3 years the months of December and January have had higher reported harvests. The reason for the change in chronology is not known. Historically, same-day-airborne hunters often waited until later in the season, when better snow conditions facilitated landing and more daylight was available for tracking. Ground trappers usually take wolves as soon as trapping is allowed in November; however, adequate snow conditions are required for back country travel and wolf sets.

Transport Methods. When same-day-airborne hunting was legal (before 1992–93), successful hunters and trappers preferred using aircraft (Table 4). Historically, more wolves were taken with

the use of aircraft, reflecting the remote nature of the unit and the importance of same-day-airborne harvesting. In recent years use of snowmachines has surpassed using aircraft as the most important method of transportation. This change occurred not only because it became illegal to take wolves same-day-airborne but because of improvements in snowmachines themselves. A few years ago drastic improvements occurred in snowmachine design and manufacturing. Modern snowmachines are more powerful, faster, travel better in deep snow, and more comfortable to ride and much more mechanically reliable. As a result, trappers and hunters are able to penetrate further into remote portions of the unit.

Other Mortality

Ballard et al. (1987) determined natural mortality rates for radiocollared wolves in a portion of Unit 13. They attributed 11% of annual mortality to intraspecific strife and 9% to accidents, injuries, starvation, and drowning. Ballard attributed the remaining 80% to legal and illegal human harvest. Since completion of this study, taking of wolves by land-and-shoot has become illegal. By observing kill sites, we can determine illegal use of airplanes to take wolves. Field observations in recent years indicate the illegal wolf harvest in Unit 13 is not large and does not affect population levels.

Nonregulatory Management Problems/Needs

Between 1975 and 1982 we extrapolated Unit 13 wolf population estimates from densities determined for radiocollared packs in a portion of the unit (Ballard et al. 1987). Since 1983, we have derived population estimates primarily by extrapolating the number of wolves determined from track surveys. When making this estimate, we also consider sightings reported by hunters, trappers, and others and observations by department personnel conducting aerial surveys for other species. Wolf population estimates based on track surveys and incidental sightings may be less accurate than estimates from extrapolating radiotelemetry information. However, these estimates are considered adequate for management purposes. In recent years population estimates obtained in this manner have approached density estimates obtained during intensive wolf censuses. Nevertheless, maintaining some radiocollared packs would serve as monitors of wolf trends in years when snow conditions preclude conducting aerial track counts.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers in Unit 13 fluctuated during this reporting period with no discernible trend. The spring population dropped below 200 wolves to an estimated 180 in 1995, after 2 years with high harvests. The following year, however, the harvest declined, and the wolf population increased. Current population estimates exceed the management objectives for wolves set by the Board of Game in 1995.

Wolf estimates are obtained by conducting track surveys and combining survey results with incidental sightings, harvest reports, and reports from the public. The quality of the annual estimate depends upon snow depth, survey conditions, and survey effort. Without radiocollared packs as a monitor to aid in determining population trends, intensive wolf censuses have been used periodically to obtain wolf density estimates in portions of Unit 13. The most recent survey in portions of Units 13A and 13B resulted in density estimates of 3–7 wolves/1000 km^2. The

range of this density estimate encompasses the unit estimate of 4.7 wolves/1000 km^2 obtained by less rigorous methods.

Wolf harvests fluctuated considerably during this reporting period. The change in harvests was thought to reflect trapping effort, weather conditions, and wolf availability. Trapping effort reflects both trapping conditions and economic factors. Trappers must have sufficient snow to travel by snowmachine or land ski planes as well as make sets. Economic factors include the price paid for furbearers and their abundance. During the early to mid 1990s, fur prices were low on most of the common Unit 13 furbearer species, except marten and wolves. Prices on wolves peaked between 1993 and 1995 and probably contributed to the high harvests. Also, weather condition and snow depth were favorable to wolf trapping those years. By 1995–96 wolf prices began to decline and snowfall was the lowest in over 7 years, restricting trapping activity.

The current wolf harvest appears to be insufficient to consistently reduce the wolf population to meet wolf management objectives for intensive management. Harvest levels observed during 1993–94 and 1994–95 were reducing wolves, and the spring population was approaching management objectives. Based on the effect these high harvests had on wolf numbers, the potential exists for current legal methods and means to reduce wolf numbers if trappers expend the effort. The reasons ground trappers are becoming more successful at taking wolves are improved transportation, equipment, and education. Mechanically improved and more reliable snowmachines have increased the amount of manageable trapline. Design changes on both traps and snares in recent years have increased holding capacity. Increased trapper education and improved trapping and snaring techniques allow trappers to concentrate effectively on wolves. Unfortunately, economic factors also influence wolf harvests. As trappers focused on wolves, harvests increased and the demand and price for wolves decreased. The role a volatile fur market will have on the demand and prices paid for wolves in future harvests is unknown. Trappers cannot be expected to target wolves when their efforts will not be financially profitable.

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Table 1 Unit 13 fall and spring wolf population estimates[a], 1991–96

Year	Population estimate			Packs (nr)	Basis of estimate
	Fall	Spring			
1991/92	359-472	195	(170-220)	40	b
1992/93	310-335	210	(170-240)	40	b
1993/94	350-400	230	(210-250)	45	b
1994/95	325-375	180	(160-200)	40	b
1995/96	310-350	200	(180-220)	40	b

[a] Fall estimate = pretrapping season population; spring estimate = posttrapping season population.
[b] Basis of estimate, aerial track surveys, incidental observations, reports from public, sealing records.

Table 2 Unit 13 wolf harvest, 1991–96

Year	Reported harvest							Estimated Harvest		Method of Take								Successful trappers/ Hunters
	M	%	F	%	Unk	%	Total	Unreportec	Illegal	Trap snare	%	Shot	%	SDA	%	Unk	%	
1991/92	51	(44)	61	(53)	3	(3)	115	5	5	23	(20)	19	(17)	73	(63)	0	(0)	53
1992/93	50	(54)	42	(45)	1	(1)	93	5	5	45	(48)	46	(50)	0	(0)	2	(2)	51
1993/94	84	(47)	86	(48)	9	(5)	179	5	5	104	(58)	74	(41)	0	(0)	1	(1)	54
1994/95	85	(56)	66	(43)	2	(1)	153	5	5	80	(52)	73	(43)	0	(0)	0	(0)	74
1995/96	64	(52)	57	(47)	1	(1)	122	5	5	91	(74)	30	(25)	0	(0)	1	(1)	58

Table 3 Unit 13 wolf harvest chronology percent, 1991–96

Regulatory Year	Harvest periods									
	August	September	October	November	December	January	February	March	April	*n*
1991/92	1	3	3	8	20	16	17	32	1	115
1992/93	4	7	1	10	14	11	13	30	10	93
1993/94	1	2	0	2	22	31	19	19	3	177
1994/95	4	3	0	6	19	29	18	20	1	153
1995/96	0	4	1	14	22	25	13	14	7	122

Table 4 Unit 13 wolf harvest percent by transport method, 1991–96

Regulatory Year	Percent of Harvest								
	Airplane	Dog sled skis/ Snowshoes	Boat	4-wheeler	Snowmachine	ORV	Highway vehicle	Unknown	*n*
1991/92	64	3	0	0	25	2	6	0	115
1992/93	8	0	0	5	75	2	8	2	93
1993/94	36	5	0	1	54	1	2	1	179
1994/95	18	2	0	2	54	2	8	14	153
1995/96	10	1	0	2	66	0	6	16	122

LOCATION

GAME MANAGEMENT UNIT: 14 (6,624 mi^2)

GEOGRAPHIC DESCRIPTION: Eastern Upper Cook Inlet

BACKGROUND

Wolf numbers in Unit 14 were probably low to moderate in the 1950s and early 1960s, primarily due to predator control efforts by the federal government (Rausch 1967). Wolf populations probably increased during the late 1960s and early 1970s, after cessation of predator control activities and bounty payments. Development in the Anchorage and Matanuska–Susitna Valley areas was probably responsible for wolf numbers remaining low near human settlements during the 1970s. Subsequent large increases in human population in this area caused substantial increases in hunting and trapping pressure, and by the mid to late 1980s, wolf numbers were relatively low throughout Unit 14. During the early 1990s wolf populations increased, possibly due to high prey densities, excessive winter moose mortality due to deep snows during the winters of 1989–90 and 1994–95. High wolf densities also occurred in adjacent areas having reduced hunting and trapping pressure. Wolf numbers have remained high through 1996; winter recreationists reported many observations of wolves. Because of increased harvest opportunity by hunters and trappers using snowmachines, the reported harvest has significantly increased.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

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

MANAGEMENT OBJECTIVES

The population objective is to maintain a minimum unitwide population of 55 wolves, with 35 wolves in Units 14A and 14B (combined), and 20 wolves in Unit 14C. The human-use objective in Subunits 14A and 14B is to allow low levels of human harvest by hunting and trapping, provided harvest does not conflict with maintaining the population objective. The human-use objective in Subunit 14C is to provide for nonconsumptive uses such as viewing, photography, listening, and the knowledge that wolves are present.

METHODS

An intensive aerial survey was conducted in Subunit 14C during 23–25 February 1995. The estimation technique, called the "Sample Unit Probability Estimator" (SUPE), utilizes intensive aerial searches of randomly selected square sample units (Becker et al. in press). Aerial snow-tracking surveys were conducted in the Lake George, Knik River, Kashwitna River, and Willow Creek portions of Unit 14 on 5 March 1994, and in the Talkeetna Mountains portion of Unit 14

on 18 March 1996. Teams of observers and pilots in Piper PA-18 aircraft searched for wolves, wolf sign, and (in Units 14A and B) caribou, in areas primarily above tree line.

Most reports of wolf distribution and pack size came from incidental observations by staff and the public, from sealing certificates, and interviews with wolf hunters and trappers. We collected harvest data when wolf hides were presented for sealing. All trappers who sealed fur in Unit 14 were queried, through our trapper questionnaire, regarding trends in wolf abundance.

During fall 1996 the U.S. Department of Agriculture, Animal Damage Control, under contract with the Elmendorf Air Force Base Natural Resources section, began a project investigating movements and distribution of wolves on Elmendorf and Fort Richardson. This project is under the direct supervision of the Anchorage area office. A female pup and a 2-year-old male were captured and radiocollared in fall 1996 on Fort Richardson.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We estimated Unit 14C contained 27 (19–39 at the 90% CI) wolves in 4 packs during late February 1995. The estimated density was 7.7 wolves/1000 km^2 (5.3–10.8 at the 90% CI). An additional pack of 8 apparently established itself on Elmendorf Air Base after that survey, leading the area biologist to estimate the 14C wolf population at 30–40 wolves during April 1996 (R. Sinnott, pers commun). During the 1994 snow-tracking flight, we observed 2 wolves on the Knik River (plus tracks of 2 more) and tracks of 8-9 on the Kashwitna River. During the 1996 snow-tracking flights in Units 14A and 14B, we observed 6 wolves in 2 packs. A group of 2 wolves was seen on the Talkeetna River near Welles Mountain, and a group of 4 wolves was reported on the north fork of the Kashwitna River.

From these observations, and information from sealing certificates, trappers, staff and the public, we estimated Unit 14 contained 70–100 wolves during spring 1996 (Table 1). Wolf numbers have increased approximately 60% since 1991–92, and several new packs have established territories within the unit.

Distribution and Movements

Areas in Unit 14 that contained wolf packs included Sheep River/Iron Creek, Kashwitna River, Bald Mountain, Kings River, Carpenter Creek, Knik River, Lake George/Eklutna River, Elmendorf Air Base, Fort Richardson/Eagle River/Ship Creek, and Portage/Twentymile River.

MORTALITY

Harvest

Season and Bag Limit. During the report period the hunting season for Unit 14 was 10 August–30 April, with a bag limit of 5 wolves. The trapping season in Units 14A and 14B was 10 November–31 March, and in Unit 14C the trapping season ran 10 November–28 February. Trappers had no bag limit on wolves.

Board of Game Actions and Emergency Orders. During June 1993 the Board of Game authorized same-day-airborne shooting of wolves, provided the person attempting to take the wolf had a trapping license and was at least 300 feet from the airplane. This regulation was in effect during the entire report period. During November 1996 this method of take was prohibited through a statewide ballot referendum (effective February 25, 1997).

Hunter/Trapper Harvest. Harvest increased dramatically during the last 2 years (Table 2), continuing an increasing trend since 1992–93. Unitwide harvest averaged 2 wolves during the 4 seasons from 1988/89–1991/92 (Masteller 1994), compared with an average of 15.7 during the 4 seasons from 1992/93–1995/96. During 1992–93 the increase in harvest was attributed to harvest from 2 packs (the newly established Knik River pack and the previously untrapped Kashwitna River pack). During 1994–95 and 1995–96 a significant portion of the harvest again came from these 2 areas, plus a relatively new pack in the Bald Mountain/Willow Creek area. Harvest has also increased in Unit 14C.

During winter 1996–97 the Elmendorf pack moved north into the Palmer Hay Flats in early winter and several wolves, including the radiocollared female, were trapped.

There have been no clear trends in the different methods of take used to harvest wolves (Table 2). During 1991–96 56% of the wolves were taken with traps or snare, and 44% were shot.

Harvest Chronology. Most wolves were taken during December and January, but in some years March is a significant month for wolf harvest (Table 3). Harvest chronology can vary considerably depending on weather and snow conditions.

Transport Methods. Most successful wolf trappers and hunters use 4-wheelers or snowmachines to access their trapping/hunting areas (Table 4). Snowmachine use declined dramatically during 1995–96 because of unusually low snowfall. During that year most of Unit 14 had no snowfall until February.

Other Mortality

During December 1993 a wolf in the Willow Mountain/Iron Creek area was illegally run down and shot by a man on a snowmachine. Other snowmachiners reported the incident to the state troopers, and the case was reported widely in the media. The man was eventually convicted, after which he forfeited his snowmachine and gun, and lost his hunting and trapping privileges for 2 years.

The male wolf radiocollared on Fort Richardson was shot in January 1997 by a Hiland Road resident allegedly defending his domestic goats.

HABITAT

Assessment

Although wolf habitat in Unit 14 has changed significantly in the last 80 years, increases in moose density has undoubtedly allowed for increases in wolf numbers in the last 30 years. Wolves are very adaptable and have high reproductive rates, allowing them to utilize areas altered by humans.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

We received many reports from the public about wolves attacking dogs and possibly threatening other pets and livestock. Wolves have killed an estimated 3–10 dogs/year in the Anchorage area. As wolf numbers increase, wolf–domestic animal conflicts may increase, especially with the dispersed pattern of human development in this area.

CONCLUSIONS AND RECOMMENDATIONS

While the population objectives have been met for Unit 14, and the number of wolves is increasing, systematic surveys will be necessary to refine the estimate or more accurately determine trends in wolf numbers. The human-use objective was also met, with both consumptive and nonconsumptive users enjoying many opportunities to interact with wolves, even on the outskirts of urban areas. No change in seasons or bag limits are recommended.

The potential for wolf–human interactions, both positive and negative, in Unit 14 make this an excellent place to study wolves (e.g., population dynamics, prey selection, movements, dispersal, and "adaptability") in habitats that have been substantially altered by humans. Additional wolf research in this area could also further our educational, viewing and listening opportunities.

There has been much speculation regarding the underlying factors causing the recent increase in wolf numbers. The estimated number of wolves has grown approximately 60% during the last 5 years (Table 1). Factors that may be related to the increase include increases in moose vulnerability during several severe winters, high wolf densities in adjacent areas, consistently high prey densities (especially moose and sheep), increasing beaver populations, and reduced illegal harvest by aircraft-assisted poachers. Previous area biologists speculated that when permits were issued to take wolves same-day-airborne for Units 13 and 19, wolves in Unit 14 also were killed. The number of incidental observations may be increasing because of the tremendous growth in the number of people owning snowmachines.

Harvest rates, based on the estimated number of wolves (Table 1), have also increased, from 5% during 1991–92 to 30% during 1995–96. This should not cause great concern because wolf populations can sustain harvest rates of approximately 40% (Ballard et al. 1987). Certain easily accessible packs (Knik River, Bald Mountain) have probably been reduced by more than 40% annually. However, as long as overall wolf densities are high and human-induced mortality is primarily composed of young wolves, dispersal and immigration will probably compensate for losses within a pack.

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Table 1 Unit 14 fall (pre-trapping season) wolf population estimates, 1991–1995

Year	Population estimate	Packs (nr)	Basis of estimate
1991/92	45-65	8-10	Incidental observations, sealing records, reports from public
1992/93	45-65	8-10	same as above
1993/94	45-65	8-10	same as above
1994/95	60-85	8-11	Sample Unit Probability Estimate in 14C, incidental observations in 14A and 14B.
1995/96	70-100	9-11	Incidental observations, sealing records, reports from public

Table 2 Unit 14 wolf harvest, 1991–1995

Regulatory year	Reported harvest				Method of take			Successful Trapper/hunters
	M	F	Unk	Total	Trap/Snare	Shot	Unk	
Subunit 14A								
1991/92	2	1	0	3	1	2	0	2
1992/93	2	3	0	5	4	1	0	3
1993/94	1	0	0	1	1	0	0	1
1994/95	9	7	0	16	9	7	0	8
1995/96	12	7	0	19	14	5	0	6
Subunit 14B								
1991/92	0	0	0	0	0	0	0	0
1992/93	4	0	0	4	0	4	0	1
1993/94	5	1	0	6	1	5	0	5
1994/95	2	2	0	4	1	3	0	2
1995/96	2	0	0	2	2	0	0	1
Subunit 14C								
1991/92	0	0	0	0	0	0	0	0
1992/93	1	0	0	1	1	0	0	1
1993/94	0	0	0	0	0	0	0	0
1994/95	0	2	0	2	1	1	0	2
1995/96	0	3	0	3	2	1	0	3
Unit 14 Total								
1991/92	2	1	0	3	1	2	0	2
1992/93	7	3	0	10	5	5	0	5
1993/94	6	1	0	7	2	5	0	6
1994/95	11	11	0	22	11	11	0	12
1995/96	14	10	0	24	18	6	0	11

Table 3 Unit 14 wolf harvest chronology percent, 1991–1995

Regulatory year	Harvest periods							*n*
	Sep–Oct	November	December	January	February	March	April	
1991/92	0	0	0	67	0	33	0	3
1992/93	0	40	60	0	0	0	0	10
1993/94	14	14	14	14	0	43	0	7
1994/95	14	0	41	41	4	0	0	22
1995/96	4	4	42	33	8	4	4	24

Table 4 Unit 14 wolf harvest percent by transport method, 1991–1995

Regulatory year	Harvest								*n*
	Airplane	Dogsled Skis Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1991/92	0	0	0	0	100	0	0	0	3
1992/93	0	0	0	50	40	0	10	0	10
1993/94	14	0	0	14	71	0	0	0	7
1994/95	9	0	0	23	59	0	0	9	22
1995/96	4	0	0	58	4	0	17	17	24

LOCATION

GAME MANAGEMENT UNIT: 16 (12,300 mi^2)

GEOGRAPHIC DESCRIPTION: West side of Cook Inlet

BACKGROUND

Prior to the 1900s and the establishment of major human settlements in Anchorage, Palmer/Wasilla and Kenai/Soldotna, wolf numbers in Unit 16 fluctuated with prey densities. Since 1900 wolf populations have been heavily influenced by various human harvest regimes. These have ranged from predator-control strategies (including the use of poison, bounties, and aerial shooting) prior to statehood to relatively restrictive regulations including only trapping and sport hunting (Harkness 1991, Masteller 1994). Recent observations indicate the wolf population has almost doubled since the late 1980s.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The goal for this area is to conserve the wolf population, retain desirable predator/prey ratios, and provide a sustainable harvest of wolves.

MANAGEMENT OBJECTIVES

The population objective is to maintain a wolf population of 30–60 wolves in at least 4 packs. This should include 8–15 wolves (in 1–3 packs) in Subunit 16A and 22–45 wolves (in 3–5 packs) in Subunit 16B. The human-use objective is to allow maximum opportunity for harvest while maintaining minimum wolf population objectives.

METHODS

We estimated wolf numbers, distribution, and population trends based on observations by staff, trappers, hunters, and pilots, and from interviews with trappers and hunters sealing fur from Unit 16. Annual wolf harvest was determined by sealing all wolves presented for examination. Wolf numbers in Unit 16 were estimated via the "Sample Unit Probability Estimator" (Becker et al. in press) during March 1993 (Masteller 1994).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Unit 16 contained an estimated 50–75 wolves, in 11–13 packs, during fall 1995 (Table 1). Significantly higher than the fall 1991 estimate (35–45 wolves), the fall 1995 level is similar to the number of wolves estimated in this area during the mid 1980s (Harkness 1991). The steady increase in wolf numbers was probably due to relatively high prey abundance, lower levels of

illegal harvest, high wolf densities in adjacent areas, and several deep-snow winters, which increased prey vulnerability.

Distribution and Movements

Wolves inhabit most portions of Unit 16 (Table 2). Several packs utilize portions of other units. Due to poor travel conditions resulting from very little snowfall during winter 1995–96, the number of observations declined.

During March 1996 a large pack of at least 32 wolves apparently traveled from Unit 9B to the McArthur/Big River area in Subunit 16B. This pack was seen by several ADFG personnel, and a Fish and Wildlife Protection officer subsequently tracked the pack up the north fork of the Big River and west through Lake Clark Pass (F. Herman pers commun). Subsequent discussions with staff from Lake Clark National Park (L. Fink and L. Alsworth, pers commun) indicated this pack was commonly seen in Unit 9B and in 1994 included approximately 40 wolves (including 19 pups). Park staff made special efforts to follow this pack, and during February 1996 they saw the pack go east through Lake Clark Pass, then back to the west during March. There have been several sightings in Unit 9B since March 1996. Park staff felt the pack split up during fall 1996, but a trapper reported taking 3 wolves from a pack of 35 (on the Koksetna River) during March 1997. As this pack grew, it made a short-term foray into southern Unit 16B.

MORTALITY

Harvest

Season and Bag Limit. During the report period the hunting season for Unit 16 was 10 August–30 April, with a bag limit of 5 wolves. The trapping season was 10 November–31 March, with no bag limit.

Board of Game Actions and Emergency Orders. During June 1993 the Board of Game authorized same-day-airborne shooting of wolves, provided the person attempting to take the wolf had a trapping license and was at least 300 feet from the airplane. This regulation was in effect during the entire report period. During November 1996 this method of take was prohibited through a statewide ballot referendum (effective 25 February 1997).

Hunter/Trapper Harvest. Harvest has increased substantially during the last 3 years (Table 3). During 1988–93 annual harvest averaged 6.6 wolves (Masteller 1994), compared to an annual average of 18.3 wolves during 1993–96. Harvest during 1995–96 was reduced by poor travel and trapping/hunting conditions, created by lack of snow until early February. The proportion of wolves taken by shooting has increased in recent years, from 42% during 1988–93 to 56% during 1993–96. This is probably due to the increase in number of people hunting from snowmachines, and regulations allowing shooting from the ground the same day a trapper was airborne. The total number of trappers/hunters has also been increasing.

Harvest Chronology. Most harvest typically occurs between December and March (Table 4). As wolves become more numerous, harvest has been spread over a longer period. Harvest chronology is also greatly affected by snow conditions.

Transport Methods. In recent years the modes of transport by successful trappers/hunters have become more varied (Table 5), probably because as wolf populations increased, wolves were seen more often during fall. However, most successful hunters and trappers used snowmachines and aircraft. Despite regulations allowing same-day-airborne shooting of wolves, the harvest reported by those hunters/trappers using aircraft has generally declined, with a concomitant increase in harvest by people using snowmachines. Some trappers using airplanes may have reported using snowshoes, due to a perception that reporting the use of an airplane implied an illegal activity or might provide antihunters with information to be used against hunters and trappers.

HABITAT

Assessment

Wolf habitat in Unit 16, in terms of prey and vegetation, has not changed significantly in many years. A large outbreak of spruce bark beetle has recently begun killing mature spruce trees over extensive areas, but the resulting vegetation changes and effects on wolf or prey density are unknown at this time. Human density has increased slightly, but generally there are large areas with few permanent residents. Recreational development is increasing with more seasonal-use cabins, boating, and fishing.

CONCLUSIONS AND RECOMMENDATIONS

We have probably met our wolf population and human-use objectives. However, it is difficult to identify population trends without rigorous attempts to systematically assess population size. Current indicators point to an approximate 60% increase in wolf numbers during the last 5 years (Table 1). I recommend no changes in seasons, bag limit, or management strategy. A systematic survey should be conducted during early 1999 and compared to the 1993 survey to verify our assumptions on population growth.

