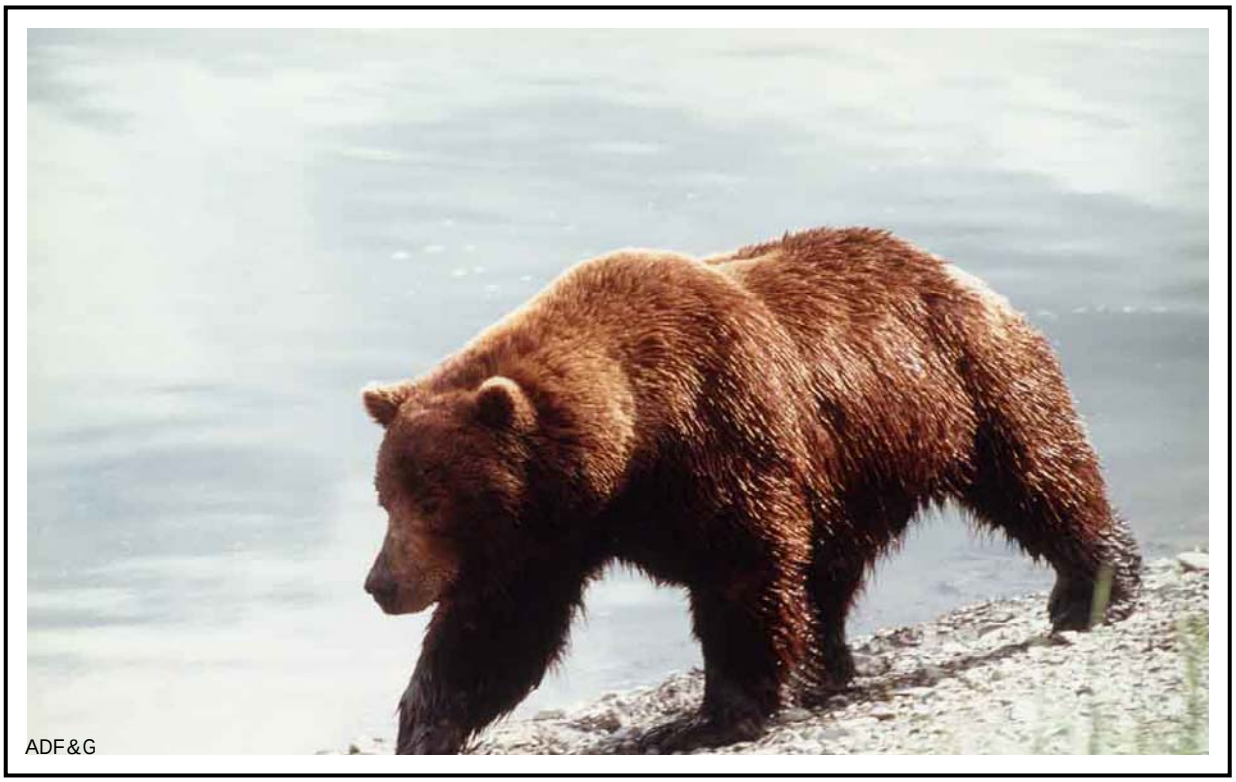
Brown Bear
Management Report
of survey-inventory activities
1 July 1998–30 June 2000

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2001



Please note that population and harvest data in this report are estimates and may be refined at a later date.

If this report is used in its entirety, please reference as: Alaska Department of Fish and Game. 2001. Brown bear management report of survey-inventory activities 1 July 1998–30 June 2000. C. Healy, editor. Project 4.0. Juneau, Alaska. 324 p.

If used in part, the reference would include the author's name, unit number, and page numbers. Authors' names can be found at the end of each unit section.

Funded in part through Federal Aid in Wildlife Restoration, Proj. 4, Grants W-27-2 and W-27-3.

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

GEOGRAPHIC DESCRIPTION: Prince William Sound and North Gulf Coast

BACKGROUND

Brown bears inhabit most of Unit 6, with the exception of islands and mainland of western Unit 6D and Middleton Island in the Gulf of Alaska. Brown bears are common on the mainland east of Columbia Glacier to Icy Bay and on Hinchinbrook, Montague, Hawkins, and Kayak Islands. Distribution in Unit 6D appears unchanged from that observed by Heller (1910). Brown bear numbers increased during the mid-to-late 1990s in Unit 6. The bear population on Montague Island is recovering from excessive harvest that occurred during the 1970s and early 1980s.

Harvest is monitored by mandatory sealing that began in 1961. Total annual harvest increased substantially in the late 1980s and continued at a high level through 1992–1993. Average annual kill during regulatory years 1961–1962 through 1986–1987 was 32 bears (range = 14–63). During 1987–1988 through 1991–1992, the average yearly harvest was 50 bears (range = 40–60). Most of the increased harvest was in Unit 6D, probably resulting in a population decline. Because of seasonal restrictions established to reduce harvest, the average harvest in Unit 6 declined to 35 bears (range = 22-48) from 1992–1993 through 1997–1998.

The Board of Game changed the bag limit for brown bears in Units 6A, 6B, and 6C from 1 bear/4 years to 1 bear/year beginning in 1997 for resident hunters only. This was in response to low moose calf survival in Unit 6B and increasing bear numbers in these units.

Logging threatens brown bear abundance and distribution in Unit 6A. Extensive clearcutting of old-growth timber on private and state land is in progress between Icy Bay and Cape Yakataga. Old-growth stands are important habitat for coastal bears (Schoen 1990, Schoen and Beier 1990, Schoen et al. 1986). Logging also provides access roads, increases human activity, and stimulates developments that increase bear-human interactions that lead to increased brown bear mortality (McLellan and Shackleton 1988, Smith and VanDaele 1989). The proposed Carbon Mountain logging road would increase human access to currently remote backcountry in Units 6A and 6B. The Exxon Valdez Oil Spill (EVOS) Trustee Council has recently acquired or protected most lands scheduled for timber harvest in Unit 6D, thus removing the threat of continued, large-scale habitat loss in Prince William Sound (PWS).

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Maintain a brown bear population capable of sustaining a minimum annual harvest of 35 bears to include a minimum of 60% males, with a minimum average skull size of 23 inches.

METHODS

Griese (1991) established baseline estimates of brown bear numbers and density in Unit 6. Bear habitat was defined as non-glaciated land below 3000 ft elevation, quantified by harvest areas (major drainages or other gross geographical characteristic), and summed for each unit. Griese (1991) estimated bear density and numbers within harvest areas using den and track surveys and local knowledge. Densities were extrapolated to entire harvest areas. Bear populations for each harvest area are updated annually, based on the trend and harvest from the previous season, incidental observations, and input from local hunters and guides. A spreadsheet is used to update densities and calculate annual allowable harvest for each of 11 harvest areas (Nowlin 1995).

Annual allowable harvest (AAH) of all bears was estimated as 5% of the total population (Griese 1991, Nowlin 1993). AAH of females greater than 2 years old was estimated as 2% of the population. Because reproduction and survival data were not available for Unit 6, this rate was arbitrarily set at a level slightly more conservative than the 5.7% and 2.5% recommended for ideal conditions (Miller 1988, 1990).

I estimated the total harvest by summing reported harvest and estimated illegal kill. The reported harvest included all bears that were sealed after being taken by hunters or killed for other reasons, such as defense of life or property. Information collected included sex, age, and skull size of the bear, date and location of kill, hunter residency, number of days hunted, and method of transportation. Unsuccessful hunters were not required to report. I estimated the illegal kill based on previous years estimates (Nowlin 1998) and anecdotal information.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

The estimated brown bear population in Unit 6 was 850 bears with an increasing trend (Table 1). The greatest numbers were in Units 6D (≅310) and 6A (≅290), and followed by Units 6B (≅140) and 6C (≅120). In Unit 6D the population had declined by 1991 to about 300 bears because of excessive harvests. Lower harvest (except for 1997-1998) and high productivity in Unit 6D through 1999–2000 resulted in an increase in population (Table 1).

Montague Island in Unit 6D had an increasing population of about 60 bears (Table 1). The fall hunting season was closed in 1989 and in the spring season in 1994. It is particularly sensitive to overharvest because the population is small and isolated from the mainland. Historically, it probably had much higher numbers. Overharvest that began in the 1970s reduced the population (Griese 1990) and threatened its viability. Inbreeding in small, isolated populations, such as Montague Island, probably reduces genetic variability and may increase the danger of extinction (Mills and Smouse 1994, Randi et al. 1994). However, genetic isolation is not complete on Montague. During the last decade 6–8 brown bears were transported from Valdez and Cordova

and released on Montague Island. In addition, anecdotal evidence suggests that bears may occasionally swim from Hinchinbrook Island to Montague.

Density estimates for Unit 6 compared favorably to Miller's (1993) estimates from elsewhere in south coastal Alaska. Hinchinbrook Island was within a high-density range (>175 bears/1000 km^2) that included Kodiak Island, much of the Alaska Peninsula, and parts of Southeast Alaska. Montague Island, eastern PWS, and the north gulf coast had midrange density (40–175 bears/1000 km^2), consistent with contiguous coastal habitat to the southeast and with the northern Alaska Peninsula. Western PWS was low density (<40 bears/1000 km^2), similar to the adjacent Kenai Peninsula.

MORTALITY

Harvest

Season and Bag Limit. The hunting season for all hunters in Units 6A, 6B, and 6C was 1 September to 31 May. The Unit 6D season, except Montague Island, was 15 October to 15 May for all hunters. Before 1997–1998 the bag limit was 1 bear every 4 regulatory years. This was changed to 1 bear every regulatory year for resident hunters in Units 6A, 6B, and 6C in 1997, and the season for Unit 6D was changed to 15 October to 25 May. Taking cubs (bears ≤ 2 years old) or a female accompanied by cubs was prohibited. There was no open season on Montague Island.

Hunter Harvest. Reported kill during 1998–1999 and 1999–2000 for Unit 6 was 61 and 48, respectively (Table 1). Most of the harvest occurred in Units 6A (26 and 21 bears per year), and 6D (19 and 18 bears per year).

During 1998–1999 males were 71% of the reported kill, and in 1999–2000 males were 69%, of the reported kill (Table 2). Mean skull sizes among males were 23 and 24 inches, similar to mean skull sizes from the past 5 years. (Table 3).

Reported kill of all bears was ≤ AAH in 5 of 11 harvest areas during 1998–1999 and 8 of 11 during 1999–2000 (Table 1). Reported kill of females >2 years old was ≤ AAH in all harvest areas during both years except on Hinchinbrook Island in 1998. AAH in the Rude River-Ellamar area of Unit 6D was exceeded during the last 3 years (Table 1) because of increasing popularity of bear hunting in PWS and successful guiding operations. This raises concerns for overharvest. However, average skull size (23 inches) and age (5 years) of male bears in the area during the last 15 years has remained unchanged compared to the harvest of the last 3 years. A continued increase in harvest in the Rude River-Ellamar area may require a regulatory change.

The change in bag limit for resident hunters has had little effect on bear harvest in Unit 6C. Beginning in 1997 there was a shift toward more local hunters and fewer non-local hunters in Unit 6C, but harvest remained average. Local hunter interest resulted in a record high harvest during 1998 in Unit 6B, and an increase in harvest in Unit 6A (Table 4). Allowable harvest was exceeded in the Cape Suckling-Katalla area of Unit 6A during both regulatory years (Table 1). This area is more accessible to local bear and moose hunters than the remainder of 6A, where bear harvest did not substantially increase.

Hunter Residency. Nonresidents harvested the majority of brown bears in Unit 6 during 1998–1999 (49%) and 1999–2000 (54%) (Table 4). In Unit 6C local residents, hunters took the highest proportion of the harvest.

Harvest Chronology. Peak brown bear harvests occurred during September and May each year in Unit 6 (Table 5). Seasonal chronology varies by unit, with most bears taken in the fall in Unit 6A, a tendency toward higher fall harvest in Units 6B and 6C, and higher spring harvest in Unit 6D because of the later fall opening date.

Transport Methods. Airplanes were the most important method of transportation overall in Unit 6 (Table 6). In Unit 6C, highway vehicles and boats predominated because of road and boat launch access. In Unit 6D, boats and aircraft were important because of the sheltered waters of PWS. These patterns were typical of the past 5 years.

Other Mortality

Nonhunting and estimated illegal kill totaled 11 and 12 bears in 1998–1999 and 1999–2000, respectively (Table 2). This was similar to the last reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

As clearcut logging continues in Unit 6A, brown bear habitat quality will decline, access will improve, and nonhunting mortality will probably increase. The Alaska Mental Health Trust continues to log timber left by previous operators as buffers and wildlife habitat in eastern Unit 6A. The University of Alaska logging operation is moving into the Yakataga and Duktoth River Valleys north of Cape Yakataga. Neither state agency is required to protect brown bear habitat.

CONCLUSIONS AND RECOMMENDATIONS

We achieved our management objectives for brown bears in Unit 6. We maintained a population capable of sustaining a harvest of 35 bears and had a minimum of 60% males in the kill with an average skull size of at least 23 inches.

Brown bear numbers were increasing during the reporting period despite exceeding 5% AAH in some hunt areas. We will continue to monitor the effect of the 1-bear/year bag limit in Units 6A–C. The bag limit was changed without scientific evidence that brown bears were contributing significantly to moose calf mortality, although bears are often seen feeding on calves. Harvest in eastern Unit 6D may require regulatory changes if the increasing trend continues.

Brown bear den and track surveys should be resumed in areas of concern, including Montague Island and eastern Unit 6D.

LITERATURE CITED

GRIESE, H.J. 1990. Unit 6 brown bear survey-inventory report. Pages 27–83 *in* S.O. Morgan, ed. Annual report of survey-inventory activities. Part V. Brown bear. Vol. XX. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report Project W-23-2, Study 4.0. Juneau. 189pp.

———. 1991. Unit 6 brown bear survey-inventory performance report. Pages 33–47 *in* S.M. Abbott, ed. Annual performance report of survey-inventory activities. Part V. Brown Bear. Vol. XXII. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report Project W-23-4. Study 4.0. Juneau. 271pp.

HELLER, E. 1910. Mammals of the 1908 Alexander Alaska expedition, with descriptions of the localities visited and notes on the flora of the Prince William Sound region. University of California. Publication 5(11):321–360.

MCLELLAN, B.N. AND D.M. SHACKLETON. 1988. Grizzly bears and resource extraction industries: effects of roads on behavior, habitat use and demography. Journal of Applied Ecology. 25:451–460.

MILLER, S.D. 1988. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bear populations in Alaska Game Management Unit 13. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Final Report Project W-22-6, Job 4.21. Juneau. 151pp.

———. 1990. Population management of bears in North America. International Conference on Bear Research and Management. 8:357–373.

———. 1993. Brown bears in Alaska: a statewide management overview. Wildlife Technical Bulletin Nr. 11. Alaska Department of Fish and Game, Juneau. 40 pp.

MILLS, L.S. AND P.E. SMOUSE. 1994. Demographic consequences of inbreeding in remnant populations. American. Naturalist. 144:412–431.

NOWLIN, R.A. 1993. Unit 6 brown bear management report of survey-inventory activities. Pages 34–48 *in* S.M. Abbott, ed. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. W-23-4 and W-23-5. Study 4.0. Juneau. 283 pp.