Factors that may have contributed to an increase in the number of wolves include increases in moose vulnerability during several deep-snow winters, low wolf harvest rates during the early 1990s, high wolf densities in adjacent areas, relatively high prey densities, increasing beaver populations, and reduced illegal harvest by aircraft-assisted poachers. (Previous area biologists speculated that when permits to take wolves same-day-airborne were issued for Unit 19, wolves in Unit 16 were killed.)

Harvest rates, based on the midrange of the estimated number of wolves (Table 1), have increased from 7% during 1991–92 to 41% during 1994–95. Harvest rates can remain relatively high without endangering the wolf population (Ballard et al. 1987), and harvest should be encouraged to help maintain a desirable predator-prey ratio (provided wolf population objectives are met).

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Table 1 Unit 16 fall wolf population estimates[a], 1991–96

Year	Population estimate	Packs (nr)	Basis of estimate
1991/92	35-45	unknown	Incidental observations, sealing records, reports from public
1992/93	48-62	8-10	Sample Unit Probability Estimator (Becker et al. in press)
1993/94	50-65	9-11	Incidental observations, sealing records, reports from public
1994/95	57-79	11-13	same as above
1995/96[b]	46-75	11-13	same as above

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

[b] This does not include a pack of 30–32 wolves seen in the McArthur/Big River area during March 1996. However, tracks from this pack indicated they had departed Unit 16, traveling west through Lake Clark Pass. Subsequent observations of a very large pack in Unit 9B indicate this pack spends most of its time in Unit 9B and may have made a temporary foray into southern Unit 16.

Table 2 Probable wolf pack locations, minimum sizes, and sources of information for Unit 16, March–November 1996

Pack name/Location	Approximate Pack Size	Source
Subunit 16A		
Tokositna River[a]	9	FWP Oct. 1995
Kahiltna River/Peters Hills	10	Trapper observations
Susitna R./Kroto Creek/Amber Lake	2	Air taxi operator
Subunit 16B		
Yentna River	6	FWP, Air taxi operator
Happy River	9	Lodge caretaker
Skwentna River	2	FWP Nov. 1995
Beluga Mtn/Eight-mile Ck/Talachulitna River	6	FWP, trapper observations
Lake Creek	2	Sealing data
Mt. Susitna/Alexander Creek[b]	8	ADFG, trapper obs. sealing data
Beluga/Theodore Rivers	8	1996 trapper observations
Drift/McArthur Rivers	3	Trapper obs., sealing data

[a] Pack probably uses both Subunits 16A and 13E.
[b] Pack probably uses both Subunits 16B, 16A and 14A.

Table 3 Unit 16 wolf harvest, 1991–96

Regulatory year	Reported harvest				Method of take			Successful Trapper/hunters
	M	F	Unk	Total	Trap/Snare	Shot	Unk	
1991/92	2	1	0	3	3	0	0	3
1992/93	3	2	3	8	1	7	0	7
1993/94	6	5	1	12	4	8	0	11
1994/95	14	14	0	28	11	17	0	17
1995/96	6	9	0	15	9	6	0	7

Table 4 Unit 16 wolf harvest chronology, 1991–96

Regulatory year	Percent of Harvest							
	Sep–Oct.	November	December	January	February	March	April	*n*
1991/92	0	0	0	33	0	67	0	3
1992/93	63	0	0	0	12	25	0	8
1993/94	8	0	8	8	50	25	0	12
1994/95	7	0	14	61	11	7	0	28
1995/96	0	13	20	0	33	27	7	15

Table 5 Unit 16 wolf harvest by transport method, 1991–96

Regulatory year	Percent of Harvest								
	Airplane	Dogsled Skis Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	*n*
1991/92	33	0	0	0	67	0	0	0	3
1992/93	38	0	0	0	12	25	0	25	8
1993/94	42	17	0	0	42	0	0	0	12
1994/95	18	11	3	0	43	0	7	18	28
1995/96	27	0	0	0	73	0	0	0	15

LOCATION

GAME MANAGEMENT UNIT: 17 A, B, and C (18,800 mi^2)

GEOGRAPHIC DESCRIPTION: Northern Bristol Bay

BACKGROUND

Wolves are common residents throughout the northern Bristol Bay area; however, we have no objective data on the historic or current abundance of wolves in this area. Harvest data from 1962 to the present provide some indication of wolf distribution and relative abundance, but these data are inconsistent. Bounty records give us a partial record of harvest from 1962 through 1971. Mandatory sealing records from 1972 to the present provide greater accuracy in harvest reporting (Figure 1). In 1988 the department implemented a trapper questionnaire program to collect information on relative abundance of furbearers, including wolves.

POPULATION OBJECTIVES

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

METHODS

We collected harvest data from trappers when they brought their wolf pelts in for sealing. In 1988 we started sending an annual trapper questionnaire to selected trappers in the unit to quantify their observations of furbearer populations during the trapping season and to estimate trends in the populations. We also gained insight into wolf population trends and distribution incidental to moose and caribou surveys.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Trapper reports and general observations indicate the wolf population increased during this reporting period. Wolf density in Unit 17 peaked from 1974 to 1977 but had declined sharply by 1980. Rabies may have been a contributing factor. Densities seemed to increase again until 1989 when another rabies epidemic affected canid populations in the unit. Wolf populations began to increase again in 1992.

Distribution and Movements

Wolves are present throughout the unit. Highest densities are along the major drainages of the Nushagak and Mulchatna Rivers. There is no evidence of transitory packs that follow the Mulchatna caribou herd, although lone wolves are occasionally seen with the herd as it pioneers new areas. Packs have established territories and take advantage of caribou when they move through those territories.

Population Size

The estimated 1996 fall wolf population in Unit 17A was 20–25 wolves in 5 to 7 packs, the Unit 17B population was 200–250 wolves in 15–20 packs, and the Unit 17C population was 100–150

wolves in 10–15 packs (Table 1). These estimates were based on personal data and may be inaccurate.

MORTALITY

Harvest

Season and Bag Limit

Hunting — Unit 17	5 wolves	Aug. 10–April 30
Trapping — Unit 17	No Limit	Nov. 10–March 31

Board of Game Actions and Emergency Orders. The Board of Game restricted the bag limit for hunters from 10 to 5 wolves starting in the 1992–93 regulatory year. This action resulted from a statewide proposal and was not precipitated by biological concerns specific to wolf populations in Unit 17.

Statewide regulations affecting same-day-airborne shooting of wolves fluctuated between 1991 and 1993. During 1991–92, all same-day-airborne trappers were required to affix a metal locking tag to wolves as soon as they were harvested. In 1992–93 same-day-airborne trapping was prohibited. In the 1993–94 season, same-day-airborne trapping was reinstated, but trappers were required to be more than 300' from their aircraft before shooting a wolf.

Hunter/Trapper Harvest. The wolf harvest in Unit 17 decreased during the 1995–96 season, and it was below the 5-year average of 50.0 wolves (Table 2). Eighteen trappers reported taking 41 wolves (26 males, and 15 females). Thirty-four (83%) were taken in Subunit 17B, and 7 (17%) were killed in Subunit 17C. Most were taken with a firearm (63%).

Harvest Chronology. Harvest chronology has varied from year to year (Table 3). During the 1995–96 season, most wolves were harvested in February (49%). In most years, harvest chronology reflects the suitability of snow conditions for tracking and landing rather than the availability of wolves.

Transport Methods. Aircraft have historically been the most common means of transport for wolf trappers/hunters in Unit 17 (Table 4). However, since 1992–93, the prohibition of same-day-airborne shooting resulted in trappers and hunters using snowmachines as transport to take most wolves.

CONCLUSIONS AND RECOMMENDATIONS

The cause of declines in wolf numbers in the late 1970s and late 1980s is unknown, but we suspect rabies. There is no evidence that human-induced mortality was the cause of these declines. Rabies is endemic to fox populations in southwestern Alaska, and red fox populations are greatly influenced by periodic epidemics. One rabid wolf was confirmed from the unit in 1981. In 1991–92 samples from 6 trapped wolves in Unit 17 were sent to the Alaska State Virology Laboratory for rabies tests. All tests were negative; however, these tests could not indicate if the wolves ever had been exposed to rabies and survived.

Few data are available to interpret the status of the wolf population in Unit 17. General observations and public contacts indicate the wolf population is healthy and rebounding from the decline from 1989 through 1992. Moose are the primary large prey for most packs in the unit, and moose populations have been stable to increasing throughout the unit since the late 1980s. Although no packs are known to follow the Mulchatna caribou herd, most wolves took advantage of this rapidly increasing herd as they moved through wolf territories. It is logical to expect wolf populations to increase with increased prey densities. Wolves also emigrate from Units 9 and 19 into Unit 17.

Same-day-airborne shooting of wolves has traditionally been the most common and effective method of harvesting wolves in Unit 17. Department records confirm this from 1961 to 1992, and local residents have documented extensive use of aircraft by wolf hunters back to the 1930s. Prohibition of same-day-airborne wolf shooting in 1992–93 caused a shift to snowmachines as the most commonly reported method of access. Recent developments in snowmachine technology have improved their effectiveness for assisting in wolf harvests, especially near villages. However, aircraft remain the most effective means of transport in the remote portions of the unit.

If snow conditions are favorable, trappers are able to control wolf numbers in Unit 17, as evidenced in the winter of 1994–95 when excellent travel conditions resulted in a record harvest and a corresponding reduction in the wolf population. Because of good accessibility, an abundance of trappers in the unit, and healthy ungulate populations, I recommend no department-sponsored wolf reductions for Unit 17 at this time.

We need aerial surveys of portions of Units 17B and 17C to better quantify population density. Nearly constant winds cause fresh snow to drift rapidly, and good survey conditions seldom last more than 1 day. Survey efforts should be coordinated with department personnel in Units 9 and 19 and with Lake Clark National Park personnel to survey more area while good conditions last.

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Table 1 Unit 17 fall wolf population estimates[a], 1991–96

Year	Population estimate	Packs (nr)	Basis of estimate
1991/92	200 - 250	20 – 30	Trapper questionnaire and incidental observation[b]
1992/93	250 - 350	20 – 30	Trapper questionnaire and incidental observation[b]
1993/94	300 - 350	25 – 35	Trapper questionnaire and incidental observation[b]
1994/95	400 - 475	30 – 40	Trapper questionnaire and incidental observation[b]
1995/96	320 - 425	30 – 42	trapper questionnaire and incidental observation[b]

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

Table 2 Unit 17 wolf harvest, 1991–96

Regulatory	Reported harvest				Method of take (%)			Successful
Year	Male	Female	Unk	Total	Trap/snare	Shot	Unk	trappers
1991/92	20	9	8	37	9 (24%)	28 (76%)	0 (--)	20
1992/93	12	5	2	19	4 (21%)	15 (79%)	0 (--)	14
1993/94	29	16	10	55	0 (--)	55 (100%)	0 (--)	21
1994/95	75	35	11	121	33 (27%)	88 (73%)	0 (--)	34
1995/96	26	15	0	41	15 (27%)	26 (63%)	0 (--)	18

Table 3 Unit 17 wolf harvest chronology percent, 1991–96

Regulatory Year	Harvest period December	January	February	March	April	Unknown//Other	*n*
1991/92	5%	32%	30%	22%	--	11%	37
1992/93	5%	21%	53%	11%	--	10%[a]	19
1993/94	22%	27%	16%	26%	4%	6%[b]	55
1994/95	14%	7%	32%	17%	--	30%[c]	121
1995/96	2%	20%	49%	22%	--	--	41

[a] - includes 1 wolf (5%) harvested in August and 1 wolf (5%) harvested in October.

[b] - includes 3 wolves (6%) harvested in September.

[c] - includes 2 wolves (2%) harvested in August, 8 (7%) in September, 1 (1%) in October, 21 (17%) in November, and 4 (4%) harvested at unknown times.

Table 4 Unit 17 wolf harvest percent by transport method, 1991–96

Regulatory Year	Percent of harvest Airplane	Dogsled Skis Snowshoes	Boat	3- or 4-Wheeler	Snow machine	ORV	highway vehicle	Unk	*n*
1991/92	70%	--	--	--	30%	--	--	--	37
1992/93	5%	5%	--	--	84%	--	5%	--	19
1993/94	36%	2%	--	2%	58%	--	--	2%	55
1994/95	29%	10%	2%	--	60%	--	--	2%	121
1995/96	19%	5%	--	--	49%	--	--	--	41

LOCATION

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

GEOGRAPHIC DESCRIPTION: Yukon–Kuskokwim Delta

BACKGROUND

Reported observations from trappers, furbuyers, and agency biologists indicate that wolf numbers are slightly increasing in Unit 18, particularly in the Yukon drainage and in the Kilbuck Mountains east of Bethel. The distribution of wolves in Unit 18 seems to reflect the distribution of moose and caribou. Although wolf numbers are growing slowly in Unit 18, their overall densities remain low. Sealing certificate data indicate that little change has occurred in the size of the harvest of wolves in Unit 18, except for 1992–1993 when no harvest was reported. The harvest of 6 wolves in 1994–1995 and 8 wolves in 1995–1996, although an increase from 1992–1993, is in keeping with historical low harvest levels in Unit 18.

MANAGEMENT DIRECTION

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

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

METHODS

No aerial surveys were planned or completed to determine numbers and distribution of wolves in Unit 18. We observed wolves occasionally during aerial surveys of moose and caribou. Wolf sightings were compiled with those received from other agencies, the public, trappers, and furbuyers. In addition, sightings of wolves and prey believed to be killed by wolves were reported by local trappers, hunters, pilots, and by department and US Fish and Wildlife Service (FWS) staff engaged in other activities during the reporting period.

Harvest information was obtained from sealing records, interviews with furbuyers, and the annual trapper questionnaire; we continued to support license vendors and furbearer sealers in Unit 18. Public notices were sent to 43 villages in Unit 18 for the seventh consecutive year informing the public that wolves and some furbearers taken by hunters and trappers need to be sealed after harvest. A trapper questionnaire was sent to local residents in March 1995 and again in 1996 to evaluate wolf abundance.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Previously, trappers reported evidence of wolves in more places in Unit 18 during the 1992–1994 reporting period than at any time since the 1930s. Trappers and hunters continued to report increasing numbers of wolves in the Kilbuck and Kuskokwim Mountains, as well as in the Yukon River corridor between Marshall and Paimiut during 1994–1996 reporting period. Reports from the public of wolf sightings have also increased, especially from the Kuskokwim drainage in adjacent Unit 19A.

Wolf numbers are reportedly increasing slightly along the entire lower Yukon drainage in Unit 18, in the Kuskokwim drainage, and adjacent mountain ranges east of Bethel. Previous estimates of population size of 25–50 wolves in Unit 18 may have been low (Table 1); alternatively, the wolf population may be growing. The estimated Unit 18 wolf population during 1995–1996 ranged from 75 to 100 animals in 8–10 packs.

Distribution and Movements

Observations reported by department staff and the public indicate several wolf packs occupied the entire length of the Yukon River in Unit 18 and portions of the Kilbuck Mountains and the Kuskokwim River drainage near the Unit 19A boundary.

Resident wolf packs have been observed near Nyac on the upper Tuluksak River and Fog River drainages, the upper Kwethluk and Kisaralik drainages, the Goodnews and Arolik drainages, the Paimiut Hills, Russian Mountains, Twelve-Mile Slough and the Portage Hills area, and the Andreafsky Mountains area. In addition, scattered sightings have been reported elsewhere in the unit.

Several wolf packs have apparently inhabited the Kilbuck Mountains since at least 1984. These wolves have been observed preying upon moose in the forested riparian corridors and on caribou in open mountain regions.

Other packs remained near the periphery of Unit 18, principally moving between Unit 18 and Units 17A, 17B, 19A, 19B, 21E and 22. Dispersing juvenile wolves have apparently moved from northern and eastern montane and riparian regions of Unit 18 onto the lowlands of the Yukon–Kuskokwim Delta.

Trappers from the villages of Akiachak, Akiak, and Kwethluk on the lower Kuskokwim also reported observing tracks of lone and small groups of wolves on the Gweek River and the Kisaralik River during 1992–1993. Wolves had not been seen in the Gweek River drainage since the demise of the reindeer industry over 50 years ago. Some of these reports may actually have been of coyotes, which have been periodically sighted in Unit 18 since 1989. Coyotes moving into the southwest portion of Unit 18 have also been reported in the drainages of the Kwethluk, Kisaralik, and Eek rivers. Possibly 1 coyote was seem east of the Andreafsky area. Some of these coyotes may have been mistaken for wolves.

Trappers and residents from the villages of Mountain Village, Sheldon's Point, Pilot Station, Russian Mission, and Alakanuk on the Yukon River reported observing tracks of single wolves or packs of wolves throughout the reporting period. A pack of 15 to 18 wolves has reportedly ranged between Pilot Station and Russian Mission along the Yukon River during the last 7 years. This reflects the growing moose population along the lower Yukon River. Wolves now range along the entire Yukon drainage in Unit 18 from the Unit 21E border to the mouth of the Yukon.

MORTALITY

Harvest

Seasons and Bag Limits

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18		
Residents and Nonresidents:		
Trapping - no limit	10 Nov-31 Mar	10 Nov-31 Mar
Hunting - 5 wolves	10 Aug-30 Apr	10 Aug-30 Apr

Board of Game Actions and Emergency Orders. During the 1992–1994 reporting period, the department recommended statewide changes in wolf seasons and bag limits. The proposals to the Board of Game increased the bag limit to 5 wolves for hunters in Unit 18 and the bordering units. The bag limit became the same for all units in Alaska, except Units 7, 15, and 26.

Hunter/Trapper Harvest. Sealing certificate data indicate that 6 wolves were harvested in Unit 18 during the 1994–1995 regulatory year, and 8 wolves were harvested during 1995–1996. No wolves were reported harvested during 1992–1993.

Three of the 6 wolves harvested in 1994-1995 were males; no sex information was reported for the other 3 wolves (Table 2). Three of these 6 wolves were trapped near Devil's Elbow on the Yukon River between Marshall and Russian Mission. One other wolf was trapped on the North Fork of the Andreafsky River, north of the village of St. Mary's on the Yukon River. One wolf was shot on the Arolik River southeast of the village of Quinhagak on Kuskowkim Bay, and the other wolf was shot north of Nyac in the Kuskokwim Mountains.

Six of the 8 wolves reported harvested in 1995–1996 were males; 2 were identified as females (Table 2). The 5 wolves reported as snared were taken from a single pack of 11 wolves in the Kisaralik drainage east of Bethel. One wolf was reported shot 11 miles southeast of the village of Quinhagak. Two other wolves were reported taken in the Kanektok River drainage east of Quinhagak. All of the wolves reported harvested during the 1995–1996 season in Unit 18 were taken east of the Kuskokwim River, within the range of the rapidly expanding Mulchatna caribou herd.

The reported wolf harvest in Unit 18 has fluctuated in size annually. The unusually high 1988–1989 harvest of 17 wolves (Table 2) was probably related to increased availability of wolves and to an active furbuyer offering good prices. The high return on wolf pelts to the trapper in Unit 18 has remained relatively stable during the last several years, although the value of wolf pelts in other parts of Alaska has declined. The decrease in harvest during 1992–1993 apparently reflected a decline in trapping activity during that period. According to trappers, travel conditions during the winters of 1990–1991 and 1992–1993 were also not very good, especially for wolf tracking. This may also explain the low harvest of that regulatory year. Wolf harvest is, however, normally very low in Unit 18.

We believe that most wolves caught in Unit 18 are not sold and consequently not sealed. Wolf ruffs are highly prized as parka trim, and the local domestic demand for wolf pelts is very high. Local residents prefer stiffer home-tanned wolf pelts for parka ruffs. Knowledgeable furbuyers believe only about one-third to one-half of wolves harvested in Unit 18 are actually sealed.

Harvest Chronology. Sealing certificate data indicate 4 wolves were taken during December 1994, and 1 each was taken during February and March 1995 (Table 3). Sealing certificate data also indicate that 3 trappers harvested 8 wolves in Unit 18 during 1995–1996. Six wolves were taken during February 1996, and 1 each was taken during November 1995 and March 1996.

Transport Methods. Five wolves were taken by individuals using snowmachines as transportation during the 1994–1995 regulatory year; the form of transportation for the take of the other wolf was not given (Table 4). Two of these wolves were ground shot and the other 4 were trapped. Six of the 8 wolves reported harvested in Unit 18 during 1995–1996 were taken using snowmachines as transportation; the form of transportation used during the take of the other 2 wolves was not given (Table 4). One wolf was ground shot and 5 were snared. The method of take was not given for the other 2 wolves taken during 1995–1996.

Other Mortality

No new information is available on natural mortality of wolves in Unit 18. Periods of extremely cold weather in January and February (windchill to -70 °F) may cause some mortality for smaller furbearers, but trappers report no observable effects on wolves.

HABITAT

Assessment

As mentioned in previous progress reports, extensive riparian, upland and montane tundra habitats in Unit 18 are available to support much larger populations of moose, caribou, and mainland

muskoxen. Increased numbers of ungulates in the Kuskokwim and Yukon drainages should result in continued increase in numbers of wolves within Unit 18. Recent migrations of several thousand Western Arctic Herd caribou into the lower Yukon and Andreafsky River areas, the increase and expansion of both the Kilbuck and Mulchatna caribou herds into eastern Unit 18, the growth of the muskox herd north of the Yukon River, and the increase of moose numbers along the entire lower Yukon River in Unit 18 will also attract wolves from nearby units into Unit 18.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers are slowly increasing in Unit 18, presumably in response to moose and caribou population growth and dispersal. Wolf numbers are slightly increasing along the entire lower Yukon drainage in Unit 18 and are also increasing slightly along the lower Kuskokwim drainage, and in the adjacent Kilbuck and Kuskokwim mountain ranges.

The current population estimate is 75 to 100 wolves and 8 to 10 packs for Unit 18. Six wolves were reportedly harvested in Unit 18 in 1994–1995, 8 in 1995–1996, but none in 1992–1993. The annual harvest in Unit 18 has ranged from 1 to 17 wolves during previous years.

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

The advent of 30,000–40,000 Mulchatna caribou in Unit 18 since 1994 to locations south and east of the Kuskokwim River is of particular importance for the future status of wolves in Unit 18. The rate of predation by wolves on caribou in eastern Unit 18 may have become temporarily insignificant because of this recent western expansion of very large numbers of Mulchatna caribou. Wolves, however, are becoming more numerous in the Kilbuck Mountains in response to the increasing populations of large ungulates. The increased numbers of suitable prey will also allow for increased year-round occupancy by more wolves within Unit 18.

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Table 1 Unit 18 fall wolf population estimates[a], 1985–1995

Regulatory year	Population estimate[b]	Packs (nr)
1985-1986	25-50	5-7
1986-1987	25-50	5-7
1987-1988	25-50	5-7
1988-1989	50-75	6-7
1989-1990	50-75	6-7
1990-1991	75-100	6-7
1991-1992	75-100	6-7
1992-1993	75-100	6-7
1993-1994	75-100	6-7
1994-1995	75-100	6-7
1995-1996	75-100	8-10

[a] Fall estimate of pre-trapping season population.
[b] Bases of estimate from incidental observations, reports from public, sealing records, and trapper questionnaire results.

Table 2 Unit 18 wolf harvest, 1985–1995

Regulatory	Reported Harvest			Method of take			Number Successful
year	M	F	Unknown	Trap/snare	Shot	Unknown	trap/hunt
1985-1986	1		6	6	1		2
1986-1987	2				2		2
1987-1988	4	4	3	5	5	1	6
1988-1989	11	6					7
1989-1990	2	2					2
1990-1991	1			1			1
1991-1992	2	2		4			2
1992-1993	0	0		0			0
1993-1994			4				?
1994-1995	3		3	4	2		4
1995-1996	6	2		5	1	2	3

Table 3 Unit 18 wolf harvest chronology by time period, 1985–1995

	Harvest periods					
Regulatory year	Nov	Dec	Jan	Feb	Mar	*n*
1985-1986	6	1				7
1986-1987		2				2
1987-1988		1	5	3	2	11
1988-1989		5	1	4	7	17
1989-1990			1	1	2	4
1990-1991				4		1
1991-1992					4	4
1992-1993						0
1993-1994			2		2	4
1994-1995		4		1	1	6
1995-1996	1			6	1	8

Table 4 Unit 18 wolf harvest by transport method, 1985–1995

	Percent of harvest			
Regulatory year	3 or 4-Wheeler	Snowmachine	Unknown	*n*
1985-1986		7		7
1986-1987		2		2
1987-1988	1	9	1	11
1988-1989		16	1	17
1989-1990		4		4
1990-1991		1		1
1991-1992		4		4
1992-1993				0
1993-1994		4		4
1994-1995		5	1	6
1995-1996		6	2	8

LOCATION

GAME MANAGEMENT UNIT: 19A, B, C, and D and 21A and E (60,523 mi^2)

GEOGRAPHIC DESCRIPTION: Drainages of the Kuskokwim River upstream from the village of Lower Kalskag; Yukon River drainage from Paimiut upstream to, but not including, the Blackburn Creek drainage; the entire Innoko River drainage; and the Nowitna River drainage upstream from the confluence of the Little Mud and Nowitna rivers

BACKGROUND

Wolves play multiple roles in the economy and ecology of the upper Kuskokwim region. As furbearers, wolves provide pelts for personal use by subsistence-based residents and are harvested by trappers for commercial sale of their pelts. Hunters consider wolves a trophy big game animal but also as competitors for moose.

Harvest of wolves in the upper Kuskokwim and middle Yukon drainages has been regulated by regulations that have changed frequently in response to public controversies that arose primarily over wolf control programs in other regions of the state. Harvests dropped after the cessation of bounties in 1967. The federal airborne hunting act of 1972 eliminated the former common practice of shooting wolves from airplanes, but as part of specific management programs, the Department of Fish and Game issued aerial shooting permits to members of the public until 1983.

With the exception of regulatory year 1978–1979 when 29 wolves were reported taken by shooting from aircraft in Unit 19, few wolves were taken by aerial shooting. Only 4 wolves, other than those taken in 1978, were taken under the authority of aerial permits in Unit 19 between 1972 and 1983. Most wolf harvest (67%) during that period occurred by land-and-shoot hunting; harvests ranged from 32 to 81 wolves annually in Unit 19 (Pegau 1984). Hunting of wolves by land-and-shoot continued until regulatory year 1992–1993 when all same-day-airborne hunting of wolves was prohibited. Beginning in 1994–1995, same-day-airborne taking of wolves was permitted for holders of a trapping license if trappers moved more than 300 ft from the aircraft before shooting a wolf. A public ballot initiative that passed in November 1996 repealed that "land and walk" regulation, again prohibiting all same-day-airborne hunting of wolves beginning in late February 1997.

Wolf predation plays a significant role in the population dynamics of moose, the primary ungulate species sought by subsistence hunters throughout the upper Kuskokwim drainage. As early as 1980 biologists recognized moose densities were low in the upper Kuskokwim drainage. At the time, the situation was characterized as a "predator problem." In 1989 a series of severe winters began. Four of 7 winters between 1989 and 1995 were "severe" with deep, persistent snow. In the early 1990s residents reported declining moose numbers and in 1994, with the aid of the Tanana Chiefs Conference, local residents met with officials from the Alaska Department of Fish and Game to discuss predator control options. Local residents favor wolf control programs designed to reduce wolf numbers and increase moose for subsistence use. The Board of Game adopted a wolf control program for Unit 19D East in 1995, but it has not yet been implemented.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size by humans and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times. Management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. Those goals are to:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of the uses, conservation, and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

The following objectives apply to the 1 July 1993–30 June 1996 reporting period.

- Manage to maintain a harvestable population of wolves capable of sustaining an annual harvest of at least 100 wolves, assuming no further restrictions in current harvest regulations and bag limits.

- In areas where wolf predation is thought to be significantly affecting ungulate populations through calf or adult mortality, attempt to redirect wolf harvest efforts and/or increase trapper/hunter effectiveness in those areas through trapper seminars.

- Continue to refine annual wolf population estimates in the area based on incidental sightings, hunter interviews, trapper questionnaires, and a thorough evaluation of sealing documents.

- Conduct wolf population surveys where needed to obtain statistically bounded estimates.

We are proposing modified objectives for the next reporting period to reflect increased efforts in public education and to reflect the Board of Game's adoption of a wolf predation control implementation plan that may remain in effect for up to 5 years beginning 1 July 1996.

- Conduct wolf predation control programs as directed by the commissioner and Board of Game.

- Provide for a sustained annual harvest rate of up to 30% from the combined wolf population of Units 19, 21A, and 21E, except where greater harvest rates are mandated by approved wolf predation control implementation plans.

- Provide trapper education programs to increase trapper skills, ethics, and regulatory compliance.

- Conduct an aerial survey of the wolf population in Unit 19D East during late winter of 1999.

- Cooperate with any ongoing wolf studies conducted by the US Fish and Wildlife Service.

- Continue to refine annual wolf population estimates in the area, based on incidental sightings, hunter interviews, trapper questionnaires, and evaluation of sealing documents.

- Monitor harvests through sealing records and trapper questionnaires.

- By March 1998 develop a proposal to conduct research on low-density wolf-prey population dynamics in Unit 19D East.

- Model the potential effects of wolf predation on prey populations in all subunits.

METHODS

We gathered harvest statistics largely from sealing documents, although we also used Fur Acquisition Reports and Fur Export Reports. Because most of the wolves harvested from western Interior Alaska are sold (versus used domestically for garments), I assume that >90% of the annual wolf harvest is reflected on sealing documents. In addition, conversations with many wolf hunters and trappers led to additional information on wolf pack sizes and territory boundaries. To arrive at annual wolf population estimates for subunits, we used a combination of information sources. Sealing documents, hunter/trapper interviews, and comparisons to known density areas (19D East) are used to estimate numbers.

Trapper questionnaires have been sent annually to >100 trappers and hunters in Units 19 and 21. Respondents to the questionnaires rated the current year's abundance in their respective areas as abundant, moderate, or low. These responses were assigned a numeric index value (high = 9, moderate = 5, and low = 1), and a mean index was obtained for each area. While this does not provide a density estimate for respective areas, yearly comparisons allow monitoring of perceived trends in the population.

Because of proposed intensive management of wolves in Unit 19D East, a 5000-mi^2 segment of the upper Kuskokwim River drainage was surveyed in spring 1995 and spring 1997. A Sample Unit Probability Estimator (SUPE) survey (Becker et al., in press) was conducted both years.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

According to respondents to the Unit 19 and 21 trapper questionnaire, wolf abundance increased during 1987–1996. From the 1987–1988 season to the 1991–1992 season, trappers considered wolf populations moderate. During the 1992–1993 through 1995–1996 seasons, wolf populations were considered high. According to the corresponding trend index, wolf populations have been increasing steadily during that same period.

Based on a SUPE aerial survey conducted in a 5000-mi^2 area in the upper Kuskokwim drainages within Unit 19D, the wolf population increased to a density of 9.5–15.9 wolves/1000 km^2 (90% CI) by spring 1995. That estimated density was higher than reported elsewhere in Alaska and northern Canada for wolf–moose–bear systems in which moose were the primary prey occurring at low densities (Gasaway et al. 1992). Using estimates of the relationship between prey biomass and wolf density (Messier 1995), we believe the observed moose density of 108–178 moose/1000 km^2 would support an expected wolf density of 2.6–4.4 wolves/1000 km^2 in the absence of alternate prey. The large discrepancy between the estimated and predicted wolf population indicated that a) the wolf population was poised for a significant decline and b) wolf predation could have a significant antiregulatory effect on the declining moose population. A possible explanation for the high-density wolf population in the presence of low-density prey is the moose population was in poor condition and highly vulnerable to wolf predation during the preceding severe winters. Wolves did not respond numerically to the declining moose population because the increased vulnerability of moose increased a predation rate (proportion of moose population killed by wolves per unit time) which allowed wolves to meet their nutritional needs for survival and reproduction despite a declining prey base. We hypothesized that wolves would eventually decline when moose vulnerability and availability declined.

During spring 1997 the upper Kuskokwim drainages were again surveyed using the SUPE aerial survey and wolf numbers were much lower than estimated in spring 1995. The 1997 estimate of 3.0 to 5.4 wolves/1000 km^2 represented a 67% decline in the wolf population within 2 years and was consistent with the prediction drawn from the prey biomass versus wolf density relationships seen in other parts of Alaska and North America (Fuller 1989) (i.e., 2.6 to 4.4 wolves/1000 km^2). Wolf population declines demonstrated in Unit 19D are apparently limited to that subunit. Based on analyses of trapper questionnaires, sealing certificates, and incidental observations, populations elsewhere in the management area remained stable or increased during recent years; however, no other population estimation surveys have been completed.

We estimated fall wolf populations in the area (Table 1) based on analyses of sealing documents, trapper questionnaires, and incidental observations throughout Units 19, 21A, and 21E, as well as data provided from the population estimation surveys in Unit 19D.

Population Composition

Other than sex ratios reported on sealing documents from the harvested segment of the population, no data were available concerning the sex composition of the Units 19, 21A, and 21E

wolf population. Those sex ratios in the harvest have not been significantly different from 1:1 during the past 5 years, and we suspect the population at large also contains nearly equal sex ratios. No information is available concerning age classes or ratios in the population.

Distribution and Movements

Wolves are present throughout Units 19, 21A, and 21E. The harvest is well distributed, as are wolf tracks and incidental sightings. Good habitat and potential ungulate prey are throughout the area.

MORTALITY

Harvest

Season and Bag Limit.

Unit/Bag Limit/Special Restrictions	Resident/Nonresident/Subsistence Open Seasons
Regulatory year 1993-1994	
Units 19, 21A, and 21E.	
Hunting: 5 wolves. No hunting wolves same day as airborne.	10 Aug–30 Apr
Trapping: No limit. No taking wolves same day as airborne.	1 Nov–31 Mar
Regulatory year 1994-1995	
Units 19, 21A, and 21E.	
Hunting: 5 wolves. No hunting wolves same day as airborne.	10 Aug–30 Apr
Trapping: No limit. Must be greater than 300 ft from aircraft on same day as airborne.	1 Nov–30 Apr
Regulatory year 1995-1996	
Units 19, 21A, and 21E.	
Hunting: 5 wolves. No hunting wolves same day as airborne.	10 Aug30 Apr
Trapping: No limit. Must be greater than 300 ft from aircraft on same day as airborne.	1 Nov–30 Apr

Board of Game Actions and Emergency Orders. Land-and-shoot hunting of wolves was the most common method used for wolf harvest within the management area between 1972 and 1992. During 1992 and 1993, the Board of Game prohibited the same-day-airborne hunting of wolves statewide. In 1994 the board adopted a "land and walk" regulation that allowed trappers to land an aircraft and take wolves by shooting if the trapper moved at least 300 ft from the aircraft. That regulation was in effect until February 1997 when all same-day-airborne shooting of wolves was prohibited, as a result of a ballot initiative.

However, trappers are not prohibited from checking lines and dispatching trapped or snared wolves on the same day they are airborne. This new regulation will reduce the wolf harvest in areas where aircraft land-and-shoot methods have been used in the past.

Hunter/Trapper Harvest. In Units 19, 21A, and 21E, 107 wolves were reported taken during the 1995 regulatory year, a harvest rate of approximately 7% (Tables 2, 3, and 4). Reported wolf harvests in the area during the 1994 regulatory year (223 wolves) constituted the highest harvest recorded during the past 10 years and probably reflected the higher wolf populations as well as increased effort by ground-based trappers. The number of wolves taken by trapping or snaring during 1994 (83) was the highest on record, more than doubling the previous high (38 trapped snared wolves in 1989) by those methods. We anticipate the number of wolves taken by trapping and snaring to continue to increase, as hunters and trappers adapt to the new regulations prohibiting same-day-airborne shooting.

Hunter Residency and Success. Local trappers and hunters take most of the annual harvest of wolves in the area. Hunters/trappers using airplanes for access typically traveled from the south side of the Alaska Range to take wolves in Units 19 and 21 in past years, but because of the aircraft-use restrictions in effect, this transportation mode and method of hunting will cease. We suspect an increasing proportion of the annual wolf harvest will come from local hunters and trappers. Hunters take a negligible proportion of wolves in August and September incidental to hunting other big game species (Table 3). Nonresidents take most of the wolves during the autumn months.

Success rates by wolf hunters/trappers are difficult to determine. One indicator may be the mean number of wolves taken per successful hunter/trapper (Table 2). This number varies annually and shows no clear trend in mean success rates.

Harvest Chronology. Most reported wolf harvest occurs during February and March (Table 3). March continues to be the month with highest wolf harvests, probably due to access and weather constraints during other times of the year. Increased day length in March, coupled with adequate snow cover to allow tracking wolf packs and subsequent landing of aircraft or overland transport by snowmachine combine to facilitate the greater harvests during that month. However, with current restrictions on the use of aircraft, we anticipate future harvests will become more equally distributed throughout the winter.

Transport and Harvest Methods. Although past reported wolf harvests were predominantly facilitated with aircraft as the primary transportation method, this will rapidly change. Snowmachine access will probably increase in proportion to aircraft use. However, trappers in Units 19B, 19C, 21A, and 21E will continue to use aircraft to access their traplines. Snares and traps will become increasingly important tools in maintaining harvests of wolves.

Other Mortality

With the exception of intrauterine, neonatal, or summer pup mortality, we believe that natural mortality of nondispersing wolves is relatively low. Natural mortality of dispersing subadult wolves may be high if dispersal occurs during periods of prey scarcity. During winter 1995–1996, we are aware of 2 instances where adult wolves were severely injured by moose. In both instances

the wolves apparently survived the encounters but were severely injured with broken ribs and legs. Both wolves were subsequently snared, so the extent of the injuries was easily documented. Although these types of injuries probably occur from time to time, the relative occurrence probably increases during winters when prey is relatively difficult to find or to catch. The winter of 1995–1996, in most of Unit 19D, was such a winter. Snow levels and moose densities were relatively low, making predation difficult.

Habitat

Prey populations are adequate to sustain existing low-density wolf populations. In the presence of low-density moose populations, wolves are expected to exhibit low reproductive success and high dispersal rates. To maintain wolf populations, adequate prey populations must be maintained.

Nonregulatory Management Problems/Needs

Management decisions concerning Alaska's wildlife populations are guided by a diverse set of resource values. For example, proposed wolf control programs in Unit 19 designed to increase moose numbers for human subsistence harvest have almost unanimous support from local rural residents but are opposed by a large segment of the Alaskan urban population. To implement more widely acceptable wildlife management programs, each interest/user group must accept the validity of the needs and values expressed by different social and economic segments of Alaskan society.

CONCLUSIONS AND RECOMMENDATIONS

In the absence of same-day-airborne hunting and trapping of wolves, wolf harvests are expected to be lower than those of the 1985–1995 period. Increased trapping effort may stabilize wolf harvests over time, but wolf harvests are not expected to regulate wolf population growth. Wolf populations will be naturally regulated by availability of their ungulate prey. Periodic severe weather events will cause fluctuations of both moose and wolf populations, but overall densities for both wolf and moose populations are expected to remain at or below their current level.

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Table 1 Units 19, 21A, and 21E autumn wolf population estimates[a], 1985–1996

Year	Population estimate	Number of packs	$\bar{x}$ wolves/pack
1985-1986	660-780	110-129	5.4
1986-1987	670-780	107-136	5.4
1987-1988	665-770	76-95	7.6
1988-1989	710-815	72-88	8.6
1989-1990	720-940	72-91	9.2
1990-1991	720-940	72-91	9.2
1991-1992	720-940	72-91	9.2
1992-1993	750-950	71-92	9.4
1993-1994	970-1000	72-90	10.0
1994-1995	1568-1768	170-200	8.9
1995-1996	1200-1768	170-200	8.9
1996-1997	1200-1300	150-170	7.7

[a] Fall estimate = pretrapping season population based on population surveys, incidental observations, reports from public, sealing records, and trapper questionnaires.

Table 2 Sex composition, method of take, and per trapper catch for Units 19, 21A, and 21E wolf harvests, 1985–1995

Regulatory year	Reported harvest				Method of take			$\bar{x}$ wolves/ trapper
	M	F	Unk	Total	Trap	Shot	Unk	
1985-1986	26	29	0	55	24	31	0	2.2
1986-1987	50	38	4	92	24	68	0	4.2
1987-1988	110	92	5	207	27	178	2	3.8
1988-1989	82	61	38	181	14	167	0	3.6
1989-1990	108	89	11	208	38	169	0	3.4
1990-1991	98	89	2	189	11	178	0	3.1
1991-1992	57	59	14	130	23	107	0	2.4
1992-1993	21	14	13	48	24	22	2	1.9
1993-1994	41	41	2	84	36	44	4	2.2
1994-1995	115	86	22	223	83	137	3	2.7
1995-1996	68	38	1	107	29	77	1	2.9

Table 3 Unit 19, 21A, and 21E wolf harvest chronology, 1985–1995

Year	Harvest period										Total harvest
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	
1985-1986	0	2	0	2	11	14	21	5	0	0	55
1986-1987	0	1	0	8	5	5	38	34	1	0	92
1987-1988	1	5	0	4	27	27	51	92	18	0	207
1988-1989	2	3	1	5	16	16	12	121	2	12	181
1989-1990	1	8	0	7	30	30	25	111	3	0	208
1990-1991	0	5	1	1	25	25	37	112	0	0	189
1991-1992	0	2	0	1	19	19	37	55	0	1	130
1992-1993	1	5	0	4	2	2	12	22	1	0	48
1993-1994	2	6	0	4	8	17	13	31	0	3	84
1994-1995	3	12	2	4	31	39	57	59	16	0	223
1995-1996	0	1	1	4	2	14	23	53	9	0	107

Table 4 Units 19, 21A, and 21E wolf harvest by subunit, 1985–1995

Year	Unit 19						Unit 21			Total
	A	B	C	D	Z	Subtotal	A	E	Subtotal	
1985-1986	2	2	5	31	0	40	12	3	15	55
1986-1987	8	16	22	29	0	75	17	0	17	92
1987-1988	60	52	12	14	4	142	34	31	65	207
1988-1989	6	32	40	32	0	110	31	40	71	181
1989-1990	28	46	41	22	0	137	66	5	71	208
1990-1991	41	11	45	31	0	128	34	27	61	189
1991-1992	19	22	50	20	0	111	7	12	19	130
1992-1993	15	7	10	3	0	35	8	5	13	48
1993-1994	5	19	33	19	0	76	5	3	8	84
1994-1995	44	41	54	33	0	172	8	43	51	223
1995-1996	19	27	19	16	0	81	4	22	26	107
5-Yr $\bar{x}$	20	23	33	18	0	95	6	17	23	118

LOCATION

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

GEOGRAPHIC DESCRIPTION: Lower Tanana Valley, Central Yukon Valley

BACKGROUND

Wolf population size and harvest vary substantially both spatially and temporally within this study area. These fluctuations primarily result from variation in prey availability, wolf control programs, and harvest.

Human consumptive use of caribou, moose, and sheep dominates interest in wildlife within this study area, partly because of its proximity to Fairbanks, the second largest concentration of people in the state. During the last 20 years, the department conducted wolf predation control programs in Unit 20A (autumn 1975–spring 1982 and Oct 1993–Nov 1994) and 20B (autumn 1979–spring 1986) to increase moose and caribou populations. The caribou population declined from 10,700 to 3600 due to unfavorable weather and predation. This decline precipitated the most recent wolf predation control program implemented in 1993. The program was suspended prematurely in 1994.

Because of the interest in consumptive use, ADF&G staff continue intensive investigations on predator–prey relationships, especially in Unit 20A (Gasaway et al. 1983; Boertje et al. 1996) In addition, within Denali National Park and Preserve (DNP&P) in adjacent Unit 20C, an 11-year wolf study continues because of interest in the animal as predator, wilderness symbol, and fundamental component of a naturally regulated system (Adams et al. 1995; Mech et al. 1995; Meier et al. 1995).

Besides the attention the wolf receives as a limiting factor and wilderness symbol, trappers within the study area continue the long tradition of harvesting this economically and culturally significant renewable resource.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The department will manage wolf populations to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. We recognize the aesthetic value of observing wolves in their natural environment as an important human use of wolves.

We also recognize that integral to wolf management is the premise that wolf populations are renewable resources that can be harvested and manipulated to enhance human uses of other resources. Management may include both the manipulation of wolf population size and total protection of wolves from human influence.

MANAGEMENT OBJECTIVES

During this reporting period the management objectives changed. Refer to the wolf performance reports for the chronology of changes in objectives. A composite of all objectives during this period includes the following:

- To estimate wolf population size and harvest from aerial surveys in Units 20A and 20B by 1996. Specifically, conduct a survey unit probability estimate for the Tanana Flats portion of Unit 20A and a track intercept probability estimate for Unit 20B.
- Conduct aerial surveys in Units 20C, 20F, and 25C by spring 1998.
- Model the potential range of effects wolf predation has on ungulates in each subunit by 1993.
- Solicit public input regarding prey population and harvest objectives before the spring 1995 Board of Game meeting. Determine what wolf population levels can be supported with these objectives.
- Determine wolf population and harvest objectives that will reasonably meet public needs for consumptive and nonconsumptive uses of wolves and their prey in all subunits of the study area by 1993.
- Implement policies and programs for wolf management as directed by the Board of Game.
- Initiate a calf mortality study of moose and/or caribou by 1996.
- Monitor harvest through sealing certificates.

METHODS

POPULATION SIZE

During this reporting period we conducted intensive wolf population surveys in Unit 20A. We conducted aerial surveys in Unit 20A throughout winter 1993–1994 in conjunction with the wolf control program. We also flew a survey on the Tanana Flats portion in early winter 1994. We conducted a survey of Unit 20A in spring 1996 using a combination of radiocollared wolves in the foothills and a survey unit probability estimate (SUPE) in the flats. In other years we used radiocollars in the foothills and aerial surveys and miscellaneous wolf observations on the flats. This work was conducted as part of ongoing wolf research in the unit.

We collected miscellaneous observations and reports for all areas. We also collected additional information for Unit 20B while conducting lynx/hare surveys, moose surveys, and other reconnaissance flights. However, extrapolations from earlier or adjacent surveys provide the primary basis for estimates in areas other than Unit 20A. We used data from radiotelemetry surveys in Denali National Park to estimate wolf numbers in Unit 20C. However, the area within the park provides the best habitat and the least hunting and trapping effort, so the information is of limited usefulness when evaluating harvest.

HARVEST

We used wolf sealing certificate data to determine annual harvests.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

In early winter 1993 we estimated 750 to 1070 wolves in 85 to 144 packs for the entire study area. In early winter 1994, we estimated 660 to 975 wolves in 90 to 145 packs. In early winter 1995, we estimated 630 to 885 wolves in 90 to 140 packs. While these totals for the study area vary, they only reflect new information for Units 20A and 20C (Table 1). The ranges represent the combined subjective minimum and maximum estimates for each area.

We attempted to obtain a SUPE estimate for wolves inhabiting the flats portion of Unit 20A on 22–23 February 1996. We received up to 2 ft of snow and, approximately 48 hours later, began the survey. While tracking conditions and pilot skills were excellent, we only located 3 packs. Incidental wolf observations indicated at least 6 packs inhabited the survey area. Likewise, the incidental wolf observations also indicated the presence of substantially more wolves than the 17.3 ($s_{\bar{x}} = 2.3$) provided by the SUPE. In support of this discrepancy, a minimum of 52 wolves in 2 radiocollared packs inhabited less than a third of survey area in October 1996. Perhaps the rather severe snowfall temporarily restricted travel. If so, although we sampled 58 of 149 survey units, the sampling intensity may have been inadequate. Alternatively, a couple of packs may have simply been outside the survey area. We remain uncertain as to why the technique performed poorly. We discarded these results in favor of more subjective, but in our view, more credible, incidental observations.

Researchers in Denali National Park and Preserve documented declining wolf population in southern Unit 20C by 1994. Declines in 1995 estimates reflect that observation.

MORTALITY

Harvest

Season and Bag Limit. Smith (1994) summarized the history of regulations pertaining to same-day-airborne and land-and-shoot taking of wolves in Alaska. The hunting and trapping regulations for Units 20 and 25C during this reporting period were as follows:

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Units 20A, 20B, 20C, 20F, and 25C		
Regulatory year 1993-1994		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Trapping: No limit. No shooting of wolves same day airborne, except a wolf may be shot in a trap or snare.	1 Nov–31 Mar	1 Nov–31 Mar
Regulatory year 1994-1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is more than 300 ft from airplane.	1 Nov–30 Apr	1 Nov–30 Apr
Regulatory year 1995-1996		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug-30 Apr	10 Aug-30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is more than 300 ft from airplane.	1 Nov-30 Apr	1 Nov-30 Apr

Board of Game Actions and Emergency Orders. The board discussed and approved a ground-based, 3-year wolf control program in Unit 20A, excluding military land and a strip adjacent to Denali National Park. The program began in October 1993 with 2 objectives:

- Reverse the decline of the Delta Caribou Herd and increase the midsummer population to 6000–8000 caribou, with a sustainable annual harvest of 300–500 caribou.

- Determine whether or not ground-based control methods can effectively reduce wolf numbers temporarily to reverse declines in prey populations.

ADF&G staff shot and snared 98 and 36 wolves during the 1993 and 1994 regulatory years, respectively (Table 2). The project was suspended amid controversy in December 1994.