———. 1995. Unit 6 brown bear management report of survey-inventory activities. Pages 35–57 *in* M.V. Hicks, ed. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. W-24-1 and W-24-2. Study 4.0. Juneau. 303 pp.

———. 1998. Unit 6 brown bear management report of survey-inventory activities. Pages 32–54 *in* M.V. Hicks, ed. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. W-24-3 and W-24-4. Study 4.0. Juneau. 270 pp.

RANDI, E. L. GENTILE, G. BOSCAGLI, D. HUBER, AND H.U. ROTH. 1994. Mitochondrial DNA sequence divergence among some west European brown bear (*Usus arctos L*) populations. Lessons for conservation. *Heredity*. 73:480–489.

SCHOEN, J.W. 1990. Bear habitat management: a review and future perspective. International Conference on Bear Research and Management. 8:143–154.

———. AND L.R. BEIER. 1990. Brown bear habitat preferences and brown bear-logging relationships in southeast Alaska. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Final Report. Project W-22-6, Job 4.17. Juneau. 27pp.

———, ———, J.W. LENTFER, AND L.J. JOHNSON. 1986. Denning ecology of brown bears on Admiralty and Chichagof Islands. International Conference on Bear Research and Management. 7:293–304.

SMITH, R.B. AND L.J. VAN DAELE. 1989. Impacts of hydroelectric development on brown bears, Kodiak Island, Alaska. International Conference on Bear Research and Management. 8:93–103.

PREPARED BY:

David W. Crowley
Wildlife Biologist III

SUBMITTED BY:

Michael G. McDonald
Wildlife Biologist III

Table 1 Unit 6 brown bear estimated population, annual allowable harvest and reported harvest, 1995–1999

Unit	Area	Regulatory year	Density (bears/ 1000 km^2)	Nr. bears	Annual allowable harvest (all bears)	Reported harvest (all bears)	Annual allowable harvest (F>2 yr old)	Reported harvest (F>2 yr old)
6A	Icy Bay-Cape Suckling	1995–1996	93	172	9	7	3	0
		1996–1997	95	176	9	7	4	3
		1997–1998	98	181	9	11	4	3
		1998–1999	97	180	9	10	4	1
		1999–2000	97	180	9	11	4	1
	Cape Suckling-Katalla	1995–1996	67	93	5	6	2	1
		1996–1997	69	96	5	4	2	1
		1997–1998	72	99	5	4	2	1
		1998–1999	75	104	5	16	2	2
		1999–2000	73	100	5	10	2	2
	Kayak Island	1995–1996	78	7	0	0	0	0
		1996–1997	78	7	0	0	0	0
		1997–1998	78	7	0	1	0	0
		1998–1999	78	7	0	0	0	0
		1999–2000	78	7	0	0	0	0
6A Total		1995–1996	82	271	14	13	5	1
		1996–1997	84	278	14	11	6	4
		1997–1998	87	287	14	16	6	4
		1998–1999	88	290	15	26	6	3
		1999–2000	87	287	14	21	6	3

Table 1 Continued

Unit	Area	Regulatory year	Density (bears/ 1000 km^2)	Nr. bears	Annual allowable harvest (all bears)	Reported harvest (all bears)	Annual allowable harvest (F>2 yr old)	Reported harvest (F>2 yr old)
6B		1995–1996	120	129	6	5	3	2
		1996–1997	124	134	7	3	3	1
		1997–1998	129	139	7	6	3	0
		1998–1999	134	144	7	12	3	0
		1999–2000	129	139	7	3	3	1
6C		1995–1996	101	112	6	5	2	3
		1996–1997	103	115	6	6	2	1
		1997–1998	108	120	6	6	2	1
		1998–1999	108	120	6	4	2	1
		1999–2000	108	120	6	6	2	1
6D	Rude River-Ellamar	1995–1996	63	78	4	6	2	0
		1996–1997	63	78	4	4	2	1
		1997–1998	64	80	4	16	2	3
		1998–1999	63	78	4	6	2	1
		1999–2000	63	78	4	12	2	2
	Valdez Arm	1995–1996	39	36	2	1	1	0
		1996–1997	39	36	2	1	1	0
		1997–1998	39	36	2	2	1	0
		1998–1999	41	38	2	3	1	0
		1999–2000	41	38	2	1	1	0

Table 1 Continued

Unit	Area	Regulatory year	Density (bears/ 1000 km^2)	Nr. bears	Annual allowable harvest (all bears)	Reported harvest (all bears)	Annual allowable harvest (F>2 yr old)	Reported harvest (F>2 yr old)
6D	Western PWS	1995–1996		17	1	0	0	0
		1996–1997		17	1	0	0	0
		1997–1998		17	1	0	0	0
		1998–1999	5	17	1	0	0	0
		1999–2000	5	17	1	0	0	0
	Hinchinbrook Island	1995–1996	224	90	4	4	2	1
		1996–1997	224	90	4	5	2	2
		1997–1998	232	93	5	6	2	2
		1998–1999	244	97	5	9	2	3
		1999–2000	247	99	5	4	2	1
	Hawkins Island Island	1995–1996	98	17	1	0	0	0
		1996–1997	104	18	1	0	0	0
		1997–1998	110	19	1	2	0	0
		1998–1999	110	19	1	0	0	0
		1999–2000	110	19	1	0	0	0
	Montague Island	1995–1996	60	45	2	0	1	0
		1996–1997	63	48	2	0	1	0
		1997–1998	68	52	3	0	1	0
		1998–1999	75	57	3	1	1	0
		1999–2000	79	60	4	1	1	0

Table 1 Continued

Unit	Area	Regulatory year	Density (bears/ 1000 km^2)	Nr. bears	Annual allowable harvest (all bears)	Reported harvest (all bears)	Annual allowable harvest (F>2 yr old)	Reported harvest (F>2 yr old)
6D Total		1995–1996	-	282	14	11	6	1
		1996–1997	-	285	14	10	6	3
		1997–1998	-	295	15	26	6	5
		1998–1999	-	305	15	19	6	4
		1999–2000	-	309	15	18	6	3
Unit 6 Total		1995–1996	-	794	40	34	16	7
		1996–1997	-	812	41	30	16	9
		1997–1998	-	840	42	54	17	10
		1998–1999	-	859	43	61	17	8
		1999–2000	-	854	43	48	17	8

Table 2 Unit 6 brown bear harvest, 1995–1999

		Reported								Estimated						
	Regulatory	Hunter kill					Nonhunting			illegal	Total estimated kill					
Unit	year	M	F	(%)	Unk.	Total	M	F	Unk.	kill	M	(%)	F	(%)	Unk	Total
6A	1995–1996															
	Fall 95	5	2	(29)	0	7	0	0	0	1	5	(71)	2	(29)	1	8
	Spring 96	6	0	(0)	0	6	0	0	0	1	6	(100)	0	(0)	1	7
	Total	11	2	(15)	0	13	0	0	0	2	11	(85)	2	(15)	2	15
	1996–1997															
	Fall 96	1	5	(83)	0	6	0	0	0	1	1	(17)	5	(83)	1	7
	Spring 97	5	0	(0)	0	5	0	0	0	1	5	(100)	0	(0)	1	6
	Total	6	5	(45)	0	11	0	0	0	2	6	(55)	5	(45)	2	13
	1997–1998															
	Fall 97	7	6	(46)	0	13	1	0	0	1	8	(57)	6	(43)	1	15
	Spring 98	2	0	(0)	0	2	0	0	0	1	2	(100)	0	(0)	1	3
	Total	9	6	(40)	0	15	1	0	0	2	10	(63)	6	(38)	2	18
	1998–1999															
	Fall 98	11	7	(39)	0	18	0	0	0	1	11	(61)	7	(39)	1	18
	Spring 99	7	0	(0)	0	7	1	0	0	0	8	(100)	0	(0)	0	8
	Total	18	7	(28)	0	25	1	00	0	1	19	(73)	7	(27)	1	26
	1999–2000															
	Fall 99	12	4	(25)	0	16	1	0	0	1	13	(76)	4	(24)	1	18
	Spring 00	2	2	(50)	0	4	0	0	0	1	2	(50)	2	(50)	1	5
	Total	14	6	(30)	0	20	1	0	0	2	15	(71)	6	(29)	2	23

Table 2 Continued

Unit	Regulatory year	Reported: Hunter kill M	F	(%)	Unk.	Total	Reported: Nonhunting M	F	Unk.	Estimated illegal kill	Total estimated kill M	(%)	F	(%)	Unk.	Total
6B	1995–1996															
	Fall 95	1	2	(67)	0	3	0	0	0	1	1	(33)	2	(67)	1	4
	Spring 96	2	1	(33)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
	Total	3	3	(50)	0	6	0	0	0	2	3	(50)	3	(50)	2	8
	1996–1997															
	Fall 96	2	1	(33)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
	Spring 97	0	0	(0)	0	0	0	0	0	1	0	(0)	0	(0)	1	1
	Total	2	1	(33)	0	3	0	0	0	2	2	(67)	1	(33)	2	5
	1997–1998															
	Fall 97	2	1	(33)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
	Spring 98	3	0	(0)	0	3	0	0	0	1	3	(100)	0	(0)	1	4
	Total	5	1	(17)	0	6	0	0	0	2	5	(83)	1	(17)	2	8
	1998–1999															
	Fall 98	4	3	(43)	0	7	0	0	0	1	4	(57)	3	(43)	1	8
	Spring 99	4	1	(20)	0	5	0	0	0	1	4	(80)	1	(20)	1	6
	Total	8	4	(33)	0	12	0	0	0	2	8	(67)	4	(33)	2	14
	1999–2000															
	Fall 99	0	1	(100)	0	1	0	0	0	1	0	(0)	1	(100)	1	2
	Spring 00	2	0	(0)	0	2	0	0	0	1	2	(100)	0	(0)	1	3
	Total	2	1	(33)	0	3	0	0	0	2	2	(67)	1	(33)	2	5

Table 2 Continued

Unit	Regulatory year	Reported								Estimated illegal kill	Total estimated kill					
		Hunter kill					Nonhunting									
		M	F	(%)	Unk.	Total	M	F	Unk.		M	(%)	F	(%)	Unk.	Total
6C	1995–1996															
	Fall 95	1	2	(67)	0	3	0	0	0	1	1	(33)	2	(67)	1	4
	Spring 96	1	1	(50)	0	2	0	0	0	1	1	(50)	1	(50)	1	3
	Total	2	3	(60)	0	5	0	0	0	2	2	(40)	3	(60)	2	7
	1996–1997															
	Fall 96	2	0	(0)	0	2	1	0	0	1	3	(100)	0	(0)	1	4
	Spring 97	2	1	(33)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
	Total	4	1	(20)	0	5	1	0	0	2	5	(83)	1	(17)	2	8
	1997–1998															
	Fall 97	3	1	(25)	0	4	0	1	0	1	3	(60)	2	(40)	1	6
	Spring 98	1	0	(0)	0	1	0	0	0	1	1	(100)	0	(0)	1	2
	Total	4	1	(20)	0	5	0	1	0	2	4	(67)	2	(33)	2	8
	1998–1999															
	Fall 98	3	1	(25)	0	4	0	0	0	1	3	(75)	1	(25)	1	5
	Spring 99	0	0	(0)	0	0	0	0	0	1	0	(0)	0	(0)	1	1
	Total	3	1	(25)	0	4	0	0	0	2	3	(75)	1	(25)	2	6
	1999–2000															
	Fall 99	2	1	(30)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
	Spring 00	3	0	(0)	0	3	0	0	0	1	3	(100)	0	(0)	1	4
	Total	5	1	(17)	0	6	0	0	0	2	5	(83)	1	(17)	2	8

Table 2 Continued

Unit	Regulatory year	Reported								Estimated illegal kill	Total estimated kill					
		Hunter kill					Nonhunting									
		M	F	(%)	Unk.	Total	M	F	Unk.		M	(%)	F	(%)	Unk.	Total
6D	1995–1996															
	Fall 95	2	0	(0)	0	2	0	0	0	1	2	(100)	0	(0)	1	3
	Spring 96	7	2	(22)	0	9	0	0	0	2	7	(78)	2	(22)	2	11
	Total	9	2	(18)	0	11	0	0	0	3	9	(82)	2	(18)	3	14
	1996–1997															
	Fall 96	5	3	(38)	0	8	0	0	0	2	5	(63)	3	(38)	2	10
	Spring 97	0	1	(100)	0	1	1	0	0	1	1	(50)	1	(50)	1	3
	Total	5	4	(44)	0	9	1	0	0	3	6	(60)	4	(40)	3	13
	1997–1998															
	Fall 97	2	2	(50)	0	4	3	0	0	1	5	(71)	2	(29)	1	8
	Spring 98	15	4	(21)	0	19	0	0	0	1	15	(79)	4	(21)	1	20
	Total	17	6	(26)	0	23	3	0	0	2	20	(77)	6	(23)	2	28
	1998–1999															
	Fall 98	4	3	(43)	0	7	0	0	0	4	4	(57)	3	(43)	4	11
	Spring 99	9	1	(10)	0	10	1	1	0	0	10	(83)	2	(17)	0	12
	Total	13	4	(24)	0	17	1	1	0	4	14	(74)	5	(26)	4	23
	1999–2000															
	Fall 99	2	3	(60)	0	6	1	0	0	4	3	(50)	3	(50)	4	10
	Spring 00	8	3	(27)	0	11	0	1	0	0	8	(67)	4	(33)	0	12
	Total	10	6	(38)	0	16	1	1	0	4	11	(61)	7	(39)	4	22

Table 2 Continued

Unit	Regulatory year	Reported								Estimated illegal kill	Total estimated kill					
		Hunter kill					Nonhunting									
		M	F	(%)	Unk.	Total	M	F	Unk.		M	(%)	F	(%)	Unk.	Total
Unit 6 Total	1995–1996															
	Fall 95	9	6	(40)	0	15	0	0	0	4	9	(60)	6	(40)	4	19
	Spring 96	16	4	(20)	0	20	0	0	0	5	16	(80)	4	(20)	5	25
	Total	25	10	(29)	0	35	0	0	0	9	25	(71)	10	(29)	9	44
	1996–1997															
	Fall 96	10	9	(47)	0	19	1	0	0	5	11	(55)	9	(45)	5	25
	Spring 97	7	2	(22)	0	9	1	0	0	4	8	(80)	2	(20)	4	14
	Total	17	11	(39)	0	28	2	0	0	9	19	(63)	11	(37)	9	39
	1997–1998															
	Fall 97	14	10	(42)	0	24	4	1	0	4	18	(62)	11	(38)	4	33
	Spring 98	21	4	(16)	0	25	0	0	0	4	21	(84)	4	(16)	4	29
	Total	35	14	(29)	0	49	4	1	0	8	39	(72)	15	(28)	8	62
	1998–1999															
	Fall 98	22	14	(39)	0	36	0	0	0	6	22	(61)	14	(39)	6	42
	Spring 99	20	2	(9)	0	22	2	1	0	2	22	(88)	3	(12)	2	27
	Total	42	16	(28)	0	58	2	1	0	8	44	(72)	17	(28)	8	69
	1999–2000															
	Fall 99	16	9	(36)	0	25	2	0	0	7	18	(67)	9	(33)	7	34
	Spring 00	15	5	(25)	0	20	0	1	0	3	15	(71)	6	(29)	3	24
	Total	31	14	(31)	0	45	2	1	0	10	33	(69)	15	(31)	10	58