Hunter/Trapper Harvest. Excluding wolves killed in the Unit 20A wolf control program, area-wide harvest increased from 1989 through 1993. Harvests then declined in 1994 and 1995 to near 1989 levels. This pattern tracks unexploited wolf population estimates from Denali National Park rather well (L Adams, pers commun). Researchers in the park attributed the increase in wolf numbers to increases in prey vulnerability, especially caribou, due to severe winters. Since weather trends were similar throughout all subunits, the pattern indicates that wolf numbers increased throughout the area. Further, one could speculate that wolf numbers declined

moderately during the last 2 years, but we recognize that varying trapping conditions and, therefore, effort and success, confound such speculation.

Harvest Chronology. Midwinter trapping continued to provide most of the harvest (Table 3). The month of April accounted for about 1% (5 of 458) of wolves taken by the public during 1993–1995 regulatory years.

Method of Take and Transport Methods. Trapping and snaring continued as the leading method of take (Table 2). Airplanes and snowmachines continued to be the most popular types of transportation (Table 4). The data indicates a decline in the use of airplanes that probably reflects recent changes in same-day-airborne regulations.

CONCLUSIONS AND RECOMMENDATIONS

We made progress on all objectives except conducting aerial surveys in Units 20C, 20F, and 25C by 1998. In addition, we did not conduct a TIPE estimate in 20B but collected significant information during other surveys. I recommend the following objectives:

- Monitor harvest through sealing certificates.
- Conduct aerial surveys in Units 20B, 20C, 20F, and 25C.
- Monitor the wolf population in Unit 20A by maintaining radio collars in wolf packs, including packs inhabiting the flats.
- Assist wolf research efforts in Unit 20A.

Wolf research in Unit 20A should be recognized as important to intensive management statewide. We do not know whether the wolf population will reach the theoretical density that the number of prey can support. If the wolf population does reach its potential, the current success in moose management will be short-lived. To date, we have not reaped the benefits of the moose population growth because the public desires higher moose densities, or fears that predation and cow harvests will cause a moose population decline. Those concerns are understandable given the history of the effects of predation and cow harvests in Unit 20A during the 1970s (Gasaway et al. 1983). To gain public support for more aggressive harvest of enhanced moose populations, we need a clear strategy for management of enhanced predator–prey systems. Forming a viable management strategy hinges on a thorough understanding of wolf predation, weather, and competition for food among moose.

If the wolf population does not reach its potential, we can continue to recommend increased ungulate harvests. However, in that scenario we still need to determine what factors regulated the wolf population in order to maintain that regulation. In regulatory year 1995 hunters and trappers harvested an estimated 30% of the autumn 1995 wolf population of Unit 20A. So, harvest could potentially regulate the wolf population at a level that allows high moose harvests. Alternatively, social or complex food-related factors may result in regulation of the wolf population. The theoretical wolf densities expected from the current prey biomass have not been observed in the

Interior. Further, wolf harvest intensity may influence the operation of such density-dependent factors. Similar questions apply to wolf–caribou relationships (Dale 1997).

In the near term, I recommend maintaining current Unit 20A seasons and bag limits to evaluate harvest trends under current regulations and trapping effort. Similarly, there seems little need to recommend changes for other units. We receive numerous comments regarding the April trapping/hunting season. Concerns over fur quality and the pregnancy status of adult females will probably continue to generate proposals. Because trappers take so few wolves in April, little biological rationale exists for or against April seasons.

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Table 1 Fall wolf population estimates for Units 20A, 20B, 20C, 20F, and 25C, 1985–1995

Unit	Year	Population estimate[a]	Packs (nr)	Basis of estimate
20A	1985	195	26	Aerial survey, trapper interviews
	1986	220-240	25-30	Extrapolation from previous year
	1987	200-230	25-30	Extrapolation from previous year
	1988	183	21	Aerial survey, trapper reports, radiocollars
	1989	180-220	20-25	Extrapolation from previous year
	1990			
	1991	267	24-34	Aerial survey, trapper reports
	1992	220-295	25-35	Extrapolation from previous year
	1993	250-275	30-34	Radiotelemetry, aerial surveys
	1994	160-180	25-35	Radiotelemetry, aerial surveys
	1995	180-210	25-35	Radiotelemetry, aerial surveys
20B	1985	168	25	Aerial survey, radiocollars
	1986	140-180	21-27	Extrapolation from previous year
	1987	140-180	21-27	Extrapolation from previous year
	1988	140-180	21-27	Extrapolation from previous year
	1989	150-225	20-25	Extrapolation from previous year
	1990	222		Aerial survey of 20B West, extrapolation
	1991			
	1992	150-225	20-30	Extrapolation
	1993	150-225	20-30	1992 extrapolation
	1994	150-225	20-30	1992 extrapolation
	1995	150-225	20-30	1992 extrapolation
20C	1985	120-140	20-25	Density extrapolation from 20B
	1986	120-140	20-25	National Park Service study and extrapolation
	1987	100-120	20-25	National Park Service study and extrapolation
	1988	180-220	20-25	National Park Service study and extrapolation
	1989	175-225	20-25	National Park Service study and extrapolation
	1990	320		
	1991			

Table 1 Continued

Unit	Year	Population estimate[a]	Packs (nr)	Basis of estimate
	1992	200-320	25-40	National Park Service study and extrapolation
	1993	200-320	25-40	Denali National Park data and extrapolation
	1994	200-320	25-40	Denali National Park data and extrapolation
	1995	150-200	25-35	Denali National Park data and extrapolation
20F	1985	60-100	10-15	Density extrapolation from 20B
	1986	60-100	10-15	Density extrapolation from 20B
	1987	60-100	10-15	Density extrapolation from 20B
	1988	80-120	15-30	Density extrapolation from 20C
	1989	75-110	15-30	Density extrapolation from 20C
	1990	130		Density extrapolation from 20B
	1991			
	1992	75-125	10-20	
	1993	75-125	10-20	1992 extrapolation
	1994	75-125	10-20	1992 extrapolation
	1995	75-125	10-20	1992 extrapolation
25C	1985			
	1986	50-60	8-10	Density extrapolation from 20B
	1987	50-60	8-10	Density extrapolation from 20C
	1988	60-100	15-30	Density extrapolation from 20C
	1989	75-110	15-30	Density extrapolation from 20C
	1990	107		Density extrapolation from 20B
	1991			
	1992	75-125	10-20	Density extrapolation
	1993	75-125	10-20	1992 extrapolation
	1994	75-125	10-20	1992 extrapolation
	1995	75-125	10-20	1992 extrapolation

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

Table 2 Wolf harvest in Units 20A, 20B, 20C, 20F, and 25C, 1985–1995

Unit	Regulatory year	Reported harvest				Method of take			
		M	F	Unk	Total	Trap/ Snare	Shot	Unk/ Other	Wolf control
20A	1985				24	17	7	0	0
	1986				37	33	3	1	0
	1987	19	13	4	36	30	5	1	0
	1988	17	11	4	32	23	9	0	0
	1989	20	10	1	31	21	9	1	0
	1990	31	20	5	56[a]	10	44	2	0
	1991	35	28	4	67	43	24	0	0
	1992	30	25	2	57	49	6	2	0
	1993	66	83	11	160[b]	47	11	4	98
	1994	34	29	3	66[b]	25	4	1	36
	1995	37	21	1	59	52	5	2	0
20B	1985				57	20	5	0	32
	1986				6	5	1	0	0
	1987	8	10	0	18	17	1	0	0
	1988	20	13	1	34	31	3	0	0
	1989	18	16	1	35	28	6	1	0
	1990	5	6	0	11	8	3	0	0
	1991	25	23	8	56	41	13	2	0
	1992	27	17	3	47	38	9	0	0
	1993	48	53	2	103	90	7	2	0
	1994	27	21	2	50	33	17	0	0
	1995	19	25	1	45	36	9	0	0
20C	1985				8	6	0	0	0
	1986				4	1	2	0	0
	1987	7	5	1	13	8	3	2	0
	1988	5	4	0	9	8	1	0	0
	1989	8	8	1	17	11	5	1	0
	1990	21	22	3	46	18	25	3	0
	1991	16	5	0	21	13	8	0	0
	1992	11	5	1	17	12	4	1[a]	0
	1993	13	14	2	29	33	3	0	0
	1994	8	3	0	11	10	2	0	0
	1995	4	3	1	8	7	1	0	0
20F	1985				2	2	0	0	0
	1986				2	2	0	0	0
	1987	1	1	3	5	1	4	0	0
	1988	2	3	0	5	5	0	0	0
	1989	10	2	2	14	11	2	1	0

Table 2 Continued

Unit	Regulatory year	Reported harvest M	F	Unk	Total	Method of take Trap/ Snare	Shot	Unk/ Other	Wolf control
	1990	2	5	0	7	6	0	1	0
	1991	4	6	0	10	7	2	1	0
	1992	0	2	0	2	1	1	0	0
	1993	7	3	0	10	11	3	0	0
	1994	2	5	0	7	2	5	0	0
	1995	0	1	0	1	0	1	0	0
25C	1985				2	2	0	0	0
	1986				2	0	1	1	0
	1987	5	5	0	10	10	0	0	0
	1988	2	1	0	3	0	3	0	0
	1989	3	4	0	7	0	7	0	0
	1990	8	4	0	12	1	10	1	0
	1991	2	5	0	7	3	4	0	0
	1992	18	9	1	28	27	1	0	0
	1993	10	9	0	19	16	3	0	0
	1994	10	3		13	10	3	0	0
	1995	7	2	1	10	8	1	1	0
Combined	1985				93				
	1986				51				
	1987				82				
	1988				83				
	1989				104				
	1990				132				
	1991				161				
	1992				151				
	1993				321				
	1994				148				
	1995				123				

[a] One killed by other wolves.

[b] Includes wolf control removal.

Table 3 Wolf harvest chronology, Units 20A, 20B, 20C, 20F, and 25C, regulatory years 1985-1995

Unit	Regulatory year	Harvest periods			*n*
		Aug–Oct	Nov–Jan	Feb–Apr	
20A	1985	2	11	11	24
	1986	0	24	9	33
	1987	3	22	11	36
	1988	4	11	17	32
	1989	8	13	10	31
	1990	5	27	24	56
	1991	7	36	24	67
	1992	4	31	22	57
	1993	15	91	37	143[a]
	1994	5	52	7	64[a]
	1995	4	38	15	57
20B	1985	1	9	15	25
	1986	0	5	1	6
	1987	0	9	9	18
	1988	2	27	5	34
	1989	4	18	13	35
	1990	1	7	3	11
	1991	7	25	24	56
	1992	6	26	15	47
	1993	2	60	39	101
	1994	10	26	13	49
	1995	4	29	11	44
20C	1985	0	3	3	6
	1986	0	3	0	3
	1987	2	8	2	12
	1988	1	10	0	11
	1989	0	8	9	17
	1990	2	19	25	46
	1991	0	12	9	21
	1992	0	7	10	17
	1993	1	12	16	29
	1994	2	4	5	11
	1995	1	1	5	7
20F	1985	0	1	1	2
	1986	0	1	1	2
	1987	0	2	3	5
	1988	0	1	3	4
	1989	2	5	7	14

Table 3 Continued

Unit	Regulatory year	Harvest periods			*n*
		Aug–Oct	Nov–Jan	Feb–Apr	
	1990	0	4	3	7
	1991	0	6	5	11
	1992	0	1	1	2
	1993	1	6	3	10
	1994	0	1	6	7
	1995	1	0	0	1
25C	1985	0	1	1	2
	1986	0	0	1	1
	1987	0	9	1	10
	1988	0	1	2	3
	1989	2	0	5	7
	1990	3	6	3	12
	1991	0	1	6	7
	1992	1	10	17	28
	1993	2	7	10	19
	1994	1	7	5	13
	1995	0	5	5	10
3-year total (1993-1995)		49 (10%)	339 (67%)	118 (23%)	

[a] Includes wolf control removal.

Table 4 Wolf harvest by transport method Units 20A, 20B, 20C, 20F, and 25C, regulatory years 1985–1995

Unit	Regulatory year	Method of transportation: Airplane	Dogsled, skis, snowshoes	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Horse	Unk	*n*
20A	1985	7	8	0	0	5	0	0	0	4	24
	1986	5	0	0	2	28	0	0	0	0	35[a]
	1987	9	1	0	1	24	0	1	0	0	36
	1988	14	0	0	0	17	1	0	0	0	32
	1989	4	0	0	1	17	0	3	1	5	31
	1990	42	1	0	1	10	0	1	0	1	56
	1991	25	2	0	2	34	1	2	0	1	67
	1992	21	3	0	0	30	0	0	0	2	56
	1993	16	0	0	1	37	0	0	0	6	62[d]
	1994	5	2	0	0	21	0	2	0	0	30[e]
	1995	5	4	0	0	46	0	2	0	2	59
20B	1985	5	1	0	0	14	0	2	0	3	25[b]
	1986	2	0	0	0	4	0	0	0	0	6
	1987	2	0	0	0	16	0	0	0	0	18
	1988	5	0	1	1	26	0	1	0	0	34
	1989	9	0	1	0	15	1	5	4	0	35
	1990	2	2	0	1	6	0	0	0	0	11
	1991	10	1	1	1	34	1	4	0	3	55
	1992	6	1	1	0	34	1	3	0	1	47
	1993	4	2	0	1	81	0	4	0	11	103
	1994	8	0	1	1	32	0	7	0	1	50
	1995	1	2	1	1	37	0	1	0	1	45
20C	1985	0	3	0	0	2	0	1	0	0	6
	1986	0	2	0	0	1	0	0	0	0	3[c]
	1987	3	0	0	3	5	0	1	0	1	13
	1988	3	0	1	2	2	0	1	0	0	9[c]
	1989	9	0	0	0	7	0	0	1	0	17
	1990	22	10	0	0	5	0	3	0	6	46
	1991	7	2	0	0	12	0	0	0	0	21
	1992	1	4	0	0	10	0	0	0	0	15
	1993	12	4	0	0	12	0	1	0	0	29
	1994	3	3	1	0	3	0	1	0	0	11

Table 4 Continued

Unit	Regulatory year	Method of transportation: Airplane	Dogsled, skis, snowshoes	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Horse	Unk	*n*
	1995	0	0	0	1	6	0	0	0	0	7
20F	1985	0	0	0	0	0	0	0	0	0	0
	1986	0	2	0	0	0	0	0	0	0	2
	1987	3	1	0	0	1	0	0	0	0	5
	1988	0	0	0	0	4	0	1	0	0	5
	1989	0	0	2	0	7	0	0	5	0	14
	1990	0	2	0	0	5	0	0	0	0	7
	1991	0	0	0	0	8	0	2	0	0	10
	1992	0	0	0	0	1	0	1	0	0	2
	1993	1	1	1	1	6	0	0	0	0	10
	1994	5	1	0	0	1	0	0	0	0	7
	1995	0	0	0	1	0	0	0	0	0	1
25C	1985	0	1	0	0	0	0	0	0	1	2
	1986	0	0	0	0	0	0	1	0	0	1
	1987	0	4	0	0	6	0	0	0	0	10
	1988	2	1	0	0	0	0	0	0	0	3
	1989	5	0	0	2	0	0	0	0	0	7
	1990	5	1	0	1	1	1	2	0	1	12
	1991	4	0	0	0	2	0	1	0	0	7
	1992	13	0	0	0	15	0	0	0	0	28
	1993	10	0	0	1	4	1	3	0	0	19
	1994	0	0	1	0	11	0	1	0	0	13
	1995	1	0	0	0	8	0	0	0	1	10

[a] Excludes 1 Denali National Park wolf.
[b] Excludes 28 wolves taken by ADF&G.
[c] Excludes 2 Denali National Park wolves.
[d] Excludes 98 wolves taken by ADF&G.
[e] Excludes 36 wolves taken by ADF&G.

LOCATION

GAME MANAGEMENT UNIT: 20D (5637 mi^2)

GEOGRAPHIC DESCRIPTION: Central Tanana Valley near Delta Junction

BACKGROUND

Wolves are present throughout Unit 20D where their primary prey species are moose, caribou, and Dall sheep. Wolf and prey numbers were high in Unit 20D during the 1960s. The wolf population was estimated at 200 to 250 at that time (14.8 to 18.6 wolves/1000 km^2). Moose populations began to decline in the mid-1960s and a wolf reduction program was authorized in 1979 to increase moose numbers (ADF&G 1984). This program included issuing aerial shooting permits to the public. From fall 1979 to spring 1983, 105 wolves were removed from Unit 20D by trappers, ADF&G staff, and hunters with permits for aerial shooting. Most wolves were taken in southern and eastern Unit 20D (ADF&G 1983). Since the wolf reduction program ended in spring 1983, all wolf harvest in Unit 20D has been by hunting or trapping. This report covers population and harvest data for regulatory years 1993, 1994, and 1995.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. Those goals are listed:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of the uses, conservation and

management of wolves, their prey and habitat in Alaska.

MANAGEMENT OBJECTIVES

The following objectives apply to the 1 July 1993-30 June 1996 reporting period:

Determine distribution, abundance, predation rates, and population trends in selected areas.

- Seal hides taken by hunters and trappers; interview hunters and trappers to assess relative abundance of wolves.
- Conduct fixed-wing aerial surveys during the winter in selected areas.
- Radiocollar and monitor selected packs.

In addition to the above objectives, I am proposing additional objectives to reflect increased efforts in public education and the Board of Game's adoption of a wolf control implementation plan effective 1 July 1997.

- Conduct wolf predation control reduction programs as directed by the commissioner and the Board of Game.
- Manage harvests to maintain a population of between 15 and 125 wolves, the population objective set by the Board of Game.
- Provide trapper education programs to improve trapper skills, ethics, and regulatory compliance.
- Model the potential effects of wolf predation on ungulates within Unit 20D.

METHODS

Population estimates were made with aerial surveys, by interviewing local trappers, hunters, and pilots, and from pack size information on fur sealing certificates. We conducted aerial surveys by flying major rivers, creeks, exposed ridges, and other locations and searching for wolf tracks. When tracks were located, we determined the number of wolves and their direction of travel. We recorded data on topographic maps. We also collected information from interviews with local pilots, hunters, and trappers to determine spring pack size at the end of trapping and hunting seasons. Wolves harvested during the winter were added to spring pack size to estimate fall pack size prior to hunting and trapping season. The total number of wolves estimated in the subunit was increased by an additional 10% to adjust for lone wolves. Wolves harvested by trappers and hunters were sealed to monitor harvest. Information recorded for each wolf included date of kill, name of trapper or hunter, location of kill, method of take and transportation, sex of the wolf, color of the pelt, and the number of other wolves thought to be in the pack.

To radiocollar wolves for a Fortymile caribou herd predator–prey research project, we used a

fixed-wing aircraft to locate packs and a Robinson R-22 helicopter to dart wolves, using. 667 mg of Telazol® (tiletamine HCL and zolazepam HCL, Fort Dodge Lab, Fort Dodge, Iowa, USA) and 1 cc of propylene glycol to prevent the Telazol® from freezing.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolf population estimates for fall 1994 and 1995 were higher than the previous 3 years (Table 1). However, this increase was primarily due to the inclusion of 1 pack in 1994 and 2 packs in 1995 that were not full-time residents in Unit 20D. Unit 20D population estimates are conservative because, with the exception of packs noted below, population estimates include only those packs that are full-time residents in Unit 20D. Therefore, packs whose territories are predominantly in other game management units are not included in the Unit 20D population estimate unless noted, even though some wolves harvested in Unit 20D may come from those packs.

The fall 1993 wolf population was estimated to be 70–73 wolves in 10 packs (Table 1). The fall 1994 wolf population was estimated to be 90–97 wolves in 12 packs. The 1994 estimate includes the 100-mile Creek pack that overlaps from Unit 20A. The 100-mile Creek pack was included because they were observed in western Unit 20D several times during winter 1994–1995, and several 100-mile Creek wolves were caught in Unit 20D.

The fall 1995 wolf population was estimated to be 116–128 wolves in 13–14 packs (Table 1). This estimate also includes the 100-mile creek pack overlapping from Unit 20A and a new pack in northern Unit 20D reported by a local trapper. The new Unit 20D pack moved into the northern portion of the Goodpaster River in response to the Fortymile caribou herd moving into the area. The trapper caught several wolves from this pack.

Unit 20D has an estimated 13,472 km^2 (5200 mi^2) of wolf habitat. Fall wolf density estimates were 5.8–6.2 wolves/1000 km^2 in 1993, 6.7–7.2 wolves/1000 km^2 in 1994, and 8.6–9.5 wolves/1000 km^2 in 1995. Again, the increasing densities primarily reflect the inclusion of boundary packs that have periodically ranged into Unit 20D during the last 2 years.

Distribution and Movements

Table 2 lists wolves radiocollared in Unit 20D during this reporting period and their status. We radiocollared wolves for a Fortymile caribou herd predator–prey research project. Movement data for these wolves will be analyzed for the research project.

MORTALITY

Harvest

The following seasons and bag limits were in effect for wolves in Unit 20D during this reporting period.

Season and Bag Limit.

Unit/Bag Limit/ Special Restrictions	Resident and Subsistence Open Seasons	Nonresident Open Season
Unit 20D		
Regulatory year 1993-1994		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. No same-day-airborne shooting of wolves, except wolves caught in a trap or snare.	1 Nov–30 Apr	1 Nov–30 Apr
Regulatory year 1994-1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 ft from airplane. No trapping with a steel trap or with a snare smaller than 3/32 inch in diameter during April or October.	1 Nov–30 Apr	1 Nov–30 Apr
Regulatory year 1995-1996		
Hunting: 5 wolves. No wolf hunting same-day-airborne.	10 Aug-30 Apr	10 Aug-30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 feet from airplane. No trapping with a steel trap or with a snare smaller than 3/32 inch in diameter during April or October.	15 Oct-30 Apr	15 Oct-30 Apr

Board of Game Actions and Emergency Orders. In July 1994 the Alaska Legislature enacted HCS CSSB 77 (SB77) which stated, in part, that the Alaska Board of Game shall adopt regulations to

provide for intensive management programs to achieve human consumptive use goals established by the Board of Game for wildlife populations. As a result, the board solicited public input through local fish and game advisory committees on implementation of SB77. Based on the Board of Game's request, the Delta Fish and Game Advisory Committee submitted a proposal for intensive management in Unit 20D.

In December 1994 the Board of Game determined that Unit 20D had a long history and importance of hunting and found that human consumption of moose and caribou is the preferred use of these species in Unit 20D.

The Board of Game established a population goal of 15 to 125 wolves in March 1995, after finding that Unit 20D caribou and moose populations were low. This broad range was necessary to allow temporary reduction of the wolf population to low levels, if needed, to stimulate prey population increases. The Board of Game also extended the wolf trapping season and requested the department prepare an implementation plan for wolf control.

The Board of Game adopted a wolf predation control implementation plan (5 AAC 92.110) for Unit 20D in October 1995.

Hunter/Trapper Harvest. Hunters and trappers reported taking 48, 25, and 41 wolves during regulatory years 1993, 1994, and 1995, respectively. The mean annual harvest of 38 wolves for this reporting period (1993-1995) was higher than any single annual harvest since wolf control ended in 1983 (Table 3). Increased harvest resulted from renewed interest in wolf trapping by local trappers, and in 1995-1996, from a privately sponsored wolf harvest incentive program within the calving grounds of the Fortymile Caribou Herd in northern Unit 20D. That program was referred to as the Fortymile Caribou Calf Protection Program. During the 1993-1994 to 1994-1995 seasons, 53% of harvested wolves were female, 43% were male, and 4% were unknown sex.

Most harvest occurred south of the Tanana River in Unit 20D during 1993-1994 and 1994-1995, with 79% and 68% from southern Unit 20D, respectively. In 1995-1996, harvest was more evenly divided between southern and northern Unit 20D, due in part to increased trapper effort in northern Unit 20D because of the Fortymile Caribou Calf Protection Program. In 1995-1996, 56% of harvest occurred in northern Unit 20D.

Harvest Chronology. There were no significant changes in wolf harvest chronology during this reporting period. Wolves were taken in all months during which harvest is legal (Table 4), with most wolves being harvested during November through March. From 1993-1994 through 1995-1996, March was the month with the most harvest, with 31% of all wolves taken in March during this time. The 1993-1994 harvest rate was estimated to be 57% of the estimated fall population. Although some of those wolves may have been taken from packs ranging outside the unit, the harvest rate on resident packs probably equaled or exceeded the long-term sustainable harvest (26% and 32%, respectively). During 1994 and 1995, harvest rates were near the maximum sustainable. Therefore, recent harvests probably have precluded significant increases in Unit 20D wolf population size.