Table 3 Unit 6 brown bear mean skull size and age, 1995–1999

		Males				Females			
Unit	Year	Skull size	*n*	Age	*n*	Skull size	*n*	Age	*n*
6A	1995–1996	24	11	6	10	22	2	4	2
	1996–1997	23	6	6	6	22	5	4	5
	1997–1998	24	9	6	9	21	6	6	6
	1998–1999	23	16	5	18	20	6	4	7
	1999–2000	23	13	6	12	21	7	4	4
6B	1995–1996	24	2	4	2	21	3	4	3
	1996–1997	22	2	3	2	23	1	15	1
	1997–1998	23	5	4	5	19	1	2	1
	1998–1999	24	8	9	8	19	3	2	4
	1999–2000	28	2	--	0	20	1	3	1
6C	1995–1996	21	2	2	2	21	3	6	3
	1996–1997	25	3	7	3	22	1	5	1
	1997–1998	25	4	5	4	21	1	2	1
	1998–1999	23	3	4	3	21	1	4	1
	1999–2000	22	4	2	2	22	1	16	1
6D	1995–1996	23	9	6	9	21	2	7	2
	1996–1997	22	5	5	5	20	3	7	4
	1997–1998	22	17	5	17	21	5	8	5
	1998–1999	22	12	4	13	22	4	6	4
	1999–2000	24	11	3	3	21	6	5	3
Unit 6 Total	1995–1996	23	25	6	23	21	10	5	10
	1996–1997	23	16	5	16	21	10	6	11
	1997–1998	23	35	5	35	21	13	6	13
	1998–1999	23	39	5	42	20	14	4	16
	1999–2000	24	30	3	17	21	15	7	9

Table 4 Unit 6 brown bear successful hunter residency, 1995–1999

Unit	Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	Residency unknown	(%)	Total Successful hunters
6A	1995–1996	1	(9)	0	(0)	10	(91)	0	(0)	11
	1996–1997	0	(0)	0	(0)	11	(100)	0	(0)	11
	1997–1998	5	(31)	1	(6)	10	(63)	0	(0)	16
	1998–1999	4	(15)	3	(12)	19	(73)	0	(0)	26
	1999–2000	3	(14)	4	(19)	14	(67)	0	(0)	21
6B	1995–1996	2	(33)	1	(17)	3	(50)	0	(0)	5
	1996–1997	1	(33)	2	(67)	0	(0)	0	(0)	3
	1997–1998	2	(33)	2	(33)	2	(33)	0	(0)	6
	1998–1999	6	(50)	3	(25)	3	(25)	0	(0)	12
	1999–2000	1	(33)	0	(0)	2	(67)	0	(0)	3
6C	1995–1996	3	(60)	0	(0)	2	(40)	0	(0)	5
	1996–1997	2	(40)	1	(40)	2	(20)	0	(0)	5
	1997–1998	4	(67)	1	(0)	1	(20)	0	(0)	6
	1998–1999	4	(100)	0	(0)	0	(0)	0	(0)	4
	1999–2000	5	(83)	1	(17)	0	(0)	0	(0)	6
6D	1995–1996	2	(18)	5	(45)	4	(36)	0	(0)	11
	1996–1997	1	(9)	3	(27)	6	(55)	1	(9)	11
	1997–1998	4	(15)	6	(22)	16	(59)	1	(4)	27
	1998–1999	4	(21)	7	(37)	8	(42)	0	(0)	19
	1999–2000	2	(11)	6	(33)	10	(56)	0	(0)	18
Unit 6 Total	1995–1996	8	(24)	6	(18)	18	(58)	0	(0)	33
	1996–1997	4	(13)	6	(20)	19	(63)	1	(3)	30
	1997–1998	15	(27)	10	(18)	29	(53)	1	(2)	49
	1998–1999	18	(30)	13	(21)	30	(49)	0	(0)	61
	1999–2000	11	(23)	11	(23)	26	(54)	0	(0)	48

Table 5 Unit 6 brown bear harvest chronology by percent, 1995–1999

		Harvest periods										
	Regulatory	September		October		November		April		May		
Unit	year	1–15	16–30	1–15	16–31	1–15	16–30	1–15	16–30	1–15	16–31	*n*
6A	1995–1996	(36)	(18)	(9)	(0)	(0)	(0)	(0)	(9)	(18)	(9)	11
	1996–1997	(18)	(18)	(9)	(9)	(0)	(0)	(0)	(27)	(18)	(0)	11
	1997–1998	(27)	(27)	(27)	(7)	(0)	(0)	(0)	(0)	(7)	(7)	15
	1998–1999	(46)	(15)	(4)	(4)	(0)	(0)	(0)	(12)	(8)	(12)	26
	1999–2000	(29)	(24)	(29)	(0)	(0)	(0)	(0)	(10)	(5)	(5)	21
6B	1995–1996	(40)	(20)	(0)	(0)	(0)	(0)	(0)	(0)	(20)	(20)	5
	1996–1997	(33)	(33)	(33)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	3
	1997–1998	(17)	(0)	(33)	(0)	(0)	(0)	(0)	(0)	(17)	(33)	6
	1998–1999	(25)	(8)	(25)	(0)	(0)	(0)	(0)	(8)	(25)	(8)	12
	1999–2000	(0)	(33)	(0)	(0)	(0)	(0)	(0)	(67)	(0)	(0)	5
6C	1995–1996	(20)	(0)	(40)	(0)	(0)	(0)	(0)	(0)	(0)	(40)	5
	1996–1997	(25)	(0)	(0)	(0)	(0)	(0)	(0)	(25)	(0)	(50)	4
	1997–1998	(40)	(0)	(40)	(0)	(0)	(0)	(0)	(0)	(0)	(20)	5
	1998–1999	(25)	(25)	(25)	(0)	(0)	(25)	(0)	(0)	(0)	(0)	4
	1999–2000	(17)	(0)	(17)	(17)	(0)	(0)	(33)	(17)	(0)	(0)	6
6D	1995–1996	(0)	(0)	(0)	(9)	(9)	(0)	(0)	(9)	(64)	(9)	11
	1996–1997	(0)	(0)	(11)	(44)	(22)	(11)	(0)	(0)	(11)	(0)	9
	1997–1998	(0)	(0)	(4)	(13)	(0)	(0)	(0)	(0)	(35)	(48)	23
	1998–1999	(0)	(0)	(6)	(29)	(6)	(0)	(0)	(0)	(18)	(41)	17
	1999–2000	(0)	(0)	(6)	(22)	(6)	(0)	(0)	(0)	(28)	(39)	18
Unit 6	1995–1996	(22)	(9)	(9)	(3)	(3)	(0)	(0)	(6)	(31)	(16)	32
Total	1996–1997	(15)	(11)	(11)	(19)	(7)	(4)	(0)	(15)	(11)	(7)	27
	1997–1998	(14)	(8)	(18)	(8)	(0)	(0)	(0)	(0)	(20)	(31)	49
	1998–1999	(27)	(10)	(10)	(10)	(2)	(2)	(0)	(7)	(14)	(19)	59
	1999–2000	(15)	(13)	(17)	(10)	(2)	(0)	(4)	(10)	(13)	(17)	48

Table 6 Unit 6 brown bear harvest percent by transport method, 1995–1999

Unit	Regulatory year	Percent of harvest								
		Airplane	Boat	Airboat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Unknown	*n*
6A	1995–1996	92	8	0	0	0	0	0	0	13
	1996–1997	100	0	0	0	0	0	0	0	11
	1997–1998	75	0	6	6	0	0	13	0	16
	1998–1999	81	4	0	12	0	0	0	4	26
	1999–2000	86	0	0	0	0	0	0	14	21
6B	1995–1996	67	17	0	0	0	0	17	0	6
	1996–1997	33	33	0	0	0	0	33	0	3
	1997–1998	67	0	0	17	0	0	17	0	6
	1998–1999	42	8	0	0	17	0	33	0	12
	1999–2000	67	0	0	0	0	0	33	0	3
6C	1995–1996	0	40	0	0	0	0	60	0	5
	1996–1997	0	60	0	0	0	0	20	20	5
	1997–1998	0	17	17	17	0	0	33	17	6
	1998–1999	0	25	0	0	0	0	75	0	4
	1999–2000	0	17	0	17	17	0	50	0	6
6D	1995–1996	27	73	0	0	0	0	0	0	11
	1996–1997	40	40	0	10	0	0	10	0	10
	1997–1998	19	69	0	0	4	0	0	8	26
	1998–1999	21	58	0	0	0	0	5	16	19
	1999–2000	72	22	0	0	6	0	0	0	18
Total	1995–1996	54	34	0	0	0	0	11	0	35
	1996–1997	55	28	0	3	0	0	10	3	29
	1997–1998	39	35	4	6	2	0	9	6	54
	1998–1999	49	23	0	5	3	0	13	7	61
	1999–2000	69	10	0	2	4	0	8	6	48

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNITS: 7 (3520 mi^2) and 15 (4876 mi^2)

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

Brown bears are found throughout the remote lowland forests and intermountain valleys of the Kenai Peninsula, excluding coastal portions of Unit 7 and the eastern side of Kachemak Bay. Historical brown bear range remains occupied except in developed areas. Field observations and data analyses indicate brown bear densities are highest in the forested lowlands and subalpine areas west of the Kenai Mountains.

Seventy–one percent of the Kenai Peninsula is federal lands. The U.S. Forest Service (FS) (Chugach National Forest, ca. 2000 mi^2) together with the National Park Service (NPS) (Kenai Fjords National Park, ca. 885 mi^2) are the principle landowners in Unit 7. In Unit 15 the U.S. Fish and Wildlife Service (FWS) (Kenai National Wildlife Refuge) is the primary landowner responsible for management of 3062 mi^2. Ownership of the remaining 29% of the Kenai varies between municipal, state, Native Corporation, and private lands.

Brown bears were first given game status in 1902 (Miller 1990) with liberal seasons and bag limits. For example, in 1937–38 the season was 1 September to 20 June, and the bag limit was 2 brown bears for coastal areas in Southcentral and all of southeastern Alaska. The rest of the state did not have a closed season and there was no bag limit. At the time of statehood, the bag limit was 1 brown bear on the Kenai. The bag limit was further reduced in 1967 from 1 bear per year to 1 bear every 4 years. Cubs and sows with cubs were protected in the early 1970s. The season dates have ranged from 20 to 45 days. In 1978 a 10-day spring season was opened for Unit 15 and extended to the current 15-day season (10–15 May) in 1980. The Unit 7 spring season opened in 1980 concurrently with Unit 15.

More restrictive regulations were needed beginning in 1989 with a reduction of the fall season by 14 days, creating a fall opening date of 15 September. This change was to reduce the incidental take of brown bears by moose hunters. During the spring 1994 Board of Game meeting, the board shortened and moved the fall hunting season to 1–25 October in response to continued high harvests. The board again addressed the bear season in 1997 and authorized the department to operate the hunts as registration permit hunts. The season dates were also changed to 15–31 October. The fall seasons from 1995–1998 and the spring of 1999 were closed by

emergency order because additional harvests would have exceeded management objectives. Because of these closures, we determined that only 1 season would be allowable on the Kenai to stay within management objectives. The Board of Game authorized a fall-only registration hunt beginning in the fall of 1999.

In 1984 representatives of the FWS, FS, and Alaska Department of Fish and Game (ADF&G) formed an Interagency Brown Bear Study Team (IBBST) to discuss brown bear management and research needs on the Kenai Peninsula and to coordinate joint studies. The NPS joined this effort in 1990. This group has coordinated many projects that have increased our understanding of brown bear ecology. The IBBST coordinated a baseline inventory (Bevins *et al*. 1984, Risdahl *et al*. 1986) of salmon streams and known high-use brown bear areas and performed detailed ground and habitat surveys (Schloeder *et al*. 1987 and Jacobs *et al*. 1988).

A cumulative effects model was developed to identify brown bear habitat on the Kenai at risk to human activities (Suring *et al*. 1998). In 1995 ADF&G initiated a research project in cooperation with the other members of the IBBST to evaluate the cumulative effects model, assess brown bear habitat, estimate survival of bears and ultimately model the brown bear population on the Kenai (Schwartz and Arthur 1996, Schwartz *et al.* 1999).

More recently the IBBST has focused research on the dietary requirements of Kenai Peninsula brown bears (Jacoby *et. al.* 1999, Hilderbrand *et al*. 1999a), the importance of marine nitrogen in the ecosystem (Hilderbrand *et al.*1999b) and the physiological effects of diet on reproduction (Hilderbrand *et al.* 2000).

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Maintain a population of 250 brown bears with a sex and age structure that will sustain a harvest of less than 40 % females (3-year average of 6 female units).

METHODS

Cost-effective survey techniques to determine brown bear population size over large forested areas have not been developed and tested. We derived a population estimate for the Kenai by combining results from a habitat-based model and a density estimate using expert interpretation. (Del Frate, 1993) By comparing estimates of bear density to other parts of Alaska, we could approximate brown bear density on the Kenai. Miller (pers commun) suggested that the density of brown bears on the Kenai was probably lower than the 27.1 bears per 1000 km^2 (7.0 bears per 100 mi^2) he reported for his middle Susitna Study Area (1987). Consequently, we estimated the bear density on the Kenai to be 20 bears per 1000 km^2 (5.2 bears per 100 mi^2), and we calculated the suitable habitat to be 13,848 km^2 (5347 mi^2). We derived a brown bear population estimate for Units 7 and 15 by multiplying the suitable habitat by the density estimate.

In the spring of 1995, the department drafted a Brown Bear Management Protocol described in Del Frate (1999). This protocol described the desired management strategies to achieve management objectives. This protocol is evaluated and updated annually with management

recommendations for each calendar year. Those recommendations are listed below for this reporting period.

The Department initiated a strategic planning project in the spring of 1999 with the formation of an Interagency Planning Group charged with formalizing the process and recommending stakeholder candidates. Stakeholders were ultimately appointed by the Kenai Peninsula Borough Mayor, the commissioner of ADF&G and a special assistant to the Secretary of the Interior. Stakeholders were selected to represent a diverse cross-section of the public. This group met 13 times beginning in October 1999 with the following objectives:

- To review the available biological and social science information on Kenai Peninsula brown bears, to evaluate all relevant aspects of bear management that may affect the Peninsula's bear population, and to prepare, by Spring 2000, specific recommendations regarding the management and conservation of brown bears.

- To ensure public support for the Conservation Strategy by involving the public in the stakeholder process.

Since 1961, a mandatory sealing program has provided information on all harvested bears, including distribution and sex-age composition. Harvest data is reported using the division's reporting program BEARSEAL. In addition, agency personnel from either ADF&G or FWP investigated all bears killed in Defense of Life or Property (DLP). An associated DLP report form was completed. We initiated further analysis of the DLP information during this reporting period. Completion of this project is scheduled for 2001 and results will be reported by Suring and Del Frate (In prep).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Assuming that the brown bear density was 20 bears per 1000 km^2 (5.2 bears per 100 mi^2) and the suitable habitat was 13,848 km^2 (5347 mi^2), we estimated the brown bear population for Units 7 and 15 at 277 (range = 250–300). We believe the population is stable or may be slowly increasing.

Distribution and Movements

Brown bears inhabit most of the Kenai Peninsula with the exception of coastal areas of Kenai Fjords National Park and the southern portions of the peninsula (Schloeder *et al*. 1987, Jacobs *et al*. 1988). Recently, members of the public and park personnel have observed brown bears in KFNP (Nuka Bay). Occasionally, individual bears have been observed on the southern side of Kachemak Bay. It is unknown at this time whether this is a result of dispersing bears or range expansion of the population.

MORTALITY

Harvest

Season and Bag Limit. The bag limit for Units 7 and 15 was 1 bear every 4 regulatory years. Both fall and spring hunts for regulatory year 1998 were closed by emergency order. The bear hunting season for 1999 was 15–31 October for the entire Kenai Peninsula for resident and nonresident hunters. However, this season was shortened by emergency order to 15–24 October.

Board of Game Action and Emergency Orders. The Board of Game authorized a fall-only registration permit hunt beginning in the fall of 1999 with season dates of 15–31 October. To stay within objectives, both the fall 1998 and the spring 1999 hunts were closed by emergency order. The BOG permanently closed the spring season on the Kenai Peninsula beginning with the spring of 2000. The fall 1999 season was shortened by closing the season on 24 October by emergency order to maintain harvest within objectives.

The department drafted a proposal to the Board of Fisheries to close Russian Creek (also known as Goat Creek) to fishing for the month of August to protect brown bears feeding in this area. The Department of Law advised the Board of Fisheries that they did not have the authority to regulate a fishery for wildlife conservation purposes. The proposal was redrafted to protect spawning salmon 300 yards upstream from the inlet of upper Russian Lake and passed by the Board of Fisheries in 1999. This closure took effect in August of 1999.

At the request of the Brown Bear Stakeholder Group ADF&G submitted a proposal to eliminate the use of fish or fish parts for black bear bait. The group felt that the presence of fish at black bear bait stations might attract brown bears more than other types of bait. While there is no evidence to support this theory, the Department supported the proposal on the basis that bait stations would be easier to clean up. The Board of Game passed the proposal at the March 2001 meeting and it will become effective in the 2002 spring bear bait season.

Hunter Harvest. Eight bears were reported taken during regulatory year 1998–99 and all were classified as nonsport mortality. In addition, two radio collars from two research bear were recovered and it was determined that these bears were killed and never reported. Because objectives had been previously met, both seasons were closed by emergency order. Of the eight bears taken 5 were taken in the fall (3 in DLP, one illegally, and one capture mortality). Two of these bears were adult females and the others males. Three young bears (2 yearling females and 1 male) were taken DLP in the spring (Table 1).

Seventeen bears were taken during regulatory year 1999–00, all during the fall season. Ten bears (5 males and 5 females) were taken during the general season. The remainder of the bears were taken by nonsport methods. These included 2 males and 1 female by DLP, 2 males killed illegally during closed season, 1 roadkill (female), and one female from unknown causes. The bear that died from unknown causes was a sow with cubs found by a hunter during the fall hunting season (Table 1). One hundred fifty-six permits were issued and 105 reported hunting for the fall registration permit season (RB160). One additional hunter harvested a bear without a permit.

Hunter Residency and Success. Both seasons were closed by emergency order for regulatory year 1998–99. Local residents took 80%, nonlocal residents took 10% and nonresidents took 10% of the bears in 1999–2000 (Table 2).

Harvest Chronology. All hunter-harvested bears were taken during the first 7 days of the fall season during 1999–2000 (Table 3). An Emergency Order closed the season on October 24 to keep the harvest within management objectives.

Transport Methods. Successful brown bear hunters have used all transportation methods with the exception of snow machines during the past 5 years (Table 4). In 1999 most hunters used boats (40%) and highway vehicles (30%). Hunters also used 4-wheelers, ORVs and horses (10% each).

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

As interim chair of the IBBST, I drafted a request to the Commissioner of ADF&G to list the Kenai population of brown bear as a population of special concern. This request was based on the potential for decline in the future because of human encroachment into brown bear habitat. The Kenai brown bear was officially listed on 27 November 1998 as a Species of Special Concern.

Soon after the Species of Special Concern listing, the department initiated a stakeholder-driven planning project. The Kenai Peninsula Brown Bear conservation Strategy was completed and published. (Alaska Department of Fish and Game Division of Wildlife Conservation 2000). The IBBST is currently drafting a conservation assessment that will supplement the conservation strategy.

Timber harvests designed to salvage damaged timber and control the spread of spruce bark beetles (Dick *et al*. 1992) could be a major factor affecting the abundance of brown bears. The Forest Health Management Plan encompasses approximately 60% of the Kenai Peninsula and most of the brown bear habitat. The plan prioritizes over 426,000 acres of forested lands for salvage cutting. Logging mature forests may affect brown bears in numerous ways, including fragmentation of forest habitat and increased public access through an extensive road system. ADF&G and the IBBST have routinely commented on proposed timber sales that could significantly impact brown bears.

CONCLUSION AND RECOMMENDATIONS

In 1995 we drafted a management protocol (Del Frate 1999). This protocol provided a systematic record of decision for management decisions. In 1998 we made the decision to change from calendar-year management to regulatory-year management. This decision was based on the need to coincide with reporting periods and has no net effect on calculating sustained yield. Below is a summary of the decisions for the following regulatory years.

RECOMMENDED ACTION FOR 1998–99

- The harvest objective is 5.6 female units per year or 16.8 for 3 years. Five units were taken in 1996–97 and 7.5 units in 1997–98. The maximum allowable harvest for 1998–99 would then be no more than 4.3 female units.

- Prior to the start of the fall permit season 4 adult female bears were killed. In order to stay within management objectives the fall season was closed by emergency order. By that fall it became evident that the peninsula could only sustain one hunt and the decision was made to recommend a fall only season to the BOG. A proposal was drafted and approved by the BOG to eliminate the spring season. Since the regulation would not become effective in time for the spring 1999 season, the Department decided it was best to close the spring season by Emergency Order.

- Monitor the spring DLP kills for signs of excessive take of females. Only three bears were taken during the spring season including 2 yearling female bears (one additional unit). The female unit will be subtracted from the fall harvest objective.

RECOMMENDED ACTION FOR 1999–2000

- The harvest objective is 5.6 female units per year or 16.8 for 3 years. Seven and one-half units were taken in 1997–98 and 5 units in 1998–99. The maximum allowable harvest for 1999–2000 would then be no more than 4.3 female units.

- Prior to the fall permit season 2 female bears were taken (1 by DLP and 1 roadkill) in addition to 4 males. A remainder of 2.3 female units was left for the permit hunt. Ten bears were taken during the first 7 days of the fall permit season including 5 adult females. In addition, one additional adult female bear was found dead but was never reported. The harvest objective was exceeded and the remainder of the season closed by Emergency Order.

- No bears were reported taken by any means during the spring of 2000. The excess of 3.7 female units will be subtracted from the fall harvest objective.

RECOMMENDED ACTION FOR 2000–2001

- The harvest objective is 5.6 female units per year or 16.8 for 3 years. Five units were taken in 1998–99 and 8 units in 1999–00. The maximum allowable harvest for 2000–01 would then be no more than 3.8 female units.

- Three female units were taken in the fall season in addition to 6 male bears.

- So far one male bear has been taken this spring. There is only 0.8 bears remaining in the quota. Any additional bears taken in excess of the 0.8 bears will be deducted from the Fall permit season allowance.

The number of DLP's and illegally taken bears increased throughout the 1990s but declined slightly during this reporting period. The 5-year average harvest of female bears was 6.6 female units (range = 5–8 units per year). Management objectives have been exceeded and we continue

to monitor and adjust the seasons as necessary. Preliminary data for regulatory year 2000 indicate a reduced harvest however if this trend changes regulatory action may be necessary for the fall season. We are concerned that this trend will continue and long-term management objectives will eventually be exceeded and all hunting opportunity lost.

Taylor *et al*. (1987) noted that survival of adult female bears was the predominant factor affecting population dynamics. To maintain a population of 250 bears on the Kenai Peninsula, our objectives have been set at a 3-year mean annual harvest of 6 females (approximately 40% of the annual harvest objective of 14 bears). A 3-year mean allows for abnormal harvest variations caused by weather, food availability, or temporary changes in human-use patterns. We refined the desired harvest rate quota by using the point system similar to Smith's (1989) to account for young female bears ($\leq$ 2 years of age) taken primarily in nonsport situations. These bears were assumed to have a lower reproductive value (Harris and Metzgar 1990) and assigned lower scores than those of older females. Specifically, female bears $\leq$ 2 years of age were assigned only half the value of older females.

The long-term health of brown bears on the Kenai Peninsula depends upon maintaining quality bear habitat and minimizing the mortality of female bears. There are 2 activities that may negatively affect bear abundance. Forestry practices to salvage timber killed by spruce bark beetles may affect bears through the logging of mature forest stands and the building of roads into previously inaccessible areas (McLellan and Shackleton 1988). Perhaps more importantly, commercial, recreational, and residential developments on the Kenai Peninsula will continue to reduce the quantity and quality of brown bear habitat and restrict travel corridors for bears. Human encroachment into bear habitat will increase bear/human encounters and increase the probability that bears will be killed.

We need to continue to monitor sport and nonsport bear mortality by season, location, and cause to identify tangential management issues that may affect long-term survival. Potential issues have been identified, such as bear/human conflicts, bear/livestock interactions, competition between bears and sport fishermen, big game seasons that overlap with brown bear seasons, brown bears taken near black bear bait stations, and private and borough dumpster problems. Solving many of these management concerns will require innovative approaches. The Kenai Peninsula brown bear conservation strategy provided the type of public collaboration necessary to address many of these issues. The Kenai Peninsula Brown Bear Conservation Strategy was completed in 2000 and lists over 100 recommendations to maintain brown bears and their habitat on the Kenai Peninsula. Many of the recommendations in this report were reiterated in the conservation strategy. Implementation of this strategic plan is necessary to maintain a healthy brown bear population into the future.

The Kenai Peninsula brown bear population is essentially closed. Appreciable immigration is unlikely because the city of Anchorage is adjacent to the Kenai and brown bears are not at high densities in the area around Turnagain Arm. Because the Kenai Peninsula is essentially a closed system, some areas that could support slightly higher harvests can serve as refugia for the more highly impacted areas.

LITERATURE CITED

ALASKA DEPARTMENT OF FISH AND GAME DIVISION OF WILDLIFE CONSERVATION. 2000. *Kenai Peninsula Brown Bear Conservation Strategy*. State of Alaska Department of Fish and Game. 84pp

BEVINS, J., C. SCHWARTZ, E. BANGS, AND K. NELSON. 1984. Kenai Peninsula brown bear studies: Report of the Interagency brown bear study team. 103pp.

DEL FRATE, G. G. 1993. Units 7 and 15 Brown Bear. Pages 49–57 in S. Abbott ed. Management Report of Survey-Inventory Activities 1 July 1990–30 June 1992. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Project, W-23-4 and W-23-5. Study 4.0.

DEL FRATE, G. G. 1999. Units 7 and 15 Brown Bear. Pages 55–71 in M. V. Hicks ed. Management Report of Survey-Inventory Activities 1 July 1996–30 June 1998. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Project, W-24-5 and W-27-1. Study 4.0.

DICK, M. R., P. BUIST, D. WALLINGFORD, P. JOYNER, J. PETERSON, R. BURNSIDE, AND S. PHILLIPS. 1992. Forest health management plan for the western Kenai Peninsula and Kalgin Island. Alaska Department of Natural Resources Division of Forestry. 40pp.

HARRIS, RICHARD B. AND L. H. METZGAR. 1990. Using both theory and simulation to gain insight: and example using reproductive values. Eastern Workshop on Black Bear Research and Management. 10:145–151.

HILDERBRAND, G. V., S. G. JENKINS, C. C. SCHWARTZ, T. A. HANLEY, AND C. T. ROBBINS. 1999a. Effect of seasonal differences in dietary meat intake on changes in body mass and composition in wild and captive brown bears. Canadian Journal of Zoology 77: 1623 – 1630.

HILDERBRAND, G. V., T. A. HANLEY, C. T. ROBBINS, AND C. C. SCHWARTZ. 1999b. Role of brown bears (Ursus arctos) in the flow of marine nitrogen into a terrestrial ecosystem. Oecologia 121:546–550.

HILDERBRAND, G. V., C. C. SCHWARTZ, C. T. ROBBINS, AND T. A. HANLEY. 2000. Effect of hibernation and reproductive status on body mass and condition of coastal brown bears. Journal of Wildlife Management 64(1): 178–183.

——, W. R. STAPLES, N. L. WEILAND, E. E. BANGS, AND C. C SCHWARTZ. 1988. Kenai Peninsula brown bear studies: Report of the interagency brown bear study team, 1987. 17pp.

JACOBY, M. E., G. V. HILDERBRAND, C. SERVHEEN, C. C. SCHWARTZ, S. M. ARTHUR, T. A. HANLEY, C. T. ROBBINS, AND R. MICHNER. 1999. Trophic relations of brown and black bears in several western North American ecosystems. Journal of Wildlife Management 63(3): 921–929.

MCLELLAN, B. N. AND D. M. SHACKELTON. 1988. Grizzly bears and resource-extraction industries: effects of roads on behavior, habitat use and demography. Journal of Applied Ecology 25:451–460.

MILLER, S. D., E. F. BECKER, AND W. B. BALLARD. 1987. Black and brown bear density estimates using modified capture recapture techniques in Alaska. International Conference Bear Research and Management. 7:23–35.

——. 1990. Population management of bears in North America. International Conference Bear Research and Management. 8:357–373.

RISDAHL, G. L., C. A. SCHLOEDER, E. E. BANGS, AND C. C. SCHWARTZ. 1986. Kenai Peninsula brown bear studies: Report of the interagency brown bear study team. 92pp.

SCHLOEDER, C. A., M. J. JACOBS, N. L. WEILAND, E. E. BANGS, AND C. C. SCHWARTZ. 1987. Kenai Peninsula brown bear studies: Report of the interagency brown bear study team, 1986. 52pp.

SCHWARTZ, C. C. AND S. M. ARTHUR. 1996. Cumulative effects model verification, sustained yield estimation, and population viability management of the Kenai Peninsula, Alaska brown bear. Federal Aid in Wildlife Restoration Research Project Progress Report 1 July 1994–30 June 1996. Grant W-24-3, W-24-4 Study 4.27. 9pp.

——, ——, AND G. G. DEL FRATE. 1999. Cumulative effects model verification, sustained yield estimation, and population viability management of the Kenai Peninsula, Alaska brown bear. Federal Aid in Wildlife Restoration Research Project Progress Report. Grant W-24-3, W-24-4 Study 4.27.

SMITH, B. L. 1989. Sex weighted point system regulates grizzly bear harvest. International Conference Bear Research and Management. 8:375–383.