Transport Methods. Snowmachines and highway vehicles were the most common mode of transportation used by trappers and hunters who harvested wolves (Table 5). Snowmachines were used to take 64% of the wolves during the 1993-1994 through 1995-1996 seasons and highway vehicles were used to take 21%.

CONCLUSIONS AND RECOMMENDATIONS

Wolf management objectives were met during this reporting period. Also, the Board of Game established a Unit 20D population goal of 15 to 125 wolves and adopted a wolf predation control implementation plan for Unit 20D. Current population size increased, primarily due to the inclusion of several border packs in the population estimate. Recent harvests have been near the maximum sustainable harvest and probably have precluded population growth. Harvest of wolves generally increased due to increased interest by the public in trapping wolves.

In addition to our established objectives, I recommend additional objectives to reflect increased efforts in public education and the Board of Game's adoption of a wolf control implementation plan effective 1 July 1997.

- Conduct wolf predation control reduction programs as directed by the commissioner and the Board of Game.
- Manage harvests to maintain a population of between 15 and 125 wolves, the population objective set by the Board of Game.
- Provide trapper education programs to improve trapper skills, ethics, and regulatory compliance.
- Model the potential effects of wolf predation on ungulates within Unit 20D.

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Table 1 Unit 20D fall wolf population estimates[a], 1985-1995

Year	Population estimate	Packs (nr)	Basis of estimate[b]
1985	39-65	12	1, 2, 4, 6
1986	60-80	10-13	2, 6
1987	60-80	10-12	2, 4, 6
1988	79-83	10	1, 2, 4, 6
1989	94-113	13-15	1, 2, 3, 4, 5, 6
1990	108-109[c]	12	2,4,6
1991	78-83[c]	12	2,3,4,6
1992	75-79[c]	11	2,3,4,6
1993	78-84[c]	10	2,3,4,6
1994	90-97[c]	12	1,2,3,4,6
1995	116-128[c]	13-14	1,2,3,4,6

[a] Fall estimate = pretrapping season population.

[b] 1 = aerial surveys, 2 = trapper/hunter reports, 3 = radiotelemetry, 4 = sealing certificates, 5 = density extrapolation, 6 = miscellaneous observations.

[c] Estimates assume 10% of the population are lone wolves not associated with packs.

[d] Preliminary minimum estimate without information on several packs.

Table 2 Status of wolves radiocollared in Unit 20D in 1996

Date collared	Pack name	Age	Sex	Status of wolf
23 Feb 1996	Harper	Pup	F	Alive
23 Feb 1996	Harper	Pup	F	Alive
May 1996	Harper	Adult	F	Alive

Table 3 Unit 20D wolf harvest, 1985–1996

Regulatory	Reported harvest			Estimated harvest		Method of take				
Year	M	F	Unk	Unreported	Illegal	Trap/snare	Shot	SDA[a]	Unk	Total
1985-1986	17	10	1	0	0	19	0	9	0	28
1986-1987	11	7	0	0	0	18	0	0	0	18
1987-1988	5	7	0	0	0	11	1	0	0	12
1988-1989	5	12	4	0	0	20	1	0	0	21
1989-1990	2	4	0	0	0	4	2	0	0	6
1990-1991	8	13	2	0	0	6	4	13	2	23
1991-1992	4	3	2	0	0	3	5	1	0	9
1992-1993	8	9	5	0	0	16	6	0	0	22
1993-1994	17	27	4	0	0	37	10	0	1	48
1994-1995	16	9	0	0	0	24	1	0	0	25
1995-1996	16	24	1	0	0	39	1	0	1	41

[a] SDA refers to animals taken by hunters the same day hunters were airborne.

Table 4 Unit 20D wolf harvest chronology, 1985–1996

Regulatory Year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
1985-1986	0	0	0	4	3	4	5	8	2	2	28
1986-1987	0	0	0	0	2	8	2	6	0	0	18
1987-1988	1	0	0	4	0	1	6	0	0	0	12
1988-1989	0	0	0	0	5	5	10	0	1	0	21
1989-1990	0	1	0	0	3	0	0	2	0	0	6
1990-1991	0	0	2	2	0	0	3	16	0	0	23
1991-1992	0	2	0	0	2	1	1	3	0	0	9
1992-1993	1	1	0	2	8	0	4	3	2	1	22
1993-1994	0	5	0	6	11	6	4	16	0	0	48
1994-1995	0	1	0	0	3	6	8	6	1	0	25
1995-1996	0	0	0	9	7	8	7	9	1	0	41

Table 5 Unit 20D wolf harvest by transport method, 1985–1996

Regulatory Year	Airplane	Dogsled, skis, snowshoes	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
1985-1986	10	0	0	0	16	0	1	1	28
1986-1987	1	1	0	0	16	0	0	0	18
1987-1988	1	5	0	0	4	0	1	1	12
1988-1989	0	0	0	0	21	0	0	0	21
1989-1990	0	0	0	0	4	1	0	1	6
1990-1991	15	0	0	0	4	1	3	0	23
1991-1992	1	0	0	0	6	0	2	0	9
1992-1993	10	0	0	1	8	1	0	2	22
1993-1994	7	0	0	0	34	0	5	2	48
1994-1995	0	1	0	0	17	0	6	1	25
1995-1996	1	2	0	2	22	1	13	0	41

LOCATION

GAME MANAGEMENT UNIT: 20E (10,680 mi^2)

GEOGRAPHIC DESCRIPTION: Fortymile, Ladue, and Charley River drainages

BACKGROUND

Since the 1940s wolf numbers in Unit 20E fluctuated due to federal and state wolf control programs, harvest pressure, and ungulate densities. Murie (1944) reported that wolves were abundant in Unit 20E during the 1940s but were rapidly reduced by a federal predator reduction program during 1948–1960 (Gasaway et al. 1992). Once the control program ceased in 1960, wolves again became abundant in Unit 20E and subsequently declined during the mid-1970s after the area's moose and caribou populations declined to low levels (Gasaway et al. 1992).

Between 1975 and 1981 the wolf population remained low and stable even though annual harvest rates were low ($\bar{x}$ = 11%), indicating wolves in Unit 20E were still nutritionally limited by low prey availability. During 1981 through 1983 the Alaska Department of Fish and Game (ADF&G) conducted a wolf control program in a 6000-mi^2 area primarily located in Unit 20E. Following the department's wolf removal efforts and public harvest, the subunit's wolf population was approximately 175 wolves during spring 1983. The wolf population within the control area increased to 91% of the precontrol level by fall 1986. Because the control program was terminated prematurely and possibly not conducted in the best area, the ungulate populations did not display significant growth. Wolf numbers in Unit 20E, after reaching precontrol levels, remained relatively stable at moderate densities because of the low prey base.

Historically the wolf population in Unit 20E has been lightly harvested. However, during some years in accessible areas, moderate to high harvests caused population declines. Wolf trapping intensity is primarily affected by the fur market but also by trapping methods and means. When marten and lynx fur prices are high, most area trappers spend little time trapping wolves. Also, trapping pressure in Unit 20E was higher when land-and-shoot taking of wolves was legal because more nonlocal trappers traveled to the area.

Since the early 1980s wildlife agencies in Alaska and Canada experienced difficulties in implementing wolf management programs because wolves are valued differently by different groups of people. Consequently, most wolf management programs did not receive uniform public support. To the trapper, wolves are a prized and important furbearer, and many trappers do not want to see management programs that cause large population declines. To some hunters, wolves are viewed as competitors. Those hunters feel wolves should be controlled to allow for more human use of ungulate resources. In contrast, many view wolves as a symbol of wilderness and believe wolves and their prey should be naturally regulated with little human influence.

Those philosophical differences on wolf management have caused heated disagreements and divisiveness between wildlife proponents. Most of the local residents in Unit 20E and adjacent Unit 12 support an intensive management program designed to cause the Fortymile caribou herd to increase. Following the premature stoppage of the 1981 wolf control program and Governor Hickel's decision

in 1992 to rescind a wolf control program scheduled to begin in 1993, it was evident any program designed to help recover the Fortymile herd must include a diversity of public views concerning wildlife management and all of the responsible agencies.

In February 1994 the Fortymile Management Team was created and included 14 public members representing a wide range of special interest groups and 5 management agencies. The team agreed to the goal of trying to manage for the recovery of the Fortymile herd using a series of management steps designed to conserve habitat, reduce caribou harvest, and reduce wolf predation. The team developed a plan which recommended a combination of public trapping and state conducted nonlethal wolf control to reduce predation on Fortymile caribou. If the Alaska Board of Game adopts the implementation plan, nonlethal wolf control will begin in fall 1997.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Board of Game on 30 October 1991 and revised 29 June 1993. Those goals are listed:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.
- Increase public awareness and understanding of the uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

Between 1990 and 1993 the Alaska Wolf Management Planning Team, the Board of Game, ADF&G, and many members of the public cooperatively developed criteria to guide wolf management in Alaska. In 1994 the Alaska Legislature passed SB77, requiring intensive management which could include wolf control if an ungulate population met certain criteria. Based on those criteria, intensive wolf management in Unit 20E is justified to enhance the

Fortymile caribou herd. Nonlethal wolf control will be proposed to the Board of Game in March 1997. If adopted, wolf management objectives will be changed and included in the 1997 ADF&G wolf annual performance report. Following are the management objectives during this report period:

- Monitor wolf numbers, population characteristics, and harvests.
    - Monitor harvest through sealing records and trapper questionnaires.
    - Conduct fixed-wing aerial surveys during the winter in selected areas.
    - Radiocollar and monitor selected packs.
- Provide for the maximum harvest of wolves in western Unit 20E.
    - Through seasons and bag limits, allow for the greatest harvest to occur within and near the Fortymile caribou herd.
    - Monitor harvest and temporarily close the season if the population in western Unit 20E declines below 75 wolves.
    - Temporarily close the season if the population in western Unit 20E declines below 75 wolves.

METHODS

Estimating Wolf Population Size

Between 1991 and 1996 aerial wolf surveys (Stephenson 1978, Gasaway et al. 1983), standard radiotelemetry techniques, wolf observations by area pilots and trappers, and trapper questionnaire results were used to estimate wolf population size and trend. All estimates of wolf numbers were increased by 10% to account for lone wolves present but not found (Mech 1973). All wolf packs having territories wholly or partially in Unit 20E were included in the estimates.

Wolf Population Characteristics

In the Upper Tanana/Fortymile valleys between 1991 and 1996, we radiocollared and monitored 30 wolves associated with 20 packs. Most of those packs resided in Unit 20E. Radiocollared wolves were located periodically during the year to determine pack and territory size, movement patterns, and population demographics.

Harvest Monitoring

We determined harvest statistics from sealing documents and fur acquisition reports. An official ADF&G seal must be attached to all wolves taken in Alaska. During the sealing process, information is collected on specific location and method of take, date, sex, color of pelt, estimated size of the wolf pack, and transportation.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

During the late 1980s, the wolf population in Unit 20E increased by approximately 17% annually, reaching an estimated 231 wolves in 1990 (Table 1). We conducted thorough wolf surveys in Unit 20E during 1991, 1992, and 1995. Based on those surveys, the population seemed to have declined during 1991 but increased slowly until 1995 to an estimated population size of 219 to 230 wolves. Causes of the reduced count during 1991 are not known. Total reported harvest during 1990 was not high enough to explain the reduction. Survey conditions during 1991 were good in most areas of the subunit and our detection rate should be comparable to other years. Wolf numbers in western Unit 20E are expected to decline following the high harvests during 1995. The higher than normal harvest during 1995 was due to more area trappers shifting their efforts to western Unit 20E in response to the Fortymile caribou recovery effort.

MORTALITY

Harvest

Season and Bag Limit.

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Unit 20E		
Regulatory year 1993-1994		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. No same-day-airborne shooting of wolves except wolves caught in a trap or snare. Use of a steel trap or snare smaller than 3x prohibited during October, March, and April.	1 Oct–30 Apr	1 Oct–30 Apr
Regulatory year 1994-1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug-30 Apr	10 Aug-30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 ft from airplane. No trapping with a steel trap or a snare smaller than	1 Oct-30 Apr	1 Oct-30 Apr

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
3/32 inch in diameter during April or October.		
Regulatory year 1995-1996		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. A wolf may be shot same day airborne if caught in a trap or snare, or trapper is over 300 ft from airplane. No trapping with a steel trap or a snare smaller than 3/32 inch in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr

Board of Game Actions and Emergency Orders. During June 1993 the Board of Game adopted a regulation that allowed harvest of wolves by trappers the same day airborne if the person is over 300 ft from the airplane at the time of taking. The board also extended the use of steel traps for the taking of wolves to the end of March and set a minimum snare cable diameter of 3/32 inches for wolf trapping during October and April. In spring 1994 the board delayed the season opening for wolf trapping until 15 October because few trappers participated in the early season, wolf pelts were not prime, and nontarget species were vulnerable to being caught. In 1994 the Alaska Legislature passed a bill requiring intensive management if an ungulate population important to consumptive users was depleted, causing a significant reduction in harvest. This legislation allows population enhancement using prudent management techniques. Wolf control was identified as one of the preferred management techniques to meet the intent of this law. In November 1996 Alaskan voters passed an initiative which prohibited same-day-airborne hunting of wolves, fox, lynx, and coyotes. This initiative became effective on 25 February 1997.

Hunter/Trapper Harvest. The reported Unit 20E wolf harvest was 68, 39, and 84 wolves during regulatory years 1993, 1994, and 1995, respectively. Average annual harvest from 1992 to 1995 was 62 wolves which was 2.7 times the harvest during the previous 5 years. Estimated harvest rate ranged from 20% to 37% of the estimated fall population and probably exceeded the maximum sustainable harvest for this wolf population during 1995 and, possibly, 1994.

Most of the 1995 harvest occurred near the Taylor Highway and within the Middle Fork and Mosquito Fork drainages. Increased harvest was due to a program called the Fortymile Caribou Calf Protection Program, which was developed by trappers to assist the recovery of the Fortymile caribou herd. To stimulate harvest, this group paid $400.00/wolf caught within the range of the Fortymile herd. This payment approximately doubled the market value of wolf pelts and was instrumental in increasing the harvest.

Trappers continued to use snares and traps as the primary methods to catch wolves in Unit 20E (Table 2). Between 1993 and 1995, only 3 (1.5%) wolves were taken by same-day-airborne hunters.

Harvest Chronology. The percent wolf harvest during August and September (wolf hunting only), November through March (snaring, trapping, and hunting), and October and April (snaring only) was 2.4%, 67.9%, and 10.7%, respectively, during 1995 (Table 3). Most harvest occurred during February and March. During the 5 previous years, most harvest occurred December through February. During 1995 trappers who shifted their lines to western Unit 20E did so near the end of marten season (Feb) and were not totally operational until mid to late February.

Transport Methods. Most successful wolf trappers used snowmachines in Unit 20E (Table 4). Airplanes are used by a small number of trappers to access areas not trapped by land-based trappers. The number of wolves caught by trappers using airplanes for transportation will be primarily dependent on market price for wolves, lynx, and marten. During years of high marten or lynx prices, these trappers will probably reduce their efforts to catch wolves unless wolf pelt prices are also high.

HABITAT

Assessment

Prey availability dictates wolf habitat use. Therefore, preferred wolf habitat occurs with a greater ungulate prey base. Because of the migratory behavior of caribou, there are temporal high densities of caribou available to certain wolf packs. However, there are no packs in Unit 20E that can utilize caribou year-round and during all or portions of the year, every pack must rely on moose as their primary prey. Moose densities in Unit 20E are low, ranging from 0.2 to 0.9 moose/mi^2 ($\bar{x}$ = 0.46 moose/mi^2) (Gardner 1995). Those moose densities in conjunction with the temporal availability of caribou cannot support a large wolf population. Based on prey availability, wolf habitat in Unit 20E currently ranges between poor to moderate, but the habitat could support high populations of prey and wolves if environmental conditions or management actions allow the Fortymile caribou herd to increase substantially.

Human development is not currently a problem for wolves in the area; however, over 30 years of intensive suppression of wildfires has lowered the habitat carrying capacities for early seral prey species such as moose and beaver. Food is currently not a limiting factor for any ungulate prey species.

Enhancement

Since the early 1970s the biotic element of the Upper Tanana/Fortymile ecosystem has been stable at a very low density for all large mammalian predators, ungulates, and scavengers. Because this area is in a low-density equilibrium (Gasaway et al. 1992) and there is no natural fast-acting feedback mechanism, we expect it to remain in this status for a long time. If climatic anomaly (extended good weather) or an adjustment in the number of predators allowed caribou and moose populations to increase, then the entire ecosystem could support more predators, scavengers, and human use.

Unit 20E is included in the Alaska Interagency Fire Management Plan. At least 60% of the area is classified in Limited Suppression status, which should assure a near-natural wildfire regime. This, in turn, should increase habitat diversity that will benefit wolf prey species.

NONREGULATORY MANAGEMENT PROBLEM/NEEDS

Effects of nutrition, weather, harvest, disease, and predation on Fortymile caribou herd growth have been studied since the mid-1970s (Davis et al. 1978; Boertje et al. 1987, 1988; Valkenburg and Davis 1989; Boertje and Gardner 1996). These studies documented that predation was the major factor limiting recovery of the herd primarily by causing high calf mortality during summer. Wolves and grizzly bears were identified as the primary predators. Since 1994 wolves were responsible for 48% to 50% of herd mortality and grizzly bears 22% to 24%. During periods of adverse weather (1991 and 1992), wolf predation was higher, presumably due to poor nutrition of caribou.

To achieve increased growth rates of the Fortymile herd, reducing predation (especially on calves) will be necessary under current ecological conditions. Results from 2 wolf control programs conducted in Yukon indicate that decreasing the number of wolves on the summer range would be sufficient to cause a decrease in the calf mortality rate. Currently, ethical and political objections to lethal wolf control by government agencies are significant. The Fortymile Caribou Management Team recommended multiple, simultaneous actions including public trapping and nonlethal wolf control conducted by ADF&G to reduce predation.

Following are the proposed actions and the desired outcomes:

Between 1996 to 2000, reduce wolves in 15 packs that inhabit the Fortymile caribou summer range through harvest by the public and governmental, nonlethal predator control.

- Reduce wolves to a level that will allow the caribou herd to grow at a moderate rate (5% to 10% annually).

Increased harvest of wolves by the public within the herd's summer and calving ranges.

- Reduce pack size.

Translocate remaining subordinate wolves to areas at least 100 miles from their territory that support as high or higher ungulate populations.

- Reduce pack size down to the 2 dominate wolves.

Fertility control of the male by vasectomy and possibly the female by tubal ligation.

- Maintain pack size at 2 wolves.
- Substantially reduce the pair's need for food. Mech (1970) found that pack nutritional requirements increase by 40% to 60% during pup rearing.

If all these steps are successful, the wolf population within the summer range will be reduced by 60% to 70%. Wolf reductions of 69% to 85% resulted in dramatic increases in caribou numbers in central Alaska (16% per year; Gasaway et al. 1983; Boertje et al. 1996) and eastcentral Yukon (18% per year; Farnell and Hayes, unpubl data). Under favorable environmental conditions, this level of wolf reduction is expected to result in herd growth of 5% to 10%. Under favorable conditions, growth rate could exceed 10%, based on data from the 1980s and current modeling (Boertje and Gardner 1996).

CONCLUSIONS AND RECOMMENDATIONS

The wolf population in Unit 20E is currently at a moderate density and is limited by low prey abundance. Prior to 1992, harvest by humans was below sustained harvest rates and did not affect overall wolf population growth. Market prices and private incentive programs prompted area trappers to select for wolves and as a result, harvest increased causing the wolf population to decline in the central and western portions of the subunit. The present wolf predation rates on caribou and moose are maintaining these populations at low levels. At the current wolf, caribou, and moose population levels, the management goals and objectives for each species are not being met.

Most biologists who have reviewed the biological data agree that in order to meet the current population and harvest objectives for Fortymile caribou, moose, and wolves, a wolf reduction program would be necessary. A wolf reduction program combining harvest and nonlethal control techniques will be proposed to the BOG in March 1997. If implemented the program is expected to result in a 5% to 10% annual increase in the Fortymile Herd.

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Table 1 Unit 20E fall wolf population estimates[a], 1988–1995

Regulatory year	Population estimate[b]	Packs (nr)	Mean pack size[c]	Basis of estimate
1988	173	32	4.9	Aerial survey, observations, reports
1989	205	33	5.6	Aerial survey, observations, reports
1990	231	33	6.3	Aerial survey, observations, reports
1991	169-184	31	5.1	Aerial survey, observations, reports, radiocollars
1992	194-214	32	5.7	Aerial survey, observations, reports, radiocollars
1993	200-224	34	5.7	Aerial survey, observations, reports, radiocollars
1994	190-202	34	5.3	Aerial survey, observations, reports, radiocollars
1995	219-230	34	6.0	Aerial survey, observations, reports, radiocollars

[a] Fall estimate = pretrapping season population.

[b] Includes 10% estimated number of single wolves present.

[c] Calculated using mean population estimate x 0.9 divided by number of packs.

Table 2 Unit 20E wolf harvest, 1988–1995

	Reported harvest						Method of take							Successful	
Regulatory year	M	(%)	F	(%)	Total	% Autumn population[b]	Trap or snare	(%)	Shot	(%)	SDA	(%)	Unk	trappers and hunters	Wolves/ person
1988	2	(22)	7	(78)	9	5	7	(78)	2	(22)	-[c]		6	6	1.5
1989	7	(54)	6	(46)	15	7	12	(80)	3	(20)	-[c]		10	10	1.5
1990	15	(63)	9	(37)	24	10	12	(52)	5	(22)	6	(26)	1	13	1.8
1991	13	(68)	6	(32)	19	11	14	(77)	1	(5)	3	(17)	1	10	1.9
1992	28	(49)	28	(49)	57	28	52	(95)	3	(5)	0	(00)	2	21	2.7
1993	34	(57)	26	(43)	68	32	55	(90)	6	(10)	0	(00)	7	21	3.2
1994	24	(63)	14	(37)	39	20	29	(74)	8	(21)	2	(05)	0	16	2.4
1995	37	(51)	39	(49)	84	37	80	(95)	3	(4)	1	(01)	0	18	4.6

[a] Total harvest includes animals of undetermined sex.

[b] Proportion of the estimated fall population harvested by the end of the season in Apr. If a range was given for the fall estimate, the proportion taken is given as the harvest divided by the mean estimate.

[c] SDA taking prohibited during 1988-1989 and 1989-1990.

Table 3 Unit 20E wolf harvest chronology, 1988–1995

Regulatory year	Harvest periods																		
	Aug	(%)	Sep	(%)	Oct	(%)	Nov	(%)	Dec	(%)	Jan	(%)	Feb	(%)	Mar	(%)	Apr	(%)	n^a
1988	0	(0)	1	(11)	0	(0)	0	(0)	2	(22)	2	(22)	3	(33)	1	(11)	0	(0)	9
1989	0	(0)	2	(13)	1	(7)	2	(13)	3	(20)	6	(40)	1	(7)	0	(0)	0	(0)	15
1990	3	(15)	2	(10)	0	(0)	0	(0)	2	(10)	4	(20)	3	(15)	2	(10)	4	(20)	24
1991	0	(0)	1	(6)	1	(6)	2	(11)	4	(22)	4	(22)	5	(28)	1	(6)	0	(0)	19
1992	0	(0)	3	(5)	1	(2)	1	(2)	6	(11)	13	(23)	18	(32)	10	(18)	5	(9)	57
1993	2	(3)	3	(5)	4	(6)	8	(13)	18	(29)	8	(13)	12	(19)	6	(10)	1	(2)	68
1994	3	(8)	2	(5)	3	(8)	3	(8)	7	(18)	5	(13)	9	(23)	7	(18)	0	(0)	39
1995	1	(1)	1	(1)	4	(5)	12	(14)	11	(13)	10	(12)	24	(29)	15	(18)	5	(6)	84

[a] Total includes wolves for which date of take was unknown.