SURING, L. H., K. R. BARBER, C. C. SCHWARTZ, T. N. BAILEY, W. C. SHUSTER, M. D. TETREAU. 1998. Analysis of cumulative effects on brown bears on the Kenai Peninsula, Southcentral Alaska. International Conference Bear Research and Management. 10: 107–117.

SURING, L. H. AND G. G. DEL FRATE. In Prep. Spatial Analysis of locations of brown bears killed in defense of life or property on the Kenai Peninsula, Alaska. Ursus 14:

TAYLOR M. K., D. P. DEMASTER, F. L. BUNNELL, AND R. E. SCHWEINSBURG. 1987. Modeling the sustainable harvest of female polar bears. *Journal Wildlife Management*. 51:811–820.

PREPARED BY:

Gino Del Frate
Wildlife Biologist

SUBMITTED BY:

Michael G. McDonald
Assistant Management Coordinator

Table 1 Units 7 and 15 brown bear harvest, 1991–2000.

Regulatory year	Reported: Hunter Kill M	F	Unk.	Total	Nonhunting kill[a] M	F	Unk.	Total estimated kill: M	(%)	F	(%)	UNK.	(%)	Total
1991														
Fall 91	4	4	0	8	1	1	0	5	(50)	5	(50)	0	(0)	10
Spring 92	3	1	0	4	0	0	1	3	(60)	1	(20)	1	(20)	5
Total	7	5	0	12	1	1	1	8	(53)	6	(40)	1	(7)	15
1992														
Fall 92	4	6	0	10	3	0	1	7	(50)	6	(43)	1	(7)	14
Spring 93	9	4	0	13	0	0	0	9	(69)	4	(31)	0	(0)	13
Total	13	10	0	23	3	0	1	16	(59)	10	(37)	1	(4)	27
1993														
Fall 93	5	3	0	8	3	1	0	8	(67)	4	(33)	0	(0)	12
Spring 94	6	2	0	8	3	0	0	9	(82)	2	(18)	0	(0)	11
Total	11	5	0	16	6	1	0	17	(74)	6	(26)	0	(0)	23
1994														
Fall 94	3	3	0	6	4	3	0	7	(54)	6	(46)	0	(0)	13
Spring 95	2	4	0	6	1	0	0	3	(43)	4	(57)	0	(0)	7
Total	5	7	0	12	5	3	0	10	(50)	10	(50)	0	(0)	20
1995														
Fall 95	0	0	0	0	1	5	0	1	(17)	5	(83)	0	(0)	6
Spring 96	3	2	0	5	2	2	0	5	(56)	4	(44)	0	(0)	9
Total	3	2	0	5	3	7	0	6	(40)	9	(60)	0	(0)	15
1996														
Fall 96	0	0	0	0	3	0	0	3	(100)	0	(0)	0	(0)	3
Spring 97	1	5	0	6	2	0	0	3	(38)	5	(62)	0	(0)	8
Total	1	5	0	6	5	0	0	6	(55)	5	(45)	0	(0)	11
1997														
Fall 97	0	0	0	0	3	3	0	3	(50)	3	(50)	0	(0)	6
Spring 98	4	4	0	8	1	2	0	5	(45)	6	(55)	0	(0)	11
Total	4	4	0	8	4	5	0	8	(47)	9	(53)	0	(0)	17

Table 1 Continued.

Regulatory year	Reported: Hunter Kill M	F	Unk.	Total	Nonhunting kill[a] M	F	Unk.	Total estimated kill: M	(%)	F	(%)	UNK.	(%)	Total
1998														
Fall 98	0	0	0	0	3	4[b]	0	3	(43)	4	(57)	0	(0)	7
Spring 99	0	0	0	0	1	2	0	1	(34)	2	(66)	0	(0)	3
Total	0	0	0	0	5	5	0	4	(40)	6	(60)	0	(0)	10
1999														
Fall 99	5	5	0	10	4	3[c]	0	9	(53)	8	(47)	0	(0)	17
Spring 00	0	0	0	0	0	0	0	0	(0)	0	(0)	0	(0)	0
Total	5	5	0	10	4	3	0	9	(53)	8	(47)	0	(0)	17

[a] Includes DLP kills, research mortalities, and other known human-caused mortality.
[b] Two research bears were illegally killed but never reported.
[c] One research bear was found dead but never reported.

Table 2 Unit 7 and 15 brown bear successful hunter residency, 1985–2000.

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	Total successful hunters[b] *n*
1985–86	6	(40)	7	(47)	2	(13)	15
1986–87	11	(69)	4	(25)	1	(6)	16
1987–88	4	(33)	5	(42)	3	(25)	12
1988–89	7	(58)	0	(00)	5	(42)	12
1989–90	4	(67)	1	(17)	1	(17)	6
1990–91	7	(64)	1	(9)	3	(27)	11
1991–92	5	(42)	3	(25)	4	(33)	12
1992–93	11	(48)	8	(35)	4	(17)	23
1993–94	10	(63)	2	(13)	4	(25)	16
1994–95	3	(25)	8	(67)	1	(8)	12
1995–96	4	(80)	1	(20)	0	(0)	5
1996–97	2	(33)	4	(67)	0	(0)	6
1997–98	5	(63)	3	(37)	0	(0)	8
1998–99[c]	0	(00)	0	(00)	0	(0)	0
1999–00	8	(80)	1	(10)	1	(10)	10

[a] Local resident means residents of Units 7 or 15.
[b] Does not include nonsport harvest.
[c] Both fall and spring seasons were closed by Emergency Order.

Table 3 Units 7 and 15 brown bear harvest chronology percent by month, 1985–2000

Regulatory year	Harvest periods September	October	May	n[a]
1985–86	60	20	20	15
1986–87	56	19	25	16
1987–88	42	25	33	12
1988–89	75	0	25	12
1989–90	33	0	67	6
1990–91	55	0	45	11
1991–92	58	8	33	12
1992–93	39	4	57	23
1993–94	13	38	50	16
1994–95	0	50	50	12
1995–96	0	0	100	5
1996–97	0	0	100	6
1997–98	0	0	100	8
1998–99[b]	0	0	0	0
1999–00	0	100	0	10

[a] Does not include nonsport harvest.
[b] Both fall and spring seasons were closed by Emergency Order.

Table 4 Units 7 and 15 brown bear harvest percent by transport method, 1985–2000.

Regulatory year	Percent of Harvest									
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Walk	Unk.	*n*[a]
1985–86	7	13	33	0	0	13	7	7	20	15
1986–87	12	6	19	0	0	19	12	12	19	16
1987–88	25	33	17	0	0	0	33	0	0	12
1988–89	8	42	8	0	0	17	17	0	8	12
1989–90	17	0	33	0	0	0	0	17	33	6
1990–91	9	27	9	9	0	9	18	9	9	11
1991–92	17	25	17	0	0	8	8	8	17	12
1992–93	13	13	17	13	0	4	30	9	0	23
1993–94	0	6	69	6	0	0	19	0	0	16
1994–95	0	17	17	0	0	0	58	0	8	12
1995–96	0	0	0	40	0	0	60	0	0	5
1996–97	33	0	33	0	0	0	17	17	0	6
1997–98	0	0	12	25	0	0	38	25	0	8
1998–99[b]	0	0	0	0	0	0	0	0	0	0
1999–00	0	10	40	10	0	10	30	0	0	10

[a] Does not include nonsport harvest.
[b] Both Fall and Spring seasons were closed by Emergency Order.

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 8 (5,097 mi^2)

GEOGRAPHIC DESCRIPTION: Kodiak and Adjacent Islands

BACKGROUND

Kodiak's geologic character is not conducive to preserving fossil evidence, so there is no way to confirm how long bears have been on the islands. Kodiak bears have, however, been isolated from other bear populations since the last ice age (about 12,000 years ago) and during that time have developed into a unique subspecies (*Ursus arctos middendorffi*). Early human occupants of the archipelago looked to the sea for their sustenance. At that time, people occasionally hunted bears, using their meat for food, hides for clothing and bedding, and teeth for adornment. Traditional stories often revolved around the similarity between bears and humans, and around the mystical nature of bears because of their proximity to the spirit world.

Russian entrepreneurs came to the area in the late 1700s to capitalize on the abundant fur resources. Bear hides were considered a "minor fur" and sold for about the same price as river otter pelts ($10 each). The number of bears harvested increased substantially when sea otter populations declined. After the United States acquired Alaska in 1867, bear harvests on Kodiak increased, peaking at as many as 250 bears per year. Commercial fishing activities increased in the late 1880s and canneries proliferated throughout the archipelago. Bears were viewed as competitors for the salmon resource and were routinely shot when seen on streams or coasts. At the same time, sportsmen and scientists had recognized the Kodiak bear as the largest in the world, and they voiced concerns about overharvesting the population.

Professional interest in guided Kodiak bear hunts and a concern for unregulated resource use in frontier lands such as Alaska prompted the territorial government's newly established Alaska Game Commission to abolish commercial bear hunting (selling the hides) on the archipelago in 1925. The impacts of the new regulations seemed to restore bear populations on the Kodiak islands. By the 1930s, ranchers on northeast Kodiak reported an increase in bear problems and demanded action. The Game Commission sent a biologist and a team of predator hunters to eliminate problem bears on the ranches in 1939. Seven bears were killed; however, in their final report the agents discouraged further bear-control efforts (Sarber 1939).

To address the dilemma of conserving bears while protecting cattle and residents, President Franklin D. Roosevelt created the Kodiak National Wildlife Refuge by Executive Order in 1941.

The refuge withdrew 1,957,000 acres from unreserved public domain to preserve the natural feeding and breeding range of the brown bear and other wildlife.

During the 1940s, the sockeye escapement on the Karluk River dwindled, and bears were cited as a leading cause of the decline. Fishermen called for bear control, and sportsmen across the nation lobbied against it. Studies revealed that bears killed a large number of salmon, but the vast majority (98%) were fish that had already spawned, and that the impact of bears on future salmon runs was minimal. After considering these diverse opinions and the results of the studies, the Alaska Game Commission again opted to forego any bear control or hunting-season liberalization. It did, however, pass a new regulation in 1957 that protected maternal female bears statewide. The next year, that protection was extended to also include dependent cubs.

Alaska achieved statehood in 1959 and assumed responsibility for managing the state's wildlife. The Game Commission's successor, the Alaska Board of Game, reduced bear-hunting seasons on Afognak and Raspberry islands and on the Kodiak National Wildlife Refuge. They also implemented a hide-sealing requirement, established a tag fee for nonresident bear hunters, and stationed a game biologist in Kodiak. At the same time, the Board liberalized bear seasons on non-refuge lands on Kodiak and initiated another investigation into bear-cattle problems on northeast Kodiak.

During the 1960s, state biologists worked with ranchers along the Kodiak road system to examine and reduce the predation problem. Biologists reported that cattle and bears are not compatible on the same ranges (Eide 1964). Potential solutions included poisons, fences to isolate cattle ranges, and reduction of land disposals in areas with bears. Again, sportsmen did not hesitate to voice their support for Kodiak bears. In spite of public pressure, the state continued its involvement in dispatching problem bears and attempted to capture and move some bears. From 1966 through 1969, the state authorized the use of dogs to hunt brown bears on northeast Kodiak.

In late 1970, the state issued a policy curtailing bear-control programs. Ranchers suffering losses could continue to take bears in defense of life or property, but could not shoot bears from airplanes or poison them. Sport hunting was to be the primary means of reducing bear numbers, and hunting regulations were liberalized.

Same-day airborne hunting was prohibited in 1967. In that same year, hunters were required to bring the skulls of harvested bears out of the field, and, in 1968, skull-sealing was required. Population studies around Karluk Lake suggested the local harvest was excessive, so the drainage was closed to fall bear hunting by emergency regulation in 1967 and by regulation in 1968. In an additional effort to better distribute bear harvests on the refuge, a permit-quota system was established in 1968. In 1969, the bag limit for brown bears was reduced to one bear per four years, and for most of the archipelago the winter hunting season was eliminated.

In 1971, the Alaska Native Claims Settlement Act (ANCSA) resolved many long-standing land issues with aboriginal Alaskans statewide. The impacts were felt strongly on the archipelago as large areas of the coastline; the Karluk River drainage; Sitkalidak, Spruce and Whale islands; and most of the forested areas of Afognak and Raspberry islands were conveyed to the Native corporations. Federal management of the National Forest lands on Afognak was threatened, and

the Kodiak National Wildlife Refuge lost control of 310,000 acres of prime bear habitat (more than 17 % of refuge lands).

In 1975, the state created 19 exclusive guiding areas on the archipelago. The state also began distributing most of the bear hunting permits on Kodiak Island by lottery. Twenty-six hunt areas were established, Alaska residents were allocated at least 60 percent of the permits, and all harvested bears had to be inspected by a state biologist in Kodiak.

In 1975, the Forest Service began construction of a logging road between Kazakof (Danger) Bay and Discoverer Bay, and timber harvesting began in 1977. Under ANCSA's provisions, the Native Corporations took over management of their recently acquired lands in 1978. Passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 added the northwest portion of Afognak Island to the Refuge, but it also curtailed the Forest Service's management on the island. In subsequent years, the rate of timber harvest was greatly accelerated over original projections.

In 1979, work began on an environmental impact statement for the Terror Lake hydroelectric project. The project was to include an earthen dam on Terror Lake in the refuge and a 6 mile–long tunnel through a mountain ridge to a penstock and powerhouse in the Kizhuyak River drainage. The proposed project was to be the first significant invasion of inland bear habitat on Kodiak Island. To address the opposition encountered from the public and agencies, a mitigation settlement was negotiated in 1981 which included brown bear research and establishment of the Kodiak Brown Bear Trust. The hydroelectric project was completed in 1985.

Human alteration of bear habitat on Kodiak and Afognak islands spurred renewed interest and funding for bear research on the archipelago, resulting in a surge of baseline and applied bear research on Kodiak through the 1980s and 1990s. Extensive use of radiotelemetry on bears revealed denning, feeding, movement, mortality rates, and reproductive history patterns (Barnes 1986; 1990; Barnes and Smith 1995; Smith and Van Daele 1988; 1990; Van Daele *et al.* 1990). A density estimation technique developed by Miller *et al.* (1987) was applied to 2 study areas on Kodiak Island in 1987, and the brown bear population in Unit 8 was estimated (Barnes et al. 1988). Barnes (1993) monitored movements of brown bears in relation to deer hunting activity on western Kodiak Island, recommending additional effort to document unreported killing of bears and improved educational programs for deer hunters.

Bears were not directly harmed by the *Exxon Valdez* oil spill in 1989, although some were displaced from traditional feeding and traveling areas by cleanup crews. No one was injured by a bear, and no Kodiak bears were killed. To mitigate the adverse impacts of the spill, Exxon reached a settlement with the state and federal governments. Paradoxically, the impacts of the oil spill and the subsequent cleanup and settlement proved to be beneficial to bears on Kodiak. Bear-safety training exposed thousands of workers to factual information about bears, and money from the settlement fund was used for funding land acquisitions. By the close of the 20th century, over 80% of the refuge lands that had been lost as a result of ANCSA were reinstated into the refuge, either through direct purchase or by means of conservation easements. Lands were also purchased on Afognak and Shuyak islands and transferred into state ownership. The Brown Bear Trust coordinated a coalition of sportsmen and other wildlife conservation groups from around the nation to lobby for use of settlement funds to acquire Kodiak lands. The groups

also directly contributed funding to protect small parcels of important bear habitat around the islands.

Except for the changes in issuing permits to nonresidents, only minor changes in bear hunting regulations have occurred since 1976. Afognak and part of northeastern Kodiak Island were changed from an unlimited permit hunt to a limited permit hunt in 1987–88. State hunting regulations allowed for a subsistence bear hunt in 1986/87, with hunters required to salvage all bear meat for human consumption. This regulation was rescinded the next year; however, in spring 1997 a federal hunting regulation reinstated a subsistence season. Under Federal regulation up to 10 permits were available to residents of Kodiak Island villages. Permits were valid only on Federal lands, and seasons were 1–15 December and 1 April–15 May. All meat from bears harvested under this regulation was to be salvaged for human consumption.

Although hunting continued to be the most popular human use of bears on Kodiak in the early 1990s, the area was experiencing an expansion of bear viewing and photography. To address this public demand, a bear-viewing program was administered by the refuge in 1990. The program was cancelled after 1994 because of a legal challenge to the procedures used in awarding the bear-viewing concession. Biologists studied bear-human interactions at the viewing areas and concluded that bears could tolerate viewing programs as long as the human activities were predicable and restricted to specific areas.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

1. Maintain a stable brown bear population that will sustain an annual harvest of 150 bears composed of at least 60% males.

2. Maintain diversity in the sex and age composition of the brown bear population, with adult bears of all ages represented in the population and in the harvest.

3. Limit human-caused mortality of female brown bears to a level consistent with maintaining maximum productivity.

METHODS

We collected harvest data from mandatory hunter reports and the sealing program. During sealing hunters were required to bring the hide and skull of each bear harvested in Unit 8 to the Kodiak ADF&G office for inspection. We determined bear ages from cementum annuli of premolar teeth removed from each bear. Mandatory hunting reports provided information on hunting effort and success. We monitored hunting activity in the field with periodic patrols by boat and aircraft.

Brown bear population estimates were developed for 9 study areas with the “intensive aerial survey technique” (IAS) detailed in Barnes and Smith (1997*a*) and previously reported in Smith (1995). Data from these surveys were extrapolated to develop a unitwide bear density and

population estimate. We also cooperated with Kodiak NWR staff to conduct aerial brown bear composition surveys along selected streams of southern Kodiak Island.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Recent estimates of the Unit 8 brown bear population are comparable with rough estimates made in the 1950s, although a slightly increasing trend in hunting mortality and in nonsport mortality occurred through the 1980s. The bear population has increased in northeast Kodiak Island since the early 1970s because of more restrictive seasons and fewer bears killed to protect livestock. Since 1976 permits have closely regulated hunting in most of the Unit, and the brown bear population is stable to increasing in local areas.

Population Size

We have worked closely with staff from Kodiak NWR to conduct 13 intensive aerial brown bear surveys from 1987 to 2000 (Table 1). These surveys were in 9 separate areas on Kodiak Island, and 3 areas have been surveyed more often. Data from these surveys were extrapolated to estimate the total bear population on the archipelago (Barnes and Smith 1997*a*, Barnes and Smith 1998). The estimated population size was 2980 bears, 2085 of which were independent (>3 years old). There were an estimated 330 bears on the islands north of Kodiak, 208 bears on northeast Kodiak, 665 on southeast Kodiak, 1088 on southwest Kodiak, and 689 on northwest Kodiak. The average density on Kodiak Island was 265 bears/km^2 (0.7 bears/mi^2), and for the northern islands it was 142 bears/1000 km^2 (0.4 bears/mi^2). We have not conducted aerial surveys on northeastern Kodiak, Afognak or the other northern islands where dense Sitka spruce (*Picea sitchensis*) forest makes it difficult to observe bears, so the population estimates for those areas are tentative.

During this reporting period, the Spiridon Peninsula was surveyed. Data from the May 2000 survey indicated that the bear density of the 287 km^2 (111 mi^2) area was comparable to that found in the same area in 1995. Although the data reflect an increase from 118 bears/1000 km^2 in 1995 to 134 bears/1000 km^2 in 2000, there was no significant difference when we applied statistical tests.

Aerial surveys along salmon streams in southwestern Kodiak Island by the FWS indicated little change in composition of the brown bear population (Table 2). Single bears composed 40% and 37% of the bears classified in 1996 and 1997, respectively. No data were yet available from the surveys conducted during this reporting period.

Distribution and Movements

There have been several investigations of brown bear movements and population dynamics on Kodiak Island. Most involved radiotelemetry and lasted at least 3 years. The Karluk Lake area was investigated from 1954 to 1962 (Troyer and Hensel 1967), the Terror Lake area from 1982 to 1987 (Smith and Van Daele 1990), southwest Kodiak from 1983 to 1987 (Barnes 1990), the Aliulik Peninsula from 1992 to 1996 (Barnes and Smith 1997*b*), and the Spiridon Peninsula from 1991 to 1997 (Barnes, in prep). The denning characteristics of bears in the Terror Lake and the

southwest Kodiak areas were described and compared in 1990 (Van Daele *et. al*. 1990). We are currently working on a compendium of these and other research results to develop a more concise picture of bear ecology on the Kodiak archipelago.

MORTALITY

Harvest

Since statehood, the reported sport harvests of bears in Unit 8 have ranged from 77 (1968–69) to 206 (1965–66) per regulatory year (Table 3). In recent years regulations have been more consistent and designed to better distribute the hunting pressure. From 1980–81 to 1989–90 the average annual harvest was 165.4 bears (range = 124–195), and from 1990–91 to 1999–2000 the average was 160.0 bears (range = 149–177). Assuming a stable bear population of 2890 bears (2085 independent bears), we estimate sport hunters are harvesting 5.5% of the bear population annually (7.8% of the independent bears).

Season and Bag Limit. The season for residents and nonresidents in that portion of Kodiak Island east of a line from the mouth of Saltery Creek to Crag Point, and including Spruce Island, was 25 October–30 November and 1 April–15 May. The bag limit was 1 bear every 4 regulatory years by registration permit only. In the remainder of Unit 8, the season dates were the same, and the bag limit was 1 bear every 4 regulatory years by permit only. Residents, and nonresidents accompanied by a resident within the second degree of kindred, could take bear by drawing permit only. Drawing and registration permits were available for nonresidents guided by a registered, master, or Class A assistant guide.

The Federal Subsistence Board authorized an additional hunt on federal lands for subsistence hunters. Under this regulation up to 10 federal permits are issued to residents of remote Kodiak Island villages to harvest 1 bear per year for human consumption. Season dates for the hunt were 1–15 December and 1 April–15 May.

Board of Game Actions and Emergency Orders. During their Spring 1999 meeting, the Board of Game addressed proposals to limit harvest to 1 bear/lifetime and another requiring licenses and permits for individuals accompanying bear hunters in the field. Neither proposal passed.

Hunter Harvest. Hunters harvested 149 bears in regulatory year 1998–99 and 170 bears in 1999–2000, a rate similar to the previous 5-year mean of 159.8 bears (Table 3). There were 54 bears killed in fall 1998 and 60 killed in fall 1999. The mean annual fall harvest for the previous 5 years was 52.2 bears. During the spring of 1999, 95 bears were killed, and in the spring of 2000, 110 bears were killed. The reduced spring harvest in 1999 was a result of unseasonable temperatures and snow depths which kept hunters from accessing many inland areas because large lakes remained frozen throughout most of the season. The mean annual harvest for the previous 5-year was 107.6 bears. These totals do not include bears killed under federal subsistence regulations: 1 bears (1 female) in 1998–99 and 1 (1 male) in 1999–2000.

Males predominated in the harvest, composing 75.8% of the sport harvest in 1998–99 and 74.7% in 1999–2000, a rate above the previous 5-year average of 70.3%. Although the current management objective of 60% males was met both years, Miller (1990*a*) cautioned that using sex and age ratios to set allowable harvest objectives is more likely to result in overexploitation

than using total adult females for setting guideline harvests. Sport hunters harvested 36 females in 1998–99 and 43 females in 1999–2000, well below the annual mean of 47.0 females harvested during the preceding 5 years. Including other human-caused deaths of females, 49 females were killed in 1998–99 and 50 females were killed in 1999–2000, compared to the previous 5-year mean of 53.4 females.

Mean total skull sizes of male bears harvested in both 1998–99 was 24.9", and in 1999–2000 it was 24.7", differing only slightly from the mean skull size of 24.8" for the previous 5 years. Skull measurements from harvested females increased from an average of 21.8" in 1998–99 to 22.4" in 1999–2000. The average female skull size during the previous 5 years was 21.8" (Table 4). The mean age of bears harvested was 6.9 years in 1998–99, and was 7.7 years in 1999-2000 (5-year $\bar{x}$ = 7.3 years) for males. Female ages averaged 5.6 years in 1998–99, and 8.8 years in 1999–2000 (5-year $\bar{x}$ = 7.2 years) for females.

A sex/skull restriction for guided nonresident hunters in permit hunts DB 108–138 to 116–146 became effective in the spring 1995 season. Guided hunters in those areas must harvest male bears or females with skulls that are at least 15" long or 9" wide. Failure to meet these minimum requirements results in loss of a permit during the next season. Since inception of the regulation, the average annual harvest in the affected area has remained relatively stable, going from 53.3 (1988–89 to 1993–94) to 55.5 (1995–96 to 1999–2000). Nonresident harvest declined from a mean of 30.2 bears (1988–89 to 1993–94) to 25.4 bears (1995–96 to 1999–2000). Nonresident success also declined slightly from 68% (1988–89 to 1993–94) to 65% (1995–96 to 1999–2000). The regulation was effective in reducing harvest of female bears by nonresidents. Prior to the restrictions, the average nonresident harvest was 7.8 females/year (1988–89 to 1993–94), after restrictions this average fell to 2.8 females/year (1995–96 to 1999–2000). Since 1995, 8 permits have been lost because of undersized females being taken.

Permit Hunts. There are 29 drawing hunt areas in Unit 8 for brown bears. Each year 319 drawing permits are available to Alaska residents (107 in fall, 212 in spring), and 153 permits are available for nonresidents (53 in fall, 100 in spring). Nonresidents hunting with resident relatives are allocated permits from the resident quota. Nonresident-guided permits may be reduced if hunters fail to adhere to sex/skull minimums. In 1998–99 and again in 1999–2000, 342 drawing permits were picked up by successful applicants (Table 5). Annual harvest in the drawing permit areas was 138 in 1998–99 and 153 in 1999–2000. The average annual harvest during the previous 5 years was 151.8.

The northeastern portion of Kodiak Island is managed as a registration area for bear hunters (RB 230/260). The seasons mirror those in the drawing hunt areas, but there are no limits on the number of permits available. In 1998–99 we issued 264 registration permits, and in 1999–2000 we issued 279 (Table 6). This was a considerable increase over the mean number of registration permits issued in the previous 5 years (166.0) and it continued the trend of annual increases in permits issued each year since 1994–95. The number of hunters afield in the registration hunt was 171 in 1998–99 and 189 in 1999–2000, also higher than the mean of the previous 5 years (98.0). Annual harvest in the registration permit area was 11 in 1998–99 and 17 in 1999–2000. The average annual harvest during the previous 5 years was 8.2.

Hunter Residency and Success. Hunter success in the drawing permit hunts was 42% in 1998–99 and 46% in 1999–2000 (Table 5), slightly below the mean for the previous 5 years (48.8%). In the registration hunts, hunter success was 6% in 1998–99 and 9% in 1999–2000, comparable to the mean for the previous 5 years (8.0%).

Although over two-thirds of the drawing permits and the vast majority of registration permits are issued to Alaska residents, nonresidents usually harvest more bears in Unit 8 than do residents. In 1998–99, residents harvested 68 bears and nonresidents took 81 (Table 7). In 1999–2000, residents harvested 78 bears and nonresidents took 91 bears. The mean harvest for the previous 5 years was 75.4 for residents and 84.2 for nonresidents.

Harvest Chronology. The first third of the fall season (October 25 to November 6) and the last third of the spring season (May 8 to 15) were typically the most productive times for bear hunters (Table 8). In 1998–99, 80% of the harvest occurred during the first third of the fall season, and in 1999–2000, 73% of the harvest occurred in the first third. During the previous 5 years, the mean annual percentage of the harvest in the first third of the fall season was 74.4%. In 1998–99, 60% of the harvest occurred during the last third of the spring season, and in 1999–2000, 57% of the harvest occurred in the last third. The mean annual percentage of the harvest in the last third of the fall season during the previous 5 years was 53.8%.

Transport Methods. Bear hunters in Unit 8 most commonly use aircraft and boats. The proportion of hunters reporting each method varies each year, with aircraft the most common transportation method (Table 9). This annual variation may be more a function of what hunters report rather than actual changes in transportation modes. Most hunters fly into hunt areas and then use a skiff or inflatable raft in the area, and hunters are inconsistent in the way they choose to report these overlapping modes of transportation.

Other Mortality

Defense of life or property (DLP) kills, illegal kills, subsistence harvests, and other nonhunting human-caused mortality resulted in the death of 25 bears in 1998–99 and 23 in 1999–2000 (Table 3). This was considerably higher than the mean annual nonsport harvest of 16.8 bears/year during the previous 5 years.

The incidence of illegal or unreported DLP kills is unknown, however bears that have been shot but not reported are occasionally found, most frequently near the villages of Larsen Bay, Old Harbor, and Port Lions. Cases in which deer hunters, hikers, sport fishers, commercial fishers, photographers and remote area residents killed or wounded bears without reporting it have been documented often enough to warrant continued effort to improve our estimates of unreported kills.

HABITAT

Assessment

Kodiak's inland habitat is contiguous and intact. Coastal areas have much greater human activity, but the activity is generally restricted to isolated areas and small numbers of people, and roads are few and far between. Salmon management for sustained yield is a high priority on the

archipelago, and bear predation is factored in to escapement rates. The only large scale disruption of inland habitat, the Terror Lake hydroelectric project, was completed with minimal direct or indirect adverse impact to bears or their habitat due to a conscious effort to work with and around the bears.

Afognak Island has experienced considerable habitat alteration in the past 25 years due to commercial logging. Although there have been no objective studies, we suspect that these activities have not had major adverse impacts on the bear population because of continued healthy salmon runs, good berry and grass production, little direct persecution and limited general access to logging roads.

There are approximately 3 million acres of brown bear habitat on Kodiak, Afognak, and adjacent islands in Unit 8. Nearly half that acreage is contained within the Kodiak NWR. More than 300,000 acres of the original 1.9 million acres of refuge land, mostly prime coastal and riparian brown bear habitat, was transferred to Native corporations through ANCSA. By 2000, over 80 percent of the refuge lands that had been lost as a result of ANCSA were reinstated into the refuge, either through direct purchase or by means of conservation easements. Lands were also purchased on Afognak and Shuyak islands and transferred into state ownership. Current developments impacting brown bears include ongoing commercial timber harvest on Afognak Island, proposed development of the Watchout Creek hydroelectric project, expanding rural settlement, commercial fishing, and increasing recreational activities in remote areas, including hunting, sport fishing and wildlife viewing.