Table 4 Unit 20E wolf harvest by transport method, 1988–1995

Regulatory year	Airplane	(%)	Dogsled, skis, or snowshoes	(%)	Boat	(%)	3- or 4-Wheeler	(%)	Snowmachine	(%)	ORV[a]	(%)	Highway vehicle	(%)	Unk	n
1988	1	(11)	1	(11)	0	(0)	1	(11)	6	(67)	0	(0)	0	(0)	0	9
1989	1	(7)	5	(33)	0	(0)	0	(0)	7	(47)	1	(7)	1	(7)	0	15
1990	8	(33)	1	(4)	0	(0)	2	(9)	10	(43)	0	(0)	2	(9)	1	24
1991	4	(24)	1	(6)	0	(0)	1	(6)	10	(59)	0	(0)	1	(6)	2	19
1992	6	(11)	6	(11)	0	(0)	0	(0)	41	(72)	0	(0)	4	(7)	0	57
1993	16	(24)	0	(0)	0	(0)	1	(1)	31	(46)	0	(0)	19	(28)	1	68
1994	14	(36)	0	(0)	0	(0)	0	(0)	23	(59)	0	(0)	2	(5)	0	39
1995	11	(13)	3	(4)	0	(0)	1	(1)	67	(80)	0	(0)	2	(2)	0	84

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

LOCATION

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

GEOGRAPHIC DESCRIPTION: Yukon River drainage above Paimiut to Tozitna River, including Koyukuk River up to Dulbi Slough

BACKGROUND

Wolves were present when humans first settled the area and are part of the human culture. Wolves are throughout Unit 21 in all habitat types, even near human settlements. Wolf populations fluctuated from very low to very high numbers depending upon the availability of prey species and wolf-controlling activities.

Unit 21D and the lowlands of Unit 21B have more wolves than Unit 21C. In Unit 21D wolf numbers were probably lower before the early 1940s because moose were absent and caribou availability fluctuated. Immigration of moose coincident with federal wolf control rapidly increased the moose population. In the mid-1950s the moose population was estimated to be as dense as today's population, ranging from 3 to 9 moose/mi^2 in the Koyukuk lowlands near Three-day Slough. With cessation of wolf control, wolf numbers increased. Local residents believe wolf numbers are presently higher than historic levels. In Units 21B and 21C, wolf populations may be lower than in the early 1900s due to lower densities of moose in those areas. The local need for wolf pelts for parka ruffs and gifts at funeral potlatches is higher than the reported harvest. Each year some wolf pelts taken for personal use are not sealed; therefore, actual harvests are higher than reported on sealing certificates or on export and acquisition documents. Many local residents around the Galena area perceive wolves as competitors for moose and make a conscious effort to increase their wolf harvests when moose are scarce.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993.

Those goals are listed:

- Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

During the reporting period 1 July 1993 to 30 June 1996, the following objectives were in place:

- In Unit 21B manage the wolf population to maintain at least 50 moose per wolf until we attain the moose population objective of 4000 to 4500. Thereafter, maintain a fall wolf density of approximately 8 wolves/1000 km^2 and sustain an annual harvest rate of 15% to 25% from the wolf population.

- In Units 21C and 21D, maintain a fall wolf density of approximately 8 wolves/1000 km^2 and sustain an annual harvest rate of 15% to 25% from the wolf population.

We are proposing modification of those management objectives to more accurately reflect the current regulations and policies regarding wolf management in Unit 21. The Board of Game has not adopted an implementation plan for control of wolf predation in Unit 21. Therefore, management will be directed at maintaining a sustainable harvest of wolves and accommodating nonconsumptive uses of wolves. Wolf population fluctuations are expected as wolves respond to changes in the availability of their ungulate prey. The proposed management objectives for the next reporting period are listed:

- Provide for a sustained annual harvest rate of no more than 30% from the combined wolf population of Units 21B, 21C and 21D.

- Monitor harvest through sealing records and trapper questionnaires.

- Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents.

- Participate in trapper education to enhance trapper skills and ethics and to increase regulatory compliance.

- Cooperate with any ongoing wolf studies conducted by the US Fish and Wildlife Service (FWS).

- Model the potential effects of wolf predation on ungulates in each subunit.

METHODS

Wolf pack numbers and distribution were determined by aerial surveys during winter in cooperation with the FWS and by interviews with wolf trappers and aircraft pilots. In February 1994 a Sample Unit Probability Estimator (SUPE) census was conducted in Unit 21D. The subunit was divided into 760 sample units of 16 mi^2 each, and each unit was classified into 1 of 3 density strata, high, medium, or low. The probability of sighting wolf tracks after a fresh snowfall was used to obtain population estimates. Once tracks were sighted they were tracked until wolves were sighted and counted. During March 1996 a SUPE census was conducted in Unit 21B. We followed the procedures described above for Unit 21D. Fifty wolves have been radiocollared and relocated in a cooperative ADF&G–FWS study. Harvests were monitored by pelt sealing requirements.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolf population estimates increased during the past 5 years (Table 1), but most of the increase resulted from better survey information and extrapolation of surveyed density estimates to unsurveyed areas. In Unit 21D (12,096 mi^2) a SUPE population survey was completed between 8–16 March 1994. Of the 760 sample units, 66.6% of the highs, 33% of the medium, and 14% of the low stratum were flown and searched for wolf tracks. We observed 173 wolves (or distinct tracks). The SUPE estimate of the unit population was 220 to 292 ($\bar{x}$ = 256; 80% CI ± 14.2%) with a density of 7.0 to 9.4 wolves/1000 km^2 ($\bar{x}$ = 8.2). The number of single wolves was 6.5% of the total. The fall population was estimated by adding a hunting and overwinter mortality estimate of 26% (Spindler 1992) for local wolf packs.

In Unit 21B (4871 mi^2) a SUPE population estimator was used from 15–17 March 1996 to estimate wolf population. Of the 307 sample units 59% of the highs, 30% of the medium, and 15% of the low stratum were flown and searched for wolf tracks. The SUPE estimate of the unit population was 56 to 80 wolves ($\bar{x}$ = 68; 80% CI ± 17.8%) with a density of 4.4 to 6.7 wolves/1000 km^2 ($\bar{x}$ = 5.4). Unit 21C remains unsurveyed; however, we estimate a fall density of 5 to 7 wolves/1000 km^2.

Distribution and Movements

Since 1986, 50 wolves have been radiocollared in 25 packs on the Koyukuk National Wildlife Refuge (NWR) and the Nowitna NWR. Wolves were collared at the following locations: Dalki River, Upper Dulbi River, Lower Dulbi River, Nayuka River, Nowitna River mouth, Monzonite Hills, Ham Island, Three-day Slough, Bishop Rock, Happy Slough, Bonanza Creek, North Creek and Bear Creek. On the Kaiyuh Flats the density was 11 wolves/1000 km^2; on the Koyukuk lowlands north of Galena (including Three-day Slough) the density was 8 wolves/1000 km^2; and in the Nowitna drainage the density was 7 wolves/1000 km^2 (Spindler 1992).

Movement data on the packs studied have not been completely analyzed. Preliminary data shows most packs occupied territories of 250 to 500 mi^2. Some packs vacated their initial home ranges

and moved to adjacent areas, but they were not followed long enough to see if they returned to their first area. Several wolves that started as pack members, or alone when collared, moved large distances over the course of our study. One wolf moved south 40 miles and then returned north.

MORTALITY

Harvest

Seasons and Bag Limits.

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Unit 21		
Regulatory year 1993–1994		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. No taking wolves same day as airborne.	1 Nov–31 Mar	1 Nov–31 Mar
Regulatory year 1994–1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. Must be greater than 300 ft from aircraft on same day as airborne.	1 Nov–30 Apr	1 Nov–30 Apr
Regulatory year 1995–1996		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. Must be greater than 300 ft from aircraft on same day as airborne.	1 Nov–30 Apr	1 Nov–30 Apr

Board of Game Actions and Emergency Orders. The board in 1993 continued the ban on same-day-airborne hunting but allowed taking wolves the same day airborne under trapping regulations if the trapper moved 300 ft from the aircraft before taking a free-ranging wolf. The trapping season was also extended through April.

Hunter/Trapper Harvest. Hunters and trappers reported harvesting 55, 35, and 47 wolves during each of the 3 regulatory years 1993–1995, respectively (Table 2). Most of the wolves were taken in Unit 21D. 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 furbuyer. Hunting and trapping conditions vary from year to year, which affects harvests. Under good conditions the estimated unreported harvest can be as high as 30 wolves per year but only 5 to 10 during years with poor hunting conditions.

Harvest Chronology. Most wolves were harvested in February and March during each of the last 5 years, except 1993–1994 (Table 3). During that year, December and January were also important months.

Transport Methods. Most wolves were taken using snowmachines for transportation during each of the last 5 years, except 1991–1992 (Table 4). During that year, airplanes and a combination of dogsleds, skis and snowshoes were most important.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate for Unit 21 increased because prey populations increased and more information was collected about pack distribution. Presently 50% of the area has been surveyed for wolf distribution. The unit population is probably much higher. Present population levels are stable or increasing throughout the unit.

I recommend a trapper education program to improve harvest reporting and to increase trapper skills, ethics, and knowledge. I recommend more radiotelemetry studies and more spring censuses to enable us to more accurately determine wolf population sizes. Within the Koyukuk/Nowitna NWR, radiotelemetry studies have improved wolf population estimates and increased our knowledge of moose predation dynamics.

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Table 1 Unit 21B, 21C, and 21D fall wolf population estimates[a,b], 1988–1995

Regulatory year	Population estimate	Number of packs
1988–1989	305–330	42–52
1989–1990	295–340	40–55
1990–1991	295–335	54–58
1991–1992	285–340	50–53
1992–1993	295–365	50–53
1993–1994	395–505	49–57
1994–1995	339–432	49–57
1995–1996	311–425	52–62

[a] Fall estimate = pretrapping season population.

[b] Basis of estimates are ADF&G/FWS aerial surveys, Sample Unit Probability Estimator census, hunter/trapper reports, sealing records and incidental observations and 5 to 7 wolves/1000 km^2 in unsurveyed areas.

Table 2 Units 21B, 21C, 21D wolf harvest, 1988–1995

Regulatory year	Reported harvest				Estimated unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk	Total			Trap/snare	Shot	SDA[a]	Unk
1988–1989	5	6	0	11	20	31	3	2	5	1
1989–1990	14	15	0	29	20	49	7	3	19	0
1990–1991	14	4	3	21	20	41	9	12	0	0
1991–1992	22	14	4	40	20	60	19	18	1	2
1992–1993	20	11	4	35	20	55	15	16	0	4
1993–1994	31	23	1	55	20	75	38	16	0	1
1994–1995	17	11	7	35	20	55	11	18	6	0
1995–1996	16	28	3	47	20	67	29	18	0	0

[a] SDA refers to animals taken by hunters the same day hunters were airborne. In 1994–1996 this would include wolves taken by trappers using aircraft for transportation.

Table 3 Units 21B, 21C, and 21D wolf harvest chronology, 1991–1995

Regulatory year	Harvest periods							
	Aug–Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*[a]
1991–1992	2	2	9	18	45	23	0	44
1992–1993	2	0	0	14	24	57	2	49
1993–1994	2	0	29	23	29	17	0	52
1994–1995	8	14	6	8	17	44	3	36
1995–1996	6	3	9	17	11	43	11	35

[a] Includes harvest from records received after total harvest was calculated.

Table 4 Units 21B, 21C, 21D wolf harvest percent by transport method, 1991–1995

Regulatory year	Harvest percent by transport method								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	n[a]
1991–1992	41	32	11	2	2	0	0	11	44
1992–1993	6	0	0	0	86	0	0	8	49
1993–1994	0	2	2	0	88	0	0	8	52
1994–1995	19	3	5	0	49	0	0	24	37
1995–1996	0	3	6	0	91	0	0	0	35

[a] Includes harvest from records received after total harvest was calculated.

LOCATION

GAME MANAGEMENT UNIT: Unit 22 (25,230 mi^2)

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

BACKGROUND

Long-term residents report that wolves have been scarce throughout Unit 22 for over 50 years. This is especially true for the western portion of the Seward Peninsula. However, wolf numbers appear to be increasing. Reports from the public and staff indicate that lone animals or small packs of wolves are now routinely observed in Units 22A and 22B and occasionally sighted in Units 22C and 22D. We believe that wolf numbers increase seasonally during the winter months when Western Arctic Herd (WAH) caribou are present. Reports from reindeer herders indicate that wolves are now permanent residents on some ranges, and adverse interactions between wolves and reindeer are becoming more common.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain existing population levels of wolves in Unit 22.
- Minimize adverse interactions between wolves and the public.

MANAGEMENT OBJECTIVES

1 Assess harvest, interview hunter/trappers, and seal all pelts brought in for sealing.

2 Establish and maintain license vendors and sealers in all Unit 22 villages.

3 Improve compliance with current sealing requirements through public communication and education.

4 Cooperate with reindeer herders to evaluate methods for reducing adverse interactions between wolves and reindeer.

5 Develop a Unit 22 wolf management plan in cooperation with interested local residents and other agencies.

METHODS

Specific population data concerning Unit 22 wolves are not available. Limited information concerning wolf distribution, population densities, harvest, and human use are obtained annually from sealing certificate records, from incidental observations by staff, reindeer herders, and other local residents.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Although overall wolf densities remained low throughout the unit, their numbers are increasing in Units 22A and 22B, and animals have been occasionally sighted in Units 22C and 22D. Radiocollared wolves from other locations in Alaska have been observed or harvested in Unit 22 during recent years, indicating that immigration of wolves from other areas occurs in Unit 22.

The size of the Unit 22 wolf population is unknown. Estimates provided by staff in past years indicated the population size ranged from 50 to 150 animals. However, recent information indicates this range may be low, and the higher estimate of 150 wolves may actually represent a minimum estimate.

MORTALITY

Harvest

Season and Bag Limits.

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 22		
Residents and Nonresidents:		
Trapping - no limit	1 Nov–15 Apr	1 Nov–15 Apr
Hunting - 5 wolves	10 Aug–30 Apr	10 Aug–30 Apr

Human-Induced Mortality. Sealing records indicate the reported harvest of wolves in Unit 22 increased from a low of 3 during 1985–1986 to an unprecedented high of 54 wolves during 1991–1992 (Table 1). The harvest during the 1993–1995 reporting period ranged from 26 to 34 wolves sealed annually. Increased hunting activity in those areas in Units 22A and 22B used seasonally by WAH caribou has increased sightings during the last decade. Sex composition of the reported harvest throughout the 3-year reporting period is as follows: 66% males, 17% females, and 17% sex unknown (n = 87). Until 1989–1990, all of the reported wolf harvest came from Units 22A and 22B. Local hunters reported observing a pack of approximately 10 wolves in Unit 22D during 1989–1990. Hunters have since harvested small numbers of wolves from Units 22C and 22D.

Unreported harvest of wolves remains a problem in Unit 22. 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.

Hunter Residency and Success. Sealing certificate data indicate that residents of Unit 22 harvested all wolves taken during the reporting period. Residents from Unit 22A and 22B harvested most of the wolves.

Harvest Chronology. As previously indicated, the size of the wolf harvest in Unit 22 during the past 5 years is directly related to caribou harvests, distribution, and movements. During the past several years, WAH caribou have arrived onto the Seward Peninsula and Nulato Hills during late October and November. During the current reporting period, wolf harvest occurred after the arrival of caribou, with a significant portion (79%) of the reported wolf harvest occurring during January through April.

Harvest Methods. Trapping of wolves is not a major activity in Unit 22. During the reporting period, 87% ($n = 87$) of the wolves were ground shot, and only 3% were trapped or snared.

Transport Methods. Hunters and trappers taking wolves in Unit 22 preferred to travel by snowmachines. Sealing certificates indicated all of the harvest during the past 3 years was taken using a snowmachine as transportation.

CONCLUSIONS AND RECOMMENDATIONS

Although quantitative data are not available, wolf densities are increasing in portions of Unit 22, particularly in the Units 22A and 22B. WAH caribou increasing their use of the region during winter months apparently causes this increase.

The following specific goals need to be addressed if we are to effectively manage wolves on the Seward Peninsula and ensure compliance with our management objectives for Unit 22 wolf populations:

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

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

3 Quantitative data on wolf populations of Unit 22 are lacking. I recommend research to improve our understanding of wolf population dynamics and the effects of wolf predation on local ungulate populations of Unit 22.

No changes in Unit 22 hunting or trapping regulations for wolves are recommended at this time.

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Table 1 Unit 22 wolf harvest for regulatory years 1985-1996

Regulatory Year	Reported Harvest				Method of Take			Successful
	M	F	Unk.	Total	Trap / Snare	Shot	Unk.	Total Trappers/hunters
1985-1986	0	1	2	3	0	3	0	1
1986-1987	4	2	2	8	1	7	0	5
1987-1988	8	6	10	24	14	10	0	8
1988-1989	11	8	2	21	1	20	0	9
1989-1990	28	13	2	43	0	43	0	14
1990-1991	14	11	6	31	5	26	0	11
1991-1992	21	13	20	54	3	51	0	18
1992-1993	12	5	6	23	1	16	6	9
1993-1994	24	8	2	34	2	24	8	16
1994-1995	17	2	7	26	1	25	0	16
1995-1996	16	5	6	27	0	27	0	17

LOCATION

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

GEOGRAPHIC DESCRIPTION: Western Brooks Range and Kotzebue Sound

BACKGROUND

Wolves are indigenous to northwest Alaska. Prior to statehood in 1959, wolves were subject to bounty hunts and predator control programs to protect reindeer and caribou (McKnight 1973). After statehood, liberal hunting and trapping regulations, which allowed aerial shooting and same-day-airborne hunting (SDA), replaced these practices. High fur prices in the mid 1970s attracted nonlocal hunters to Unit 23, and wolf harvests were high when snow conditions were favorable for aircraft and snowmachines. During the 1980s, regulatory restrictions on aircraft and low fur prices reduced the harvest of wolves. Today, use of aircraft for hunting is prohibited. Local residents using snowmachines harvest most wolves sealed in Unit 23.

In the middle Kobuk, during May 1990, Ballard (1993) estimated a density of 1 wolf/50 mi^2 (80% CI 37–74 mi^2) using a line–intercept track sampling technique. If extrapolated to all of Unit 23, the population estimate would be 869 wolves (80% CI, 580–1169). However, this extrapolation should be viewed with caution because it assumes similar wolf densities throughout the unit. Local biologists and residents recognize 4 geographic areas where wolf densities need to be separately assessed: 1) Northern Seward Peninsula east of and including the Buckland drainage; 2) upper Kobuk drainage; 3) Noatak, Wulik and Kivilina river drainages to Cape Lisburne, and 4) lower Kobuk and Selawik river drainages.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Maintain viable populations of wolves in the Unit 23 and minimize adverse interactions between wolves and the public.

MANAGEMENT OBJECTIVES

Maintain the furbearer sealing program while exploring alternate harvest reporting systems.

METHODS

We maintained license vendors and fur sealers throughout the unit. We also collected incidental observations of wolves from staff, local and nonlocal residents. No quantitative population data were collected during this reporting period.

Several publications were prepared from data collected during the 1987–1991 study on predation and demographics of wolves in northwest Alaska (Ballard 1993). The emphasis of these papers is a discussion of wildlife research techniques. In some cases further analysis of data is performed. These papers are to be published by the Journal of Wildlife Management as a monograph,

including other papers presented at the 2nd North American Symposium on Wolves (Edmonton 1992; Carbyn *et al.* 1995). In addition, Spaulding (1996) completed a master's thesis on diet and observer bias in wolf scat analysis.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

A 1995 fall preharvest population estimate for Unit 23 was 600–1200 wolves with an unknown number of wolf packs. This estimate was based on past census work and field observations. We think the population has been increasing since 1990–1991 and is currently stable or continuing to increase.

Distribution and Movements

Wolves are throughout Unit 23. We feel all potential wolf habitat is currently occupied. Increased occurrence of wolves near villages and highly traveled areas may indicate continued high wolf population levels. Significant numbers of prey may be drawing wolves into areas with hunting pressure, concentrating high numbers of wolves.

We collected additional movement data from wolves radiocollared in the spring of 1990 and shot by hunters in spring of 1996. One female wolf collared in the Salmon River was shot in the Selawik drainage. Another wolf collared in the upper Kobuk as a 2-year-old was shot on the south side of the Waring Mountains. This wolf had previously been located outside of Shaktoolik during the winter of 1990–1991 and returned to the Kobuk Sand Dunes the following winter.

MORTALITY

Harvest

Season and Bag Limit. The season and bag limit was the same for all regulatory years in the reporting period.

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 23		
Residents and Nonresidents:		
Trapping - no limit	1 Nov-15 Apr	1 Nov-15 Apr
Hunting - 5 wolves	10 Aug-30 Apr	10 Aug-30 Apr

Board of Game Actions and Emergency Orders. The Board of Game (BOG) prohibited same-day-airborne taking of wolves in the 1991–1992 regulatory year. During the 1994 regulatory year, it became legal to shoot a wolf same day airborne if the wolf was in a trap or snare or the hunter was at least 300 ft from the airplane (5 AAC 92.095). Airplanes remained banned for same-day-

airborne hunting and trapping on National Park Service and U.S. Fish and Wildlife Service lands. In 1994, the Legislature required intensive management (i.e., predator control and habitat enhancement) before restricting resident hunting of ungulates. The large percentage of federal land in Unit 23 (60%) makes intensive management unfeasible.

Hunter/Trapper Harvest. Hunters reported harvesting 50 wolves during 1993–1994, 53 during 1994–1995, and 63 during 1995–1996 (Table 1). Hunters continue to harvest wolves most heavily in the Kobuk drainage but also take wolves along the Noatak, Selawik, and Buckland drainages (Table 2). We estimate that less than 10% of the local harvest is reported. Local use of hides, low compliance with license requirements, and confusion over sealing requirements contribute to low reporting rates for furbearers in Unit 23.

Hunter Residency and Success. Twenty-one hunters reported harvesting 50 wolves in 1993—1994. Two were nonresidents and 1 was a nonlocal Alaska resident; the rest were local residents of Unit 23. Of 20 hunters in 1994–1995, 19 were local residents and 1 was a nonlocal resident. No nonresident hunters participated in the hunt in 1994–1995. In 1995–1996, 19 local residents and 1 nonresident reported harvesting wolves. The nonresident hunter harvest was the only wolf taken in the fall with a hunting license.

Harvest Chronology. During the reporting period most wolves were harvested in the spring (Table 3). The annual chronology of harvest varied slightly due to weather conditions during hunting and trapping seasons.

Transport Methods. Snowmachines were the primary form of transportation used by hunters who reported harvesting wolves (Table 4). As expected, use of aircraft was minimal following closure of Unit 23 to most same-day-airborne wolf hunting. Some individuals continued to use aircraft to access traplines or shoot wolves incidental to other hunting activities. Ground shooting using snowmachines as transportation continues to be the most common method of harvesting wolves in Unit 23 (Table 5). The number of wolves trapped increased from 12 in 1994 to 19 in 1995.

Other Mortality

No reports of wolf mortality due to causes other than hunting or trapping were received. The last documented outbreak of rabies in wolves was 1989–1990. Without ongoing studies we doubt we would be able to detect the occurrence of a rabies outbreak in wolves in Unit 23.

CONCLUSIONS AND RECOMMENDATIONS

Prohibiting same-day-airborne wolf hunting did not reduce the reported wolf harvest, but it did change the distribution of harvest. Now, very few wolves are taken between the Kugururok and Cutler Rivers in the Noatak drainage.