The unusually cold winter of 1998-99 had a devastating impact on salmonberry and blueberry production throughout the archipelago. Bears appeared to have difficulty satisfying their nutritional requirements in the mid-to-late summer when these berries are an important part of their diet. Although salmon runs were strong in most area streams, many of the runs were later than usual, further impacting bear feeding strategies. The apparent result was more aggressive bear behavior in the fall. Increasing bear/human encounters, including 2 maulings (one fatality), prompted the Department to issue a “Bear Alert” in cooperation with the Kodiak Borough, the FWS and the U.S. Coast Guard. The alert notified hunters and others to use extreme caution while deer or elk hunting for the remainder of the year.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

The Kodiak Island Borough completed their electric fence around the landfill in 1998 and by 1999 no bears were reported in the fenced area. The last bear family to leave the landfill in 1998 did not seek natural food when they emerged from their den, but aggressively sought sustenance from dumpsters, back porches and pick-ups. They were not dissuaded by adverse conditioning, and were eventually killed by Fish and Wildlife Protection officers. Separately, in 1999, because of their presence at U.S. Coast Guard (USCG) housing, a sow and 2 cubs were shot by authorities and a third cub was sent to a zoo in Milwaukee. This generated a great deal of public interest and resulted in significant changes in the way USCG security police respond to bear calls and in the way the Base handles its garbage.

The USCG Base and Kodiak Island Borough were thorough in their responses to 1999’s bear problems around Kodiak City. Bear resistant trash bins were purchased or leased prior to bear

emergence in the spring, and were placed in many of the rural areas along the road system, including Nemetz housing near the base. Base and Borough staff also worked closely with ADF&G and Fish and Wildlife Protection staff in the design and placement of the bins. Protection officers aggressively enforced waste disposal and littering regulations and ADF&G continued our education efforts. These efforts, coupled with an abundance of natural bear foods, helped to significantly reduce bear problems around Kodiak in 2000. A mauling near Coast Guard housing on 8 October 2000 appeared to have been caused by unfortunate circumstances and was not due to a habituated or rogue bear.

Nuisance bear problems in the 5 remote villages and near Kodiak city continued to be exacerbated by inadequate garbage disposal. Improperly maintained landfills continue to attract bears to villages, resulting in several DLP bear kills annually. Developing environmentally sound and economical garbage disposal methods will require a multiagency approach and close cooperation with local and village governments. Larsen Bay village installed an oil-fired incinerator for garbage in 1993, but the facility has not been fully utilized. The high incidence of bears near Larsen Bay can be attributed to an unmanaged landfill. Reductions in staff and budgets of the Department of Environmental Conservation have hampered that agency's efforts to enforce waste disposal regulations.

Brown bear viewing and photography is a rapidly developing aspect of the summer tourism industry in Kodiak. A trial bear-viewing program, modeled after the McNeil River Sanctuary program, was administered by the FWS at Dog Salmon River in 1990 and 1991 and at O'Malley River in 1992 and 1994 (Smith 1995). The O'Malley program was cancelled after 1994 because of a legal challenge to the procedures used in awarding the bear-viewing concession to Munsey's Bear Camp. There are now no Kodiak NWR-sanctioned bear viewing programs on the refuge; however, some Kodiak-based air taxi services offer bear-viewing trips on Kodiak and to the Alaska Peninsula, and several lodges and outfitters cater to viewers and photographers. A private operator ran a guided bear-viewing program on Koniag Corporation land at Thumb River on Karluk Lake from 1995–1999. The Dog Salmon River fish pass near Frazer Lake remains a popular site for unguided bear viewers. Some outfitters are authorized by the refuge to take clients to watch bears at a distance, minimizing impact to the bears.

An archipelago-wide bear management plan is currently being developed in a cooperative effort between government agencies and the public. The plan will be developed by a Citizen's Advisory Committee (CAC) made up of representatives from various interest groups. With assistance from a professional facilitator, they plan to meet twice a month from November 2000 until March 2001. Agency staff will serve as technical advisors to the CAC but will not participate in the final decisions. A separate Intergovernmental Planning Group (IPG) will select the groups to be represented in the CAC and will write the charter for the CAC. The IPG will also be responsible for implementing the CAC's final decisions. The IPG consists of representatives from ADF&G, U.S. Fish and Wildlife Service, Kodiak Island Borough, Kodiak City, Koniag and each of the villages on Kodiak. ADF&G is funding the planning effort.

CONCLUSIONS AND RECOMMENDATIONS

Bear harvests have been relatively consistent over the past 20 years with most variations attributable to weather and hunter participation. In 1996–97 to 1999–2000, the percent males in

the harvest was the highest ever reported for any period since data began being collected in 1949. In 1998–99 the number of females harvested was the lowest since 1970–71. The management objective of males composing at least 60% of the harvest has been achieved for the past 13 consecutive years and in 32 of 40 years since statehood. The current estimated annual harvest rate of 5.5% of the total bear population is close to the suggested approximate maximum 5.7% exploitation rate from Miller's (1990*b*) population simulation studies on brown bears in Southcentral Alaska. These data indicate that the brown bear population in Unit 8 is healthy, productive and relatively stable, and that the current rate of harvest is sustainable as long as habitat is protected and the number of adult females killed remains low.

The minimum skull size requirement in permit hunts DB108/138–116/146 resulted in a 11% decline in total harvest, a 19% decline in nonresident hunter success, and a 71% decline in the harvest of females by nonresidents in that area during the first 3 years of implementation. In the past 2 years, harvests have improved, resulting in nonresident harvest and success rates comparable to the years before the regulation change. Female harvest has declined substantially, suggesting that nonresident hunters and their guides have become highly selective because of the risk of losing a permit if a bear fails to meet minimum requirements. Overall, there are few complaints about the system, and the systems appears to be a viable alternative to reductions in the number of permits.

A considerable increase in the popularity of the registration hunt along the Kodiak road system, particularly during the fall season, resulted in a dramatic increase in hunter effort and in harvest.

The increase in bear/human encounters in the area during 1999, and the number of large bears harvested or killed in defense of life or property in the area generated additional publicity and local interest in reducing problem bears. The registration hunt area is managed to keep the bear density lower than in other parts of the Unit due to higher concentrations of humans and livestock. The increased harvest remains within the management guidelines, and no actions to reduce harvest are necessary at this time.

Intensive aerial surveys and composition counts along streams in southern Kodiak Island are now included in the Kodiak NWR annual management budget, and we plan to cooperate with NWR biologists as they conduct these surveys each year. Data from these surveys should be periodically reviewed to monitor trends in the bear populations and refine population estimates.

Maintaining optimal brown bear populations is economically important to the tourist industry including hunters and wildlife viewers. The Kodiak NWR has addressed many bear-related issues in their planning efforts, proposing extensive regulations to minimize human impacts in important bear habitat (FWS 1987). These regulations were imposed on commercial operators but have not been extended to private citizens. In 2001 refuge managers began to revise their Comprehensive Conservation Plan for the refuge.

A variety of user groups have urged the department to revisit our bear management objectives for Unit 8. In response, the department has taken the lead in developing a formal bear management plan for the archipelago, garnering involvement from a broad spectrum of agencies and user groups including Kodiak NWR staff and bear hunting guides. The planning process

will emphasize public participation and consensus building, with a targeted completion date of Spring 2001 for the draft and Winter 2001 for the final plan.

LITERATURE CITED

BARNES, V. G. JR. 1986. Progress report–Brown bear studies 1985. U.S. Fish and Wildlife. Service, Denver Wildlife Ref. Centr., Unpubl. Rep. 37 pp.

———. 1990. The influence of salmon availability on movements and range of brown bears on southwest Kodiak Island. International Conference on Bear Research and Management. 8:305–313.

———. 1993. Brown bear-human interactions associated with deer hunting on Kodiak Island. International Conference on Bear Research and Management. 9 (1): 63–73.

BARNES, V. G. JR., AND R. B. SMITH. 1995. Brown bear density estimation and population monitoring on southwest Kodiak Island, Alaska. Final report. U.S. National Biological Service and Alaska Department of Fish and Game. 42 pp.

_____, AND _____ 1997*a*. Population ecology of brown bears on Aliulik Peninsula, Kodiak Island, Alaska. Final Report National Fish and Wildlife Foundation, Project 94–237. U.S. National Biological Service and Alaska Department of Fish and Game. 43 pp.

_____ and _____ 1997*b*. Population ecology of brown bears on Aliulik Peninsula, Kodiak Island, Alaska. Final Report National Fish and Wildlife Foundation, Project 94-237. U.S. National Biological Service and Alaska Department of Fish and Game. 43 pp.

_____, AND _____ 1998. Estimates of brown bear abundance on Kodiak Island, Alaska. Ursus 10:1–9.

_____, _____, AND L. VANDAELE. 1988. Density estimates and estimated population of brown bears on Kodiak and adjacent islands, 1987. U. S. Department of Interior Fish and Wildlife Service and Alaska Department of Fish and Game, Report to Kodiak Brown Bear Research and Habitat Maintenance Trust. Unpublished Report 34 pp.

EIDE, S. E. 1964. Kodiak bear-cattle relationships. Alaska Department of Fish and Game. Juneau, Alaska. 29 pp.

MILLER, S. D., E. F. BECKER, AND W. B. BALLARD. 1987. Density estimates using modified capture-recapture techniques for black and brown bear populations in Alaska. International Conference on Bear Research and Management. 7:23–35.

MILLER, S. D. 1990 *a*. Population management of bears in North America. International Conference on Bear Research and Management. 8:357–373.

_____. 1990 *b.* Impacts of increased hunting pressure on the density, structure and dynamics of brown bear populations in Alaska's Game Management Unit 13. Alaska

Department of Fish and Game. Federal Aid in Wildlife Restoration Project. Report Project W-23-2. Studies 4.18 and 4.21. Juneau, Alaska. 54 pp.

SARBER, H. R. 1939. Report on the Kodiak bear control projects. Unpublished report. Alaska Game Commission. Juneau, Alaska. 53 pp.

SMITH, R. B. 1995. Unit 8 brown bear management report of survey-inventory activities. Pages 67–87 *in* M. V. Hicks, ed. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Project Report ProjectW-24-1 and W-24-2. Study 4.0. Juneau. 303 pp.

———, AND L. J. VAN DAELE. 1988. Terror Lake Hydroelectric Project. Final report on brown bear studies 1982–86. Alaska Department of Fish and Game. Kodiak, Alaska. 195 pp.

———, AND ———. 1990. Impacts of hydroelectric development on brown bears, Kodiak Island, Alaska . International Conference on Bear Research and Management. 8:93–103.

TROYER, W. A. AND R. J. HENSEL. 1967. The brown bear of Kodiak Island. Unpublished Report. Bureau of Sport Fisheries and Wildlife. Kodiak, AK 232 pp.

U.S. FISH AND WILDLIFE SERVICE. 1987. Kodiak National Wildlife Refuge, comprehensive conservation plan, wilderness review and environmental impact statement. U.S. Fish and Wildlife Service, final internal review. 775 pp.

VAN DAELE, L. J., V. G. BARNES JR., AND R. B. SMITH. 1990. Denning characteristics of brown bears on Kodiak Island, Alaska. International Conference on Bear Research and Management. 8:257–267.

PREPARED BY:

Lawrence J. Van Daele
Wildlife Biologist III

SUBMITTED BY:

Mike McDonald
Assistant Management Coordinator

Table 1 Estimated density and observation rates of independent bears in intensive aerial survey areas, Unit 8, 1987–2000

Survey Area	Year	Replicate Surveys	Survey Rate (min/km^2)	Bears/hr	Bears/100km^2	Sightability	Density Bears/1000 km^2	Size of survey area (km^2)	Size of survey area (mi^2)
Terror Lake	1987	3	1.5	3.1	7.5	0.33	234	355	137
Terror Lake	1997	4	1.7	3.4	9.2	0.33	276	355	137
Southwest Kodiak	1987	4	1.5	3.5	8.8	0.41	218	632	244
Sturgeon River	1987	4	1.6	4.3	12.0	0.41	293	264	102
Sturgeon River	1992/93	4	1.8	2.6	7.7	0.41	190	264	102
Sturgeon River	1998	4	1.9	3.0	9.4	0.41	227	264	102
Aliulik Peninsula	1992/93	8	1.6	4.0	10.8	0.53	216	350	135
Olga Lakes	1992/93	5	1.2	1.8	3.3	0.41	80	262	101
Karluk Lake	1994	4	2.1	5.4	18.0	0.45	400	267	103
Spiridon Lake	1995	4	1.9	1.2	3.8	0.33	118	287	111
Spiridon Lake	2000	4	1.8	1.5	4.4	0.33	134	287	111
Shearwater Pen.	1996	3	2.2	2.6	9.2	0.37	248	274	106
Kiliuda Bay	1996	4	2.5	2.4	10.1	0.37	270	159	61

Table 2 Unit 8 aerial stream counts of brown bears[a], 1985–2000

Regulatory year	Complete surveys	*Single bears*		*Maternal bears*		*Yearlings & cubs*		*Cubs of the year*		Bears per survey	Total
		Number	%	Number	%	Number	%	Number	%		
1985	10	434	54	110	14	189	24	67	8	80.0	800
1986	10	445	55	115	14	191	24	54	7	80.5	805
1987	8	205	53	58	15	92	24	31	8	48.3	386
1988	4	117	51	39	17	50	22	23	10	57.3	229
1989	9	406	46	148	17	284	32	54	6	99.1	892
1990	8	460	44	177	17	273	26	126	12	129.5	1,036
1991	9	529	52	156	15	210	21	129	13	113.8	1,024
1992	5	226	44	92	18	103	20	92	18	102.6	513
1993	6	244	47	88	17	119	23	67	13	86.5	519
1994	5	238	47	85	17	110	22	65	13	100.4	502
1995	4	230	46	86	17	136	27	49	10	125.3	501
1996	3	122	39	62	20	86	27	45	14	105	315
1997	7	195	37	112	21	128	24	92	17	75.3	527
1998[b]	--	--	--	--	--	--	--	--	--	--	--
1999[b]	--	--	--	--	--	--	--	--	--	--	--
2000[b]	--	--	--	--	--	--	--	--	--	--	--

a From Kodiak National Wildlife Refuge files; standardized low-level surveys along selected streams on southwestern Kodiak Island.

b Data not yet available.