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Table 1 Unit 23 reported wolf harvest from sealing certificates, 1974–1996

Regulatory Year	Males	Females	Unknown	Total
1974-1975	-	-	50	50
1975-1976	-	-	142	142
1976-1977	-	-	157	157
1977-1978	-	-	65	65
1978-1979	-	-	50	50
1979-1980	12	6	0	18
1980-1981	33	17	0	50
1981-1982	10	7	0	17
1982-1983	25	19	4	48
1983-1984	30	14	2	46
1984-1985	45	20	0	65
1985-1986	10	8	1	19
1986-1987	23	10	1	34
1987-1988	52	33	9	94
1988-1989	42	36	5	83
1989-1990	27	25	5	57
1990-1991	17	15	13	45
1991-1992	30	22	6	58
1992-1993	28	32	11	71
1993-1994	30	17	3	50
1994-1995	24	19	10	53
1995-1996	35	25	3	63

Table 2 Unit 23 wolf harvest by drainage, 1974–1996

Reg. year	Kivalina	Noatak	Kobuk	Selawik	Buckland	Unknown	Total
1974-1975	3	5	22	20	0	0	50
1975-1976	2	9	78	53	0	0	142
1976-1977	0	26	28	82	1	10	157
1977-1978	0	3	25	20	1	70	65
1978-1979	7	4	11	15	1	30	50
1979-1980	1	2	9	4	2	0	18
1980-1981	2	3	11	24	3	7	50
1981-1982	1	10	3	3	0	0	17
1982-1983	1	11	6	21	8	1	48
1983-1984	0	9	7	21	7	2	46
1984-1985	1	16	20	21	3	4	62
1985-1986	0	11	4	2	2	0	19
1986-1987	2	5	6	18	0	2	34
1987-1988	0	27	41	11	15	0	94
1988-1989	1	12	28	39	0	3	83
1989-1990	3	10	27	2	15	0	57
1990-1991	0	7	18	15	5	0	45
1991-1992	2	8	30	4	13	1	58
1992-1993	2	11	30	15	4	9	71
1993-1994	0	17	28	3	2	0	50
1994-1995	1	12	26	7	7	0	53
1995-1996	0	11	27	18	7	0	63

Table 3 Unit 23 chronology of wolf harvest, 1993–1996

Reg. year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unknown	Total
1993-1994	1	2	0	3	11	7	5	6	10	5	50
1994-1995	0	1	0	10	3	8	8	14	9	0	53
1995-1996	0	2	0	6	5	2	1	37	9	1	63

Table 4 Number of hunters and method of transport to harvest wolves in Unit 23, 1985–1996

Reg. year	Hunters	Airplane	Snowmachine	Boat	Unknown	Total harvest
1985-1986	12	8	7	0	4	19
1986-1987	17	20	9	0	5	34
1987-1988	32	48	40	2	4	94
1988-1989	29	10	70	0	3	83
1989-1990	25	11	32	2	12	57
1990-1991	23	4	32	0	9	45
1991-1992	25	9	47	0	2	58
1992-1993	24	2	69	0	0	71
1993-1994	24	2	44	0	4	50
1994-1995	21	1	52	0	0	53
1995-1996	20	1*	62	1	0	63

*boat also used

Table 5 Methods of harvesting wolves in Unit 23, 1985–96

Reg. year	Ground shooting	Trapping	Snaring	Unknown	Total harvest
1985-1986	14	2	0	3	19
1986-1987	26	4	0	4	34
1987-1988	90	2	0	2	94
1988-1989	72	9	0	2	83
1989-1990	45	8	0	4	57
1990-1991	32	3	3	7	45
1991-1992	43	7	0	8	58
1992-1993	69	2	0	0	71
1993-1994	44	4	0	2	50
1994-1995	41	12	0	0	53
1995-1996	42	19	0	2	63

LOCATION

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

GEOGRAPHIC DESCRIPTION: Koyukuk River drainage above Dulbi River

BACKGROUND

Wolves are present throughout Unit 24. Wolf abundance in Unit 24 fluctuated over time in response to the availability of prey and, more recently, the controlling activities of man. Wolf numbers were low in the Brooks Range during the late 1800s because densities of moose, caribou, and Dall sheep were low (Campbell 1974). Prey populations increased during the early 1900s, leading to concurrent increases in wolf numbers. Now wolves are more numerous than in the 1970s but probably not as abundant as during the 1940–1950s (R Stephenson, pers commun).

There were probably fewer wolves in the southern portion of the unit before the 1940s than exist now because a stable prey base was then nonexistent. At that time, moose populations were still expanding into this area, and the availability of caribou varied widely between years. Federal wolf control efforts probably reduced the limiting effect of wolf predation on local moose populations, and moose numbers increased rapidly. When wolf control ceased, this newfound abundance of moose allowed wolf numbers to increase. Wolf numbers are presently as high in southern Unit 24 as at any known time.

Reported wolf harvests from 1988 through 1995 ranged from 30 to 119 wolves per year and averaged 76 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 the Galena area perceive wolves as direct competition for moose and make a conscious effort to increase the wolf harvest when moose seem scarce.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies.

Management may include both manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. Those goals are listed on the next page:

- Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of the uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

During the reporting period 1 July 1993 to 30 June 1996, the following objectives were in place:

- In the southern part of Unit 24 (south of Hughes; 6150 mi^2), the objective is to manage a stable fall wolf population with a density of approximately 8 wolves/1000 km^2 to sustain an annual harvest of approximately 30 wolves.

- In the central part of the unit (Hughes to Bettles), reduce wolf density to 4 wolves/1000 km^2 to achieve a moose:wolf ratio of 50:1.

- In the northern part of the unit (north of Bettles including Gates of the Arctic National Park (GANP), maintain a stable fall wolf density of approximately 8 wolves/1000 km^2, to sustain an annual harvest of 30 wolves while providing for nonconsumptive uses within the GANP.

We are proposing modification of those management objectives to more accurately reflect the current regulations and policies regarding wolf management in Unit 24. The Board of Game has not adopted an implementation plan for control of wolf predation in Unit 24. Therefore, management will be directed at maintaining a sustainable harvest of wolves and accommodating nonconsumptive uses of wolves. Wolf population fluctuations are expected as wolves respond to changes in the availability of their ungulate prey. The proposed management objectives for the next reporting period are to:

- Provide for a sustained annual harvest rate of no more than 30% from the combined wolf population of Units 24.

- Monitor harvest through sealing records and trapper questionnaires.

- Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots and by evaluation of sealing documents.

- Conduct aerial survey to estimate wolf pack sizes and number of packs in central Unit 24 during late winter 1998.

- Participate in trapper education to enhance trapper skills and ethics and to increase regulatory compliance.

- Cooperate with ongoing wolf studies conducted by the US Fish and Wildlife Service (FWS).
- Model the potential range of effects of wolf predation on ungulates in each subunit.

METHODS

We determined wolf pack numbers and distribution by aerial surveys during winter in cooperation with the FWS and US National Park Service (NPS) and by interviews with wolf trappers and light aircraft pilots. Radiocollared wolf packs within the Kanuti National Wildlife Refuge were tracked during March to determine predation rates. We monitored harvests by pelt sealing requirements; NPS collected carcasses in the GANP to determine physical condition, stomach contents, and reproductive characteristics.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolves are found throughout the unit in all habitat types and near human settlements. The numbers of wolves within the unit vary, depending on 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 1995 estimated autumn Unit 24 population of 405 to 540 wolves (Table 1) was derived by plotting known pack locations and assuming a density of 6 to 8 wolves/1000 km^2 for unknown areas.

DISTRIBUTION AND MOVEMENTS

The radiocollared wolves in the Kanuti area were tracked infrequently after 1991 but information on distribution and movements was collected (Zirkle 1995). All the wolves which were pups or yearlings when collared dispersed from the area and were not followed. During autumn, 9 to 11 packs with 85 to 100 wolves used the refuge. The average pack size for the collared packs in the spring was 4 wolves. The area covered by the packs ranged from 987 to 1567 km^2.

MORTALITY

Harvest

Seasons and Bag Limits.

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Unit 24		
Regulatory year 1993–1994		
Hunting: 5 wolves. No wolf	10 Aug–30 Apr	10 Aug–30 Apr

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
hunting same day airborne.		
Trapping: No limit. No taking wolves same day as airborne.	1 Nov–31 Mar	1 Nov–31 Mar
Regulatory year 1994–1995		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. Must be greater than 300 ft from aircraft on same day as airborne.	1 Nov–30 Apr	1 Nov–30 Apr
Regulatory year 1995–1996		
Hunting: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit. Must be greater than 300 feet from aircraft on same day as airborne.	1 Nov–30 Apr	1 Nov–30 Apr

Board of Game Actions and Emergency Orders. The board in 1993 continued the ban on same day hunting of wolves, but allowed taking wolves the same day as airborne under trapping regulations provided the trapper moved 300 feet from the aircraft before taking a free-ranging wolf. The trapping season was also extended until 30 April.

Hunter/Trapper Harvest. Hunters and trappers reported harvesting 89, 89, and 119 wolves during regulatory years 1993–1995, respectively (Table 2). Recently more wolves are being reported from the northern and southern parts and sealing compliance might be increasing. 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. Hunting conditions vary from year to year which affects harvests. Under good conditions I estimate the unreported harvest can be as high as 80 wolves per year but only 50 during years with poor hunting conditions. Wolves could be taken under either hunting or trapping regulations.

Harvest Chronology. Wolves were generally taken in February and March during the past 5 years (Table 3). Exceptions were 1991–1992 and 1995–1996 when November, December and January were also important months.

Transport Methods. Most wolves were taken using snowmachines for transportation during each of the last 5 years, except 1991–1992 (Table 4). During that year, airplanes, boats, and a combination of dogsleds, skis and snowshoes were most important.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population estimate for Unit 24 is higher during this reporting period than previous estimates because of an increase in wolf populations and because the cooperative NPS and FWS studies enabled us to more accurately determine wolf population sizes through radiotelemetry. I believe population levels are stable or increasing.

I recommend an aerial survey be conducted to determine wolf densities in the central portions of Unit 24. I also recommend radiocollared packs in the Kanuti area continue to be monitored to help improve population estimates and provide information on predation rates. Harvest reporting is suspected to be low in some portions of the unit. I recommend both federal and state biologists work more closely with local residents to improve reporting compliance.

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Table 1 Unit 24 fall wolf population estimates[a], 1988–1995

Year	Population estimate[b]	Number of packs
1988–1989	420–450	55–60
1989–1990	400–440	55–60
1990–1991	400–440	55–60
1991–1992	420–450	68–70
1992–1993	388–415	51–55
1993–1994	405–540	58–66
1994–1995	405–540	58–66
1995–1996	405–540	58–66

[a] Fall estimate = pretrapping season population.

[b] Basis of estimate: ADF&G, NPS, and FWS aerial surveys, hunter/trapper reports, sealing records and incidental observations.

Table 2 Unit 24 wolf harvest, 1988–1995

Regulatory year	Reported harvest				Estimated unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk	Total			Trap/snare	Shot	SDA[a]	Unk
1988–1989	38	32	6	76	50	126	16	20	39	1
1989–1990	17	9	4	30	60	90	25	3	0	2
1990–1991	16	24	2	42	60	102	22	20	0	0
1991–1992	42	39	4	85	55	140	70	15	0	0
1992–1993	41	32	6	79	80	159	43	35	1	0
1993–1994	48	37	4	89	60	149	62	27	0	0
1994–1995	52	28	9	89	60	149	68	14	6	1
1995–1996	52	55	12	119	60	179	88	29	2	0

[a] SDA refers to animals taken by hunters the same day hunters or trappers were airborne.

Table 3 Unit 24 wolf harvest chronology by percent, 1991–1995

Regulatory year	Harvest periods							
	Aug–Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*[a]
1991–1992	7	14	18	22	25	8	6	85
1992–1993	3	1	8	7	32	50	0	92
1993–1994	7	7	20	10	25	26	7	92
1994–1995	7	6	8	18	33	27	1	83
1995–1996	7	13	21	13	25	8	13	107

[a] Includes harvest records received after total harvest was calculated.

Table 4 Unit 24 wolf harvest percent by transport method, 1991–1995

Regulatory year	Harvest percent by transport method								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*[a]
1991–1992	18	51	32	0	0	0	0	0	85
1992–1993	3	0	0	0	89	1	4	2	92
1993–1994	3	4	3	0	83	0	1	5	92
1994–1995	16	0	6	1	73	0	3	1	88
1995–1996	3	7	2	2	69	3	4	10	107

[a] Includes harvest records received after total harvest was calculated.

LOCATION

GAME MANAGEMENT UNIT: 25A, 25B, 25D, 26B, and 26C (75,000 mi^2)

GEOGRAPHIC DESCRIPTION: Eastern Interior, Eastern Brooks Range, and Central and Eastern Arctic Slope

BACKGROUND

Wolves are present throughout the management area. They are well adapted to living in the Interior taiga forests, the rugged mountains of the Brooks Range, and the arctic slope tundra. Wolves are generally less abundant than in other parts of the Interior because populations of resident prey such as moose are scarce in many areas.

Relatively little is known about wolf populations or their influence on ungulate populations in northeastern Alaska. US Fish and Wildlife Service (FWS) biologists studied the movements and denning of 11 wolf packs in the northern Arctic National Wildlife Refuge (ANWR) in 1984 and 1985 (Garner and Reynolds 1986). Subsequent occasional aerial surveys and incidental observations further documented the presence of wolves within ANWR and to the west in Unit 26B. However, no systematic surveys were conducted within the area. Nowlin (1985) flew aerial wolf surveys in Unit 25D (west) in March 1984. A wolf survey covering most of Unit 25D was done in March 1992. Wolf surveys have not been conducted in Units 25A and 25B.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal or commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. Those goals are listed:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of the uses, conservation and management of wolves, their prey and habitat in Alaska.

Management Objectives

The following management objectives apply to the reporting period 1 July 1993–30 June 1996:

- Conduct a wolf census in Units 25A, 25D east and 25B west by 1995.
- Evaluate the effects of wolf predation on moose in Unit 25D using computer modeling.

I am are proposing additions to those management recommendations for the next reporting period to reflect the current regulations and policies regarding wolf management in Unit 25A, 25B, 25D, 26B, and 26C. The Board of Game has not adopted an implementation plan for control of wolf predation in these units. Therefore, management will be directed at maintaining a sustainable harvest of wolves and accommodating nonconsumptive uses of wolves. Wolf population fluctuations are expected as wolves respond to changes in the availability of their ungulate prey. The proposed management objectives for the next reporting period are listed:

- Provide for a sustained an annual harvest rate of no more than 30% from the combined wolf population of Units 25A, 25B, 25D; and no more than 30% of the combined wolf population of Units 26B, and 26C.
- Monitor harvest through sealing records and trapper questionnaires.
- Evaluate the effects of wolf predation on moose in Unit 25D using computer modeling.
- Monitor wolf numbers and population characteristics in nonsurveyed areas through interviews with trappers, hunters, pilots and by evaluation of sealing documents.
- Participate in trapper education to enhance trapper skills and ethics and to increase regulatory compliance.
- By March 1998 develop a proposal to conduct research on low-density wolf–prey population dynamics in Unit 25.
- Conduct an aerial survey of wolves in Unit 25A or Unit 25B during late winter 1998.

METHODS

Population data were extrapolated from survey estimates made during 1984–1985 and 1992 and from incidental observations. Sealing certificates provided most of the data on harvest.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Few wolves are present relative to adjacent areas. Populations in Units 25A, 25B, and 25D seem to have increased somewhat in recent years and seem stable in Units 26B and 26C.

Population Size

Estimates from surveys, hunter observations, and harvest data indicate that 65 to 85 packs, including 470 to 570 wolves, were present in Units 25A, 25B, and 25D in fall 1988. By fall 1992 these estimates increased to 72–93 packs including 520–634 wolves. There has been no reason to revise the 1992 estimates. Average wolf density was roughly 4.1–5.1 wolves/1000 km^2 in 1992. Nowlin (1988) believed the wolf population density was lowest in western Unit 25D. We found an estimated 150 to 215 wolves in 22 to 32 packs in Units 26B and 26C, indicating a fall 1995 wolf density of 2.2–3.2 wolves/1000 km^2. Resident packs are rare on the coastal plain in the northern portion of these subunits (Garner and Reynolds 1986).

Distribution and Movements

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

MORTALITY

Harvest

Season and Bag Limit. The wolf hunting season in Units 25 and 26 was open from 10 August through 30 April. The bag limit was 5 wolves in Unit 25 and 10 in Unit 26; however, same-day-airborne hunting of wolves was prohibited.

Units/Bag Limits/Special Restrictions	Resident/Subsistence Open Season	Nonresident Open Season
Regulatory year 1993-1994		
Units 25A, 25B, and 25D		
Hunting: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–31 Mar	1 Nov–31 Mar
Units 26B and 26C		
Hunting: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–15 Apr	1 Nov–15 Apr
Regulatory year 1994–1995		

Units/Bag Limits/Special Restrictions	Resident/Subsistence Open Season	Nonresident Open Season
Units 25A, 25B, and 25D		
Hunting: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–30 Apr	1 Nov–30 Apr
Units 26B and 26C		
Hunting: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

* All units: Wolves could be taken by shooting same day airborne if caught in a trap or snare, or by holders of a trapping license if the person shooting a wolf was more than 300 ft from the airplane.

Regulatory year 1995-1996

Units 25A, 25B, and 25D		
Hunting: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–30 Apr	1 Nov–30 Apr
Units 26B and 26C		
Hunting: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

* All units: Wolves could be taken by shooting same day airborne if caught in a trap or snare, or by holders of a trapping license if the person shooting a wolf was more than 300 ft from the airplane.

Human-Induced Mortality. Wolf harvests in Units 25A, 25B, and 25D were relatively stable between 1993 and 1995, ranging from 46 to 65 wolves each year during this 3-year period (Table 1). Most of the harvest occurred in Units 25A and 25D. Harvests in both areas are still moderate compared to historic levels. The Unit 26B harvest was relatively high in 1992 and 1993 but declined in 1994 and 1995 (Table 1). Few wolves are harvested in Unit 26C, probably because of limited access and low wolf densities.

Wolves were reported taken in scattered locations in Unit 25 including parts of the Coleen, Sheenjek, Hodzana, and Chandalar drainages in Unit 25A; the Black and Porcupine drainages in Unit 25B; and in the Birch, Beaver, Hodzana, Porcupine, and Yukon drainages in Unit 25D. In Unit 26B wolves were taken at scattered locations near the pipeline corridor from the Atigun River north to Sagwon. Wolves harvested in Unit 26C were taken on the Canning River and in various drainages south of Barter Island. Overall, more males than females were found in the harvest.

Some unreported harvest occurs, primarily in Units 26B and 26C, where hides are often used in clothing and handicrafts (Whitten 1988).

Harvest Chronology. Most reported wolf harvest occurred from November through March, although a few wolves were taken in Units 25 and 26 in August or September (Table 2).

Method of Take and Transport Methods. Most wolves harvested in Unit 25 were taken with traps or snares. Snowmachines were the most common method of access (Table 3). The occurrence of snared and trapped wolves in the harvest and the use of snowmachines for access have changed little over the years. What has changed is the proportion taken by the land-and-shoot method involving aircraft. This was the predominant harvest method before the 1988 prohibition on same-day-airborne hunting.

In Units 26B and 26C wolves were taken primarily by shooting from the ground (Table 1). Most hunters and trappers used highway vehicles to reach the area by the Dalton Highway. A few wolves were taken by individuals transported by snowmachine or aircraft.

Natural Mortality

The relatively low density of wolves in Units 25A, 25B, 25D, 26B, and 26C is consistent with the relative scarcity of resident prey. Many moose populations occur at low densities, and caribou are only seasonally abundant in some areas because of their wide-ranging migrations. Small packs, small litters, and poor pup survival coincide with areas of relative prey scarcity.

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

Predation by other wolves and rabies (Zarnke and Ballard 1987) are probably the major causes of natural mortality among wolves in northeastern Alaska. Rabies in wolves is generally confined to coastal areas (Units 26B and 26C).

CONCLUSIONS AND RECOMMENDATIONS

The highest priority for wolf management is to acquire better information on the size, trend, and distribution of wolf populations. Populations seem to be stable or increasing, but that assumption is based on scant data. I recommend ADF&G allocate more funds for wolf surveys in this area. In view of the apparent increase in wolf numbers reported by observers in various areas, the status of prey populations, particularly moose and sheep, should be closely monitored.

The next priority is to improve wolf harvest reporting by hunters and trappers. People throughout the study area and especially those in Units 26B and 26C should be better informed of the sealing requirements for harvested wolves. We should continue efforts to develop and maintain sealing officers in communities in the region. Known harvests of wolves account for no more than 10–12% of the estimated population in Unit 25 and 15–20% in Unit 26. Harvests of this magnitude are well below the maximum sustainable harvests of 30–35% generally reported for wolf

populations. However, when ungulate:wolf ratios are low, as in Units 25 and 26, sustainable wolf harvests can be lower.

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Table 1 Units 25A, 25B, 25D, 26B, and 26C wolf harvest, 1987–1995

Regulatory year	Reported harvest				Method of take		
	M	F	Unk	Total	Trap/snare	Shot	Unk
Unit 25A							
1987-1988	14	16	0	30	7	23	0
1988-1989	2	6	2	10	6	4	0
1989-1990	5	9	0	14	8	6	0
1990-1991	15	6	2	23	18	5	0
1991-1992	7	11	7	25	14	11	0
1992-1993	20	7	0	27	11	16	0
1993-1994	8	10	0	18	15	3	0
1994-1995	7	10	0	17	17	0	0
1995-1996	7	8	0	15	11	4	0
Unit 25B							
1987-1988	4	1	1	6	5	1	0
1988-1989	3	4	5	12	12	0	0
1989-1990	3	1	1	5	4	1	0
1990-1991	2	2	1	5	4	1	0
1991-1992	7	5	1	13	13	0	0
1992-1993	7	7	1	15	14	1	0
1993-1994	6	1	5	12	11	1	0
1994-1995	4	9	3	16	16	0	0
1995-1996	5	9	0	14	12	2	0
Unit 25D							
1987-1988	2	2	2	6	6	0	0
1988-1989	0	0	2	2	2	0	0
1989-1990	6	5	1	12	9	3	0
1990-1991	14	10	0	24	6	18	0
1991-1992	8	11	0	19	9	10	0
1992-1993	2	1	8	11	9	1	1
1993-1994	10	7	2	19	17	2	0
1994-1995	18	12	2	32	31	1	0
1995-1996	12	5	0	17	11	6	0
Unit 26B							
1987-1988	2	1	0	3	0	3	0
1988-1989	12	3	0	15	7	7	1
1989-1990	4	7	0	11	3	7	1
1990-1991	15	9	1	25	0	24	1
1991-1992	10	4	3	17	6	10	1
1992-1993	14	11	6	31	5	26	0
1993-1994	17	11	2	30	10	20	0
1994-1995	11	5	0	16	4	12	0

Table 1 Continued

Regulatory year	Reported harvest				Method of take		
	M	F	Unk	Total	Trap/snare	Shot	Unk
1995-1996	9	3	1	13	2	11	0
Unit 26C							
1987-1988	1	1	0	2	0	2	0
1988-1989	3	0	0	3	0	3	0
1989-1990	1	0	0	1	0	1	0
1990-1991	7	4	1	12	2	10	0
1991-1992	3	2	0	5	0	5	0
1992-1993	3	3	0	6	3	3	0
1993-1994	0	0	0	0	0	0	0
1994-1995	4	1	0	5	2	3	0
1995-1996	1	1	0	2	0	2	0

Table 2 Units 25A, 25B, 25D, 26A, and 26B wolf harvest chronology percent by time period, 1987–1995

Regulatory year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
Unit 25A											
1987-1988	3	7	0	3	7	7	7	67	0	0	30
1988-1989	0	30	0	10	10	0	10	40	0	0	10
1989-1990	0	21	0	21	14	29	14	0	0	0	14
1990-1991	0	4	0	0	26	13	17	39	0	0	23
1991-1992	8	0	0	12	12	16	12	36	4	0	25
1992-1993	7	4	0	15	7	0	4	59	4	0	27
1993-1994	0	17	0	5	11	39	17	0	0	0	18
1994-1995	0	0	0	12	6	18	23	41	0	0	17
1995-1996	0	27	0	13	33	0	27	0	0	0	15
Unit 25B											
1987-1988	0	0	0	17	17	33	17	17	0	0	6
1988-1989	0	0	0	17	50	8	17	8	0	0	12
1989-1990	0	0	0	20	60	0	0	20	0	0	5
1990-1991	0	0	0	0	20	20	0	60	0	0	5
1991-1992	0	0	0	0	69	8	15	8	0	0	13
1992-1993	0	0	0	0	7	33	27	33	0	0	15
1993-1994	0	0	0	8	25	6	0	8	0	0	12
1994-1995	0	0	0	19	0	44	19	19	0	0	16
1995-1996	0	14	0	0	7	36	29	14	0	0	14
Unit 25D											
1987-1988	0	0	0	0	50	33	17	0	0	0	6
1988-1989	0	0	0	0	50	0	50	0	0	0	2
1989-1990	0	0	0	0	42	0	25	33	0	0	12
1990-1991	0	8	0	0	8	8	0	75	0	0	24
1991-1992	0	0	0	0	0	5	21	74	0	0	19
1992-1993	0	0	0	9	18	0	64	0	9	0	11
1993-1994	0	0	0	0	32	26	10	26	5	0	19
1994-1995	0	0	0	25	0	16	22	28	3	6	32
1995-1996	0	0	0	6	23	29	6	35	0	0	17
Unit 26B											
1987-1988	0	0	0	0	0	0	33	33	33	0	3
1988-1989	0	13	0	7	33	0	0	40	7	0	15
1989-1990	18	18	0	27	18	9	0	9	0	0	11
1990-1991	16	8	0	4	0	4	0	4	64	0	25
1991-1992	18	6	0	0	24	12	0	18	24	0	17
1992-1993	3	0	0	0	0	0	3	58	36	0	31
1993-1994	7	13	0	3	0	3	33	23	17	0	30

Table 2 Continued

Regulatory year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
1994-1995	0	44	0	6	12	0	0	19	19	0	16
1995-1996	0	0	0	8	15	8	15	8	46	0	13
Unit 26C											
1987-1988	50	0	0	0	0	0	0	0	50	0	2
1988-1989	0	67	0	0	0	0	0	0	33	0	3
1989-1990	100	0	0	0	0	0	0	0	0	0	1
1990-1991	25	0	0	25	0	0	0	0	50	0	12
1991-1992	100	0	0	0	0	0	0	0	0	0	5
1992-1993	17	33	0	0	0	0	0	50	0	0	6
1993-1994	0	0	0	0	0	0	0	0	0	0	0
1994-1995	20	40	0	0	0	0	0	40	0	0	5
1995-1996	0	50	0	0	0	0	0	50	0	0	2

Table 3 Units 25A, 25B, 25D, 26B, and 26C harvest percent by transport method, 1987–1995

Regulatory Year	Method of transportation: Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
Unit 25A									
1987-1988	73.3	6.7	3.3	0.0	16.7	0.0	0.0	0.0	30
1988-1989	10.0	20.0	10.0	0.0	60.0	0.0	0.0	0.0	10
1989-1990	21.4	28.6	0.0	0.0	35.7	0.0	14.3	0.0	14
1990-1991	0.0	13.0	4.3	0.0	69.6	0.0	0.0	13.0	23
1991-1992	8.0	8.0	0.0	0.0	72.0	0.0	0.0	12.0	25
1992-1993	11.1	0.0	0.0	0.0	77.8	0.0	3.7	7.4	27
1993-1994	11.1	0.0	5.5	0.0	83.3	0.0	0.0	0.0	18
1994-1995	23.5	0.0	0.0	0.0	76.4	0.0	0.0	0.0	17
1995-1996	13.3	46.6	0.0	0.0	40.0	0.0	0.0	0.0	15
Unit 25B									
1987-1988	0.0	16.7	0.0	0.0	66.7	0.0	16.7	0.0	6
1988-1989	0.0	16.7	0.0	0.0	83.3	0.0	0.0	0.0	12
1989-1990	60.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	5
1990-1991	20.0	0.0	0.0	0.0	80.0	0.0	0.0	0.0	5
1991-1992	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	13
1992-1993	6.7	13.3	0.0	0.0	66.7	0.0	0.0	13.3	15
1993-1994	0.0	41.7	8.3	0.0	50.0	0.0	0.0	0.0	12
1994-1995	0.0	6.3	0.0	0.0	75.0	0.0	0.0	18.8	16
1995-1996	0.0	7.1	14.2	0.0	78.5	0.0	0.0	0.0	14
Unit 25D									
1987-1988	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	6
1988-1989	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	2
1989-1990	8.3	0.0	0.0	0.0	91.7	0.0	0.0	0.0	12
1990-1991	54.2	0.0	0.0	0.0	45.8	0.0	0.0	0.0	24

Table 3 Continued

Regulatory Year	Method of transportation: Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
1991-1992	57.9	0.0	0.0	0.0	42.1	0.0	0.0	0.0	19
1992-1993	9.1	0.0	0.0	0.0	81.8	0.0	9.1	0.0	11
1993-1994	10.5	0.0	0.0	0.0	89.4	0.0	0.0	0.0	19
1994-1995	9.3	0.0	0.0	0.0	90.6	0.0	0.0	0.0	32
1995-1996	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	17
Unit 26B									
1987-1988	33.3	0.0	0.0	0.0	0.0	0.0	33.3	33.3	3
1988-1989	13.3	0.0	0.0	0.0	46.7	0.0	33.3	6.7	15
1989-1990	18.2	0.0	0.0	9.1	0.0	0.0	63.6	9.1	11
1990-1991	12.0	0.0	0.0	0.0	16.0	0.0	20.0	52.0	25
1991-1992	17.6	5.9	0.0	0.0	23.5	0.0	52.9	0.0	17
1992-1993	3.2	0.0	0.0	0.0	12.9	0.0	83.9	0.0	31
1993-1994	10.0	0.0	0.0	0.0	40.0	0.0	48.2	3.3	
1994-1995	37.5	0.0	6.2	0.0	6.2	0.0	43.7	6.2	16
1995-1996	0.0	0.0	0.0	0.0	46.2	0.0	38.5	15.4	13
Unit 26C									
1987-1988	50.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	2
1988-1989	66.7	0.0	0.0	0.0	33.0	0.0	0.0	0.0	3
1989-1990	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
1990-1991	25.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	12
1991-1992	60.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	5
1992-1993	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	6
1993-1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
1994-1995	60.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	5
1995-1996	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	2

LOCATION

GAME MANAGEMENT UNIT: Unit 26A (56,000 mi^2)

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

Wolf numbers in Unit 26 have fluctuated widely since the turn of the century. During the early 1900s, caribou, moose, and wolves were less abundant than they are today. Caribou and moose numbers increased after 1930, and by the 1940s wolves were abundant. Wolf numbers were greatly reduced by federal wolf control during the 1950s and by public aerial hunting during the 1960s. Following the ban on aerial wolf hunting in 1970 and land-and-shoot aircraft hunting of wolves in 1982, wolf populations increased, especially in the mountains and foothills of the Brooks Range. Wolves are less abundant on the coastal plain because of the seasonal scarcity of caribou, outbreaks of rabies, and their vulnerability to hunters in the open country.

The reported annual harvest of wolves in recent years has ranged from 13 to 30 animals, but the actual annual harvest has ranged from approximately 55 to 112. The pelts of most wolves harvested in Unit 26A are used locally for the manufacture of parka ruffs or handicrafts and often are not sealed. The harvest of wolves is greatest in the southeastern part of Unit 26A where residents of Anaktuvuk Pass and Nuiqsut hunt and trap wolves throughout the winter.

Stephenson and James (1982) estimated the wolf population size for Unit 26A at 144–310 wolves in 1982. Trent (1988) surveyed a 16,848 km^2 (6480 mi^2) area around Umiat and estimated density in 1986 at 2.6 wolves/1000 km^2 and 2.7–3.2 wolves/1000 km^2 in 1987. Carroll (1994) surveyed a 23,293 (8955 mi^2) using a Traditional Track Count method and a 10,340 km^2 (3994 mi^2) area around Umiat using a Track Intercept Probability technique in 1992 and estimated the density of wolves to be 4.2 wolves/1000 km^2.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

1 Maintain viable wolf populations in Unit 26A.

- Monitor the population density of wolves in the most heavily hunted area in Unit 26A once every 3 years.
- Monitor harvest through the statewide sealing program by interviewing knowledgeable people in the villages and working with the North Slope Borough (NSB) to develop a more effective harvest monitoring program.
- Interview hunters, guides, and pilots to collect harvest and population status information.

2 Determine impact of wolves on Unit 26A moose populations.

- Monitor the wolf population by conducting surveys in the primary moose habitat area once every 3 years.

- Record wolf observations during moose counts and compare to observations made during past counts.

3 Involve the public in developing a management plan and in making future management decisions concerning wolves.

METHODS

A Sample Unit Probability Estimator (SUPE) sample design was used to census wolves in a 10,343 km^2 area bordered by the Colville, Killik, and Itkillik Rivers and Gunsight Mountain and a 15,293 km^2 area directly north of the Colville River. Surveys were flown using a PA-18 and a Scout aircraft on 8 and 9 April 1994. The study area was divided into 4 x 4 mile sample units. The units were classified into high, medium and low categories, according to the likelihood they contained fresh wolf tracks. We randomly selected units to be surveyed, with proportionally the most units in the "high" category surveyed, "medium" second, and "low" third. Surveys were flown 2 days after a snowfall. Each selected unit was searched thoroughly to determine whether or not fresh wolf tracks were present. When tracks were found we followed them to determine how many wolves were in the pack, and what course the wolves had followed since the last snowfall. A population estimate for the area was obtained using the number of wolves counted and by determining the probability of observing wolf tracks on the survey, which is a function of the number and category of sample units containing wolf tracks. To prepare accurate estimates, a researcher must not miss any wolf tracks in the selected sample units, correctly identify all sample units that a set of tracks passes through, and correctly enumerate the number of wolves in the packs (Becker, in press).

We collected harvest data from sealing certificate records and informal discussions with knowledgeable village residents. Harvest data for some villages was obtained through the NSB Harvest Documentation Program which maintains monitoring in each village. We received composition data from wolf carcasses collected by hunters at Anaktuvuk Pass.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We used the SUPE surveying method during April of 1994 and counted 43 wolves in 10 Packs that were considered residents of the 10,343 km^2 study area (Table 1). Wolves are defined as resident when the majority of their fresh tracks occurred within the study area. This resulted in a population estimate of 43 to 46 wolves (4.12–4.15 wolves/1000 km^2) at the 80% confidence interval. A reasonable point estimate for density within the survey area was approximately 4.1 wolves/1000 km^2.

Density of wolves in the study area has apparently been stable in recent years but has increased since the 1990s. A transect–intercept probability sampling design survey in the same area during 1992 resulted in a density estimate of 4.2 wolves/1000 km^2. Traditional Track Count surveys conducted during 1986 and 1987 in approximately the same area as the 1992 and 1994 surveys resulted in lower density estimates of 2.6 wolves/1000 km^2 and 2.7–3.2 wolves/1000 km^2, respectively (Trent 1988).

On 10 April 1994 a 15,293 km^2 area directly to the north of the Colville River was surveyed. Although wolves had been seen in the area previously, there were no wolves seen in the area during the survey. The wolves had probably followed caribou that moved out of the area.

Wolf sightings were logged during 35 hours of a moose census conducted in Unit 26A during 6–9 April 1995, and 16 wolves were observed. During the spring 1991 moose census 29 wolf sightings were recorded in 39 hours of flight.

We estimated the number of wolves in Unit 26A in 1993. Assuming that most of the coastal plain has a lower wolf density than the foothill region where we surveyed, we estimated that 240–390 wolves (1.8–2.9 wolves/1000 km^2) in 32 to 53 packs were resident in Unit 26A.

Population Composition

Staff collected necropsy data on wolves harvested at Anaktuvuk Pass from the winters of 1985–1986 to 1992–1993. Out of 110 wolf carcasses examined at Anaktuvuk Pass during 1990–91, 73 were from wolves harvested in Unit 26A. Forty-six (42%) were males, 52 (47%) were females, and 12 (11%) were unknown. Of 82 carcasses that were aged, 37 (45%) were adults and 45 (55%) were pups. Ninety-three (85%) of the wolves were gray or white, and 17 (15%) were black. Sixty-seven (61%) of these wolves were shot and 43 (39%) were trapped. Fifteen were caught during December, 23 during January, 23 during February, and 44 during March.

We examined 52 carcasses during 1991–1992. Thirty-five were from wolves harvested in Unit 26A. Twenty-eight (54%) were males, 23 (44%) were females, and 1 was unknown. Twenty-three (44%) were pups, 15 (29%) were adults, and 4 were of unknown age. Eight (15%) animals were black, 43 (81%) were gray, and one was unknown. Twenty (38%) were shot and 32 (62%) were trapped.

Of the 48 carcasses examined at Anaktuvuk Pass during 1992–1993, 21 were taken in Unit 26A. Ten (48%) were males, 2 (10%) were females, and 9 were unknown. Twelve (57%) were shot and 9 (43%) were trapped. All were gray.

No composition data was available from Anaktuvuk Pass after 1993. Composition of the harvest probably does not reflect accurate age composition because pups are more susceptible to harvest than adults. Composition data from sources other than hunter harvest are not available at this time.

Distribution and Movements

Most wolves are in the southern portion of Unit 26A near the Brooks Range and along the Colville River. However, residents have seen wolves in increasing numbers on the coastal plain

during recent years. Wolves often move toward areas of high caribou concentration. For instance, during the winters of 1990–1991 and 1993–1994, many caribou concentrated near Anaktuvuk Pass which attracted wolves and resulted in a large wolf harvest.

MORTALITY

Harvest

Season and Bag Limit

Unit 26A

Trapping	No limit	1 Nov–15 Apr
Hunting	10 wolves	10 Aug–30 Apr

Board of Game Actions and Emergency Orders. The Board of Game made it legal under trapping regulations to shoot a wolf the same day airborne if the wolf is either caught in a trap or snare or over 300 feet from the airplane at the time of taking.

Hunter/Trapper Harvest. During the 1993–1994 season, 60 wolves were sealed (Table 2). Thirty-nine (65%) were males and 18 (31%) were females and 3 (4%) were unknown. Forty-three (72%) were gray, 10 (17%) were black, and 5(11%) were white.

During the 1994–1995 reporting period, 47 wolves were sealed. Thirty-two (68%) were males and 15 (32%) were females. Forty-two (90%) of the wolves were gray, 3 (6%) were black, and 2 (4%) were white. The NSB Department of Wildlife Management began a Harvest Documentation Project in 1994 and published minimum and estimated total wolf harvest for the following villages: Nuiqsut - minimum 18, estimated total 19 and Anaktuvuk Pass - minimum 59, estimated total 61.

During the 1995–1996 season, 29 wolves were sealed. Seventeen (59%) were males, 9 (30%) were females, and 3 (11%) were unknown. Twenty-two (79%) of the wolves were gray, 5 (17%) were black, 1 (3%) was white, and 1 was unknown.

Hunter Residency and Success. In 1993–1994, 15 North Slope residents harvested 51 wolves, 4 nonlocal state residents harvested 9 wolves, and no wolves were reported harvested by nonresidents. During 1994–1995, 18 North Slope residents harvested 42 wolves, 1 nonlocal state resident harvested 1 wolf, and 4 nonresidents harvested 4 wolves. In 1995–96 all 19 reported wolves were harvested by 8 North Slope residents. There is no information on the number of unsuccessful hunters.

Method of Take, Transportation, and Chronology. The method of take, transportation, and chronology are summarized in Tables 3 and 4. During 1993–1994, 40 (66%) animals were ground shot, 19 (33%) were trapped, and 1 (1%) was snared. Fifty-one (85%) animals were taken by hunters using snowmachines for transportation, 5 (8%) were taken by hunters using aircraft, and 4 (7%) were taken by hunters using skis. The chronology of harvest was: August – 2, September – 5, November – 1, December – 4, January – 2, February – 5, March – 29, and April – 12.

During 1994–1995, 39 (83%) animals were ground shot, 7 (15%) were trapped, and 1 (2%) was snared. Thirty-six (76%) animals were taken by hunters using snowmachines for transportation, 10 (22%) were taken by hunters using aircraft, and 1 (2%) was taken by a hunter using skis. The chronology of harvest was: August – 2, September – 2, November – 3, December – 5, January – 2, February – 10, March – 13, and April – 10.

During 1995–96, 14 (74%) animals were ground shot, 4 (21%) were trapped, and 1 (5%) was snared. Eighteen (95%) animals were taken by hunters using snowmachines for transportation, and 1 (5%) was taken by a hunter using a boat. The chronology of harvest was as follows: September – 1, November – 3, March – 11, April – 1, and May – 3.

Other Mortality

We have no information to report on other sources of mortality.

HABITAT

Assessment

Unit 26A contains an extensive seasonal prey base available to wolves. The Western Arctic Caribou Herd (WAH), which numbers over 450,000 animals, seasonally occupies parts of Unit 26A and a portion of this herd remains throughout the winter. The Teshekpuk Lake Caribou Herd (TLH) numbers over 25,000, and most of this herd remains in the unit during most years.

The Colville River moose population included 1600 moose by 1991 and provided a consistent prey base, but in recent years the moose population has declined sharply. Snowshoe hares have moved into the area and increased dramatically during this same time, possibly compensating for the reduction of moose as a food source for wolves.

CONCLUSIONS AND RECOMMENDATIONS

The results of TTC and TIP wolf population surveys conducted in the southeast corner of the Unit 26A during April 1992 indicate the density of wolves increased from 2.6 and 3.2 wolves/1000 km^2 during 1986 and 1987 to 4.2 wolves/1000 km^2 during 1992. A SUPE sample design was used in the study area in 1994 and a density estimate of 4.1 wolves/1000 km^2 was calculated, indicating the population remained stable during the 2 year period. This study area, located in the foothills of the Brooks Mountain Range bordered by the Colville, Killik, and Itkillik Rivers, is important because: 1) it supports more harvest of wolves than any other area in Unit 26A and 2) it represents the most productive moose habitat in Unit 26A. By periodically estimating wolf density for the area, we will attempt to detect overhunting of wolves and better monitor the effect of wolf predation on the moose population.

Because many North Slope residents do not seal their wolf pelts, the department's wolf sealing program does not provide accurate harvest information. Department personnel have been assisting the NSB develop a harvest documentation system which is more acceptable to local residents. Harvest monitors have been hired in each village and are collecting harvest information for several species. Wolf harvest data for some of the villages for the 1994–1995 season are reported in this document. The NSB found during 1994–1995 that at least 59 wolves were harvested in

Anaktuvuk Pass while 17 were sealed and that 18 were harvested in Nuiqsut while 0 were sealed. We will have more accurate harvest information as the NSB program becomes established in more North Slope villages.

A wolf management plan for the North Slope was developed during 1992 and 1993. In developing the management plan, public meetings were held in North Slope villages, and local governments and federal management agencies were consulted. Most local people agreed that: 1) a moderate level of harvest of wolves should continue, 2) wolf pelts are highly prized and are a valuable resource for North Slope residents, 3) wolf control is unnecessary on the North Slope at this time, 4) residents oppose using aircraft to harvest wolves, and 5) if wolf populations do become too large, local people could use ground hunting methods to control the populations.

Wolf predation may be adversely affecting Dall sheep and moose populations in Unit 26A. Sheep populations have declined in number throughout the Brooks Range, and hunters have reported finding the remains of many sheep that apparently were killed by wolves in the mountains. The Colville River moose population has also declined by 50–75% since 1991. Several factors seem to be involved in this decline, one of which is wolf predation. Wolf surveys and moose counts, physical examinations, sampling, and radiotelemetry surveys will continue to help determine effects that wolves have on the moose population.

Open terrain combined with moderate to high wolf numbers makes the North Slope one of the best places for people to observe and photograph wolves. Residents and visitors commonly see wolves, especially in the mountains and foothills.

I recommend no changes in bag limits or seasons at this time because wolves are fairly abundant in Unit 26A and the population is stable or increasing. Because aerial hunting is not allowed, extensive areas in Unit 26A receive little hunting pressure. Except for the area within 50–70 miles of Anaktuvuk Pass, much of the wolf population inhabiting the foothills of the Brooks Range probably will not be heavily utilized. On the coastal plain, wolf numbers seem to be increasing but will continue to be vulnerable to hunters on snowmachines and probably will not become plentiful.

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Table 1 Wolf population estimates for Unit 26A and the Colville River study area, 1982-1994

	Colville River Study Area		Unit 26A		
Year	Wolves per 1000 km^2	Number of packs	Population estimate	Number of packs	Basis of estimate
1982			144-310		TTC survey[b] and extrapolation to rest of unit.
1986	2.6	2			TTC survey[b]
1987	2.7-3.2	4-5			TTC survey[b]
1990			145-350	14-30	Past surveys and interviews with pilots and hunters.
1992	2.9-4.2	4-8			TTC survey[b]
1992	4.0-6.2	5-8			TIP survey[c]
1993			240-390	32-53	1992 surveys and interviews with pilots and hunters.
1994	4.1-4.3	8-10			SUPE survey[d]

[a] Colville Study Area - southeast portion of Unit 26A bordered by the Colville, Killik, and Itkillik Rivers and the Brooks Range.
[b] Traditional Track Count survey.
[c] Track Intercept Probability survey.
[d] Sample Unit Probability Estimator survey

Table 2 Sex and color of wolves from reported harvests and estimated unreported harvest, Unit 26A, 1989-1996

Regulatory year	Sex			Color			Estimated unreported harvest	Total reported harvest
	% Male	% Females	% Unknown	% Gray	% Black	% White		
1988-89	38	62		100	0	0		13
1989-90	71	29		64	29	7	48	14
1990-91	66	34		83	13	3	82	30
1991-92	67	28		72	22	6	37	18
1992-93	59	30	11	79	17	3	42	29
1993-94	65	32	3	72	17	11	37	60
1994-95	73	27	0	89	6	5	32	47
1995-96	42	58	0	85	9	6	41	19

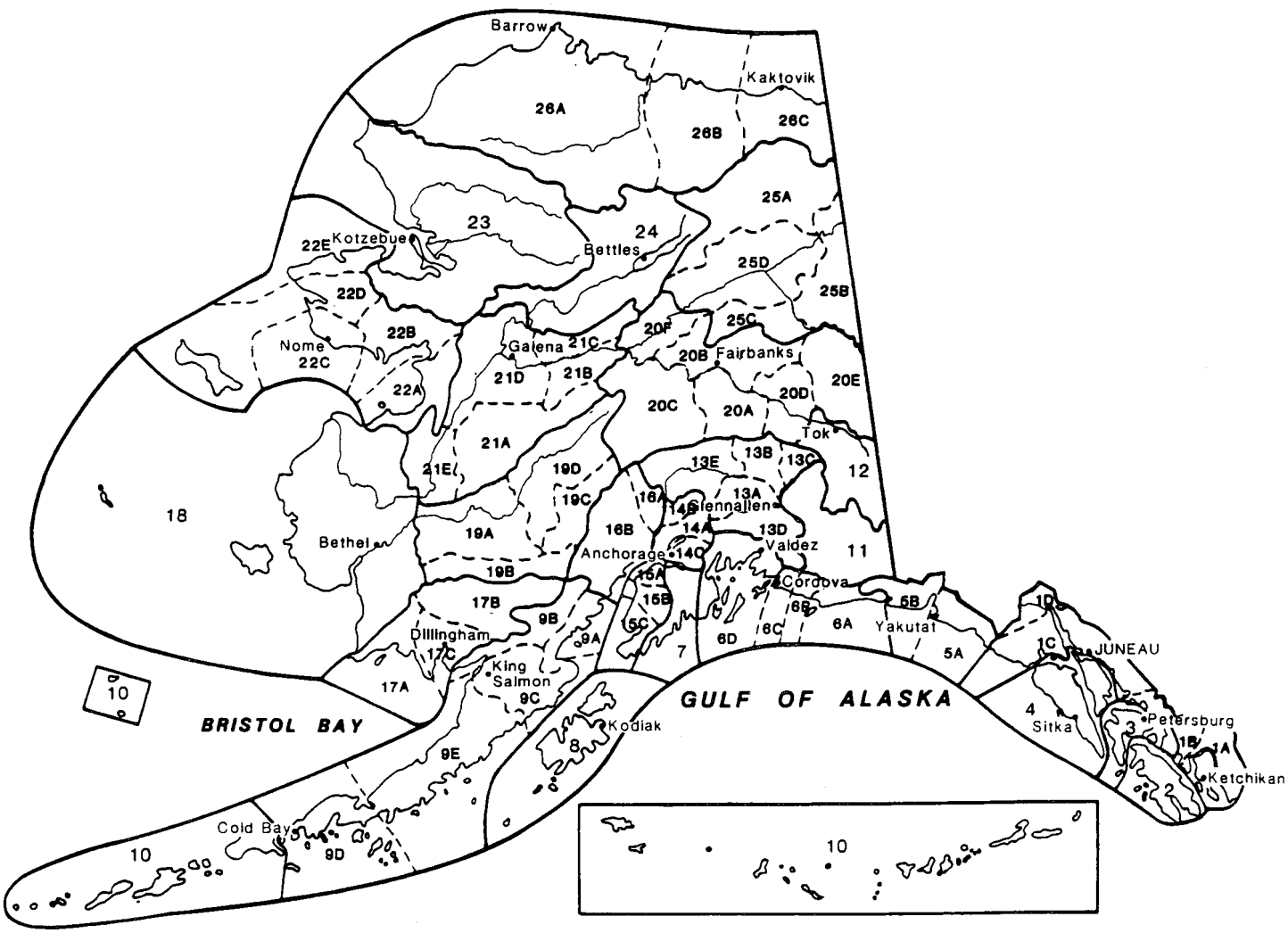
Table 3 Method and transportation percent of reported wolf harvest, Unit 26A, 1988-1996

Regulatory year	Method of take (%)				Transportation method (%)				Total reported harvest
	Trap	Rifle	Snare	Unknown	Aircraft	Snowgo	ORV	Boat	
1988-89	15	85				100			13
1989-90	64	36			15	85			14
1990-91	20	80			3	90	7		30
1991-92	39	61			6	94			18
1992-93	30	63		7	7	89	4		29
1993-94	33	66	1		8	85	0	7	60
1994-95	7	90	3		28	72			47
1995-96	21	74	5			95		5	19

Table 4 Chronology for reported wolf harvest in Unit 26A, 1988-1996

	Month											
Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Unknown	Total
1988-89	1				1		2	9				13
1989-90		2		1	2	2	2	5				14
1990-91		1			3			22	4			30
1991-92		1				2	1	11	3			18
1992-93		2		2	2			18	4		1	29
1993-94	2	5		1	4	2	5	29	12			60
1994-95	2	2		3	5	2	10	13	10			47
1995-96		1		3				11	1	3		19

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.

Craig Flatten

Chris Farmer checks the radio collar of a wolf on Heceta Island