Table 3 Reported brown bear kill data for the Kodiak archipelago by regulatory year and season, 1960/61–1999/2000

Regulatory	Fall harvest				Spring harvest				Total sport harvest					Reported non-sport				Total reported bear kill[a]			
year	M	F[c]	UNK[d]	Total[e]	M	F	UNK	Total	M	%M[f]	F	UNK	Total	M	F	UNK	Total	M	F	UNK	Total
1960/61				0	72	25	0	97	72	74%	25	0	**97**	2	1	0	3	74	26	0	**100**
1961/62	19	17	0	36	55	23	0	78	74	65%	40	0	**114**	0	0	0	0	74	40	0	**114**
1962/63	17	16	0	33	50	37	4	91	67	54%	53	4	**124**	4	4	0	8	71	57	4	**132**
1963/64	21	9	0	30	69	45	1	115	90	62%	54	1	**145**	10	7	0	17	100	61	1	**162**
1964/65	23	6	0	29	67	67	3	137	90	54%	73	3	**166**	9	13	0	22	99	86	3	**188**
1965/66	40	26	0	66	77	62	1	140	117	57%	88	1	**206**	14	11	0	25	131	99	1	**231**
1966/67	40	22	1	63	45	31	1	77	85	61%	53	2	**140**	6	4	0	10	91	57	2	**150**
1967/68	30	16	0	46	50	27	0	77	80	65%	43	0	**123**	3	3	0	6	83	46	0	**129**
1968/69	16	12	0	28	32	16	1	49	48	62%	28	1	**77**	3	1	0	4	51	29	1	**81**
1969/70	11	9	1	21	36	21	6	63	47	56%	30	7	**84**	2	0	0	2	49	30	7	**86**
10-year mean	*24.1*	*14.8*	*0.2*	*39.1*	*55.3*	*35.4*	*1.7*	*92.4*	*77.0*	*60%*	*48.7*	*1.9*	***127.6***	*5.3*	*4.4*	*0*	*9.7*	*82.3*	*53.1*	*1.9*	***137.3***
1970/71	28	12	1	41	47	17	2	66	75	70%	29	3	**107**	5	8	0	13	80	37	3	**120**
1971/72	27	21	2	50	62	31	0	93	89	62%	52	2	**143**	1	2	1	4	90	54	3	**147**
1972/73	33	33	0	66	66	47	1	114	99	55%	80	1	**180**	0	1	1	2	99	81	2	**182**
1973/74	24	38	0	62	52	35	0	87	76	51%	73	0	**149**	2	1	1	4	78	74	1	**153**
1974/75	29	23	0	52	48	25	3	76	77	60%	48	3	**128**	1	5	0	6	78	53	3	**134**
1975/76	18	14	0	32	61	29	0	90	79	65%	43	0	**122**	2	6	0	8	81	49	0	**130**
1976/77	25	16	0	41	55	34	0	89	80	62%	50	0	**130**	1	0	0	1	81	50	0	**131**
1977/78	22	12	0	34	65	38	0	103	87	64%	50	0	**137**	1	3	1	5	88	53	1	**142**
1978/79	22	13	0	35	49	39	1	89	71	57%	52	1	**124**	6	2	2	10	77	54	3	**134**
1979/80	18	18	0	36	77	34	1	112	95	64%	52	1	**148**	1	3	4	8	96	55	5	**156**
10-year mean	*24.6*	*20.0*	*0.3*	*44.9*	*58.2*	*32.9*	*0.8*	*91.9*	*82.8*	*61%*	*52.9*	*1.1*	***136.8***	*2.0*	*3.1*	*1.0*	*6.1*	*84.8*	*56.0*	*2.1*	***142.9***

Table 3 continued

Regulatory year	Fall harvest				Spring harvest				Total sport harvest					Reported non-sport				Total reported bear kill[a]			
	M[b]	F[c]	UNK[d]	TOT[e]	M	F	UNK	Total	M	%M[f]	F	UNK	Total	M	F	UNK	Total	M	F	UNK	Total
1980/81	24	14	0	38	61	25	0	86	85	69%	39	0	**124**	3	6	3	12	88	45	3	**136**
1981/82	21	16	0	37	65	34	0	99	86	63%	50	0	**136**	4	3	3	10	90	53	3	**146**
1982/83	36	26	2	64	102	36	0	138	138	68%	62	2	**202**	6	8	2	16	144	70	4	**218**
1983/84	31	26	0	57	102	36	0	138	133	68%	62	0	**195**	5	7	0	12	138	69	0	**207**
1984/85	33	21	0	54	71	30	0	101	104	67%	51	0	**155**	9	13	0	22	113	64	0	**177**
1985/86	52	32	2	86	70	34	0	104	122	64%	66	2	**190**	6	13	5	24	128	79	7	**214**
1986/87	26	39	0	65	71	30	0	101	96	58%	69	0	**165**	7	8	2	17	103	77	2	**182**
1987/88	25	25	0	50	80	40	1	121	104	61%	65	1	**170**	7	5	4	16	111	70	5	**186**
1988/89	30	23	1	54	73	39	0	112	103	62%	62	1	**166**	2	15	5	22	105	77	6	**188**
1989/90	25	20	0	45	74	32	0	106	99	66%	52	0	**151**	2	11	1	14	101	63	1	**165**
10-year mean	*30.3*	*24.2*	*0.5*	*55.0*	*76.9*	*33.6*	*0.1*	*110.6*	*107.0*	*65%*	*57.8*	*0.6*	***165.4***	*5.1*	*8.9*	*2.5*	*16.5*	*112.1*	*66.7*	*3.1*	***181.9***
1990/91	30	21	0	51	69	29	0	98	99	66%	50	0	**149**	6	7	3	16	105	57	3	**165**
1991/92	25	16	1	42	72	40	2	114	97	62%	56	3	**156**	6	6	4	16	103	62	7	**172**
1992/93	39	23	1	63	74	39	1	114	113	64%	62	2	**177**	5	7	6	18	118	69	8	**195**
1993/94	35	19	0	54	78	30	1	109	113	69%	49	1	**163**	2	6	8	16	115	55	9	**179**
1994/95	42	15	0	57	65	33	0	98	107	69%	48	0	**155**	10	14	3	27	117	62	3	**182**
1995/96	29	20	0	49	67	36	0	103	96	63%	56	0	**152**	2	2	1	5	98	58	1	**157**
1996/97	33	15	0	48	92	22	0	114	125	77%	37	0	**162**	5	7	8	20	130	44	8	**182**
1997/98	36	17	0	53	85	28	1	114	121	72%	45	1	**167**	7	3	6	16	128	48	7	**183**
1998/99	39	15	0	54	74	21	0	95	113	76%	36	0	**149**	7	13	5	25	120	49	5	**174**
1999/2000	44	16	0	60	83	27	0	110	127	75%	43	0	**170**	12	7	4	23	139	50	4	**193**
10-year mean	*35.2*	*17.7*	*0.2*	*53.1*	*75.9*	*30.5*	*0.5*	*106.9*	*111.1*	*69%*	*48.2*	*0.7*	***160.0***	*6.2*	*7.2*	*4.8*	*18.2*	*117.3*	*55.4*	*5.5*	***178.2***

[a] reported kill data derived from sealing records (1960/61 to 1989/90) and annual harvest reports (1990/91 to present).
[b] males
[c] females
[d] unknown or unreported sex
[e] total
[f] percent males in harvest (males/total)

Table 4 Total skull size, age, and sex of brown bears killed by sport hunters in Unit 8, 1980/81–1999/2000

	Males				Females			
Regulatory year	Mean skull size	*n*	Mean age	*n*	Mean skull size	*n*	Mean age	*n*
1980/81	24.0	93	6.2	101	21.6	45	6.9	48
1981/82	24.2	78	6.5	79	21.7	39	7.1	39
1982/83	24.4	89	7.2	98	22.1	55	8.6	59
1983/84	24.6	128	7.4	130	21.6	60	7.9	62
1984/85	24.7	99	7.3	102	22.0	45	7.8	51
1985/86	24.5	116	7.4	120	21.9	57	7.2	64
1986/87	24.8	93	7.6	96	21.9	60	8.5	64
1987/88	24.6	100	6.7	104	21.8	63	6.6	65
1988/89	25.5	98	9.1	103	21.6	53	7.4	61
1989/90	25.4	96	9.0	97	21.6	48	8.7	52
1990/91	25.3	97	8.6	95	21.7	43	8.0	50
1991/92	25.0	91	8.4	96	21.7	52	8.0	56
1992/93	25.1	106	8.2	112	21.9	56	7.8	61
1993/94	24.4	109	6.8	113	21.8	45	7.2	48
1994/95	25.0	103	7.8	107	21.8	46	6.8	48
1995/96	25.2	94	7.5	95	21.8	50	7.4	55
1996/97	24.7	120	7.5	125	21.7	34	7.9	37
1997/98	24.7	117	6.8	120	21.9	44	6.5	44
1998/99	24.9	112	6.9	113	21.8	36	5.6	35
1999/2000	24.7	122	7.7	125	22.4	40	8.8	41

Table 5 Unit 8 brown bear harvest data for drawing permit hunts DB 101–159 and 201–259, 1990/91–1999/2000

	Regulatory year	Permits issued	Permits returned	Percent did not hunt	Percent successful hunters	Males	%	Females	%	Unk	Total[a] harvest
Fall hunts	1990/91	124	123	2	43	30	59	21	41	0	51
(DB101-129)	1991/92	119	119	8	33	21	58	15	42	1	37
(DB201-229)	1992/93	128	127	4	46	35	63	21	37	0	56
	1993/94	118	118	3	47	34	64	20	36	0	54
	1994/95	118	116	2	48	39	82	15	28	0	54
	1995/96	113	113	2	40	29	65	16	35	0	45
	1996/97	120	119	5	39	32	73	12	27	0	44
	1997/98	131	128	2	50	33	67	16	33	0	49
	1998/99	128	126	2	39	32	68	15	32	0	47
	1999/2000	126	126	6	44	37	71	15	29	0	52
Spring hunts	1990/91	221	221	1	44	68	71	28	29	0	96
(DB131-159)	1991/92	227	225	6	50	69	66	35	34	2	106
(DB231-259)	1992/93	214	212	2	51	73	68	34	32	0	107
	1993/94	219	218	4	50	77	74	27	26	1	105
	1994/95	215	213	2	45	63	66	32	34	0	95
	1995/96	225	223	3	45	63	64	35	36	0	98
	1996/97	219	216	2	50	85	80	21	20	0	106
	1997/98	235	218	1	50	83	76	26	24	1	110
	1998/99	214	211	3	44	70	77	21	23	0	91
	1999/2000	216	214	0	48	77	76	24	24	0	101

Table 5 Continued

	Regulatory year	Permits issued	Permits returned	Percent did not hunt	Percent successful hunters	Males	%	Females	%	Unk	Total[c] harvest
Combined	1990/91	345	344	1	43	98	67	49	33	0	147
Fall and	1991/92	346	344	6	43	90	64	50	36	3	143
Spring Hunts	1992/93	342	339	3	49	108	66	55	34	0	163
(DB101-159)	1993/94	337	336	4	49	111	70	47	30	1	159
(DB201-259)	1994/95	333	329	2	54	102	69	47	31	0	149
	1995/96	338	336	3	46	92	64	51	36	0	143
	1996/97	339	335	7	45	117	78	33	22	0	150
	1997/98	366	346	3	50	116	74	42	26	1	158
	1998/99	342	337	5	42	102	74	36	26	0	138
	1999/2000	342	340	3	46	114	75	39	25	0	153

[a] Harvest figures may differ from those in other tables because of differences in classification of illegal kills and unresolved discrepancies in hunter reports.

Table 6 Unit 8 brown bear harvest data for registration permit[a] hunt numbers RB 230 and RB 260, 1990/91-1999/2000

	Regulatory year	Permits issued[a]	Permits returned	Hunters afield	Percent did not hunt	Percent successful hunters	Males	%	Females	%	Unk	Total harvest
Fall Hunts	1990/91	54	51	--	30	0	0	--	0	--	0	0
(RB230)	1991/92	110	108	--	40	6	4[b]	80	1	20	0	5[c]
	1992/93	103	102	71	30	10	4	67	2	33	1	7
	1993/94	86	86	48	44	2	1	100	0	0	0	1
	1994/95	69	65	52	20	4	2	100	0	0	0	3
	1995/96	71	68	37	48	11	0	0	4	100	0	4
	1996/97	84	83	47	43	9	2	50	2	50	0	4
	1997/98	114	98	71	24	4	3	100	0	0	0	3
	1998/99	157	145	99	32	7	7	100	--	--	0	7
	1999/2000	176	175	110	33	7	7	88	1	12	0	8
Spring	1990/91	63	60	--	37	5	1	50	1	50	0	2
Hunts	1991/92	73	71	--	15	13	3	38	5	62	0	8
(RB260)	1992/93	98	92	66	28	9	1	20	4	80	1	6
	1993/94	70	68	45	34	9	1	25	3	75	0	4
	1994/95	75	68	45	40	7	2	67	1	33	0	3
	1995/96	85	83	58	32	9	4	75	1	25	0	5
	1996/97	82	78	53	32	15	7	88	1	12	0	8
	1997/98	94	55	34	38	12	2	50	2	50	0	4
	1998/99	107	92	72	22	6	4	100	0	--	0	4
	1999/2000[b]	103	96	79	18	11	7	78	2	22	0	9

Table 6 Continued

	Regulatory year	Permits issued[a]	Permits returned	Hunters afield	Percent did not hunt	Percent successful hunters	Males	%	Females	%	Unk	Total harvest
Combined	1990/91	117	111	--	34	3	1	50	1	50	0	2
Fall and	1991/92	183	179	--	30	9	7[b]	54	6	46	0	13[c]
Spring	1992/93	203	194	137	29	9	5	45	6	55	2	13
Hunts	1993/94	156	154	93	30	5	2	40	3	60	0	5
(RB230	1994/95	144	133	97	27	6	5	83	1	17	0	6
& RB260)	1995/96	156	151	95	39	9	4	44	5	56	0	9
	1996/97	166	161	100	38	12	9	75	3	25	0	12
	1997/98	208	153	105	31	8	5	71	2	29	0	7
	1998/99	264	237	171	28	6	11	100	0	--	0	11
	1999/2000[b]	179	271	189	27	9	14	82	3	18	0	17

[a] No limit on the number of permits issued.

[b] Includes 1 female bear illegally killed by an sport hunter.

Table 7 Residency of successful brown bear hunters[a] in Unit 8, 1990/91–1999/2000

Regulatory year	Local residents[b]	(%)	Nonlocal residents	(%)	Nonresidents[c]	(%)	Total successful hunters
1990/91	7	5	47	32	95	63	149
1991/92	14	9	53	34	88	57	155
1992/93	16	9	58	33	103	58	177
1993/94	6	4	66	40	91	56	163
1994/95	10	6	58	37	87	56	155
1995/96	20	13	61	40	71	47	152
1996/97	10	6	63	39	89	55	162
1997/98	12	7	71	43	83	50	166
1998/99	11	7	57	38	81	54	149
1999/2000	16	9	62	37	91	54	169

[a] Permits required for all hunters; does not include sport hunters who killed bear without a permit, so may differ from other tables.

[b] Includes residents of Game Management Unit 8.

[c] Includes the following successful non-residents guided by next-of-kin: 1990/91 – 2; 1991/92 – 0; 1992/93 – 1; 1993/94 – 1; 1994/95 – 1; 1995/96 – 3; 1996/97 – 1; 1997/98 – 3; 1998/99 – 1; and, 1999/2000 – 2 .

Table 8 Chronology of the brown bear harvest, by season and period, in Unit 8, 1990/91–1999/2000

Regulatory year	Fall Season							Spring Season							Regulatory Year Total[a]
	Oct 25–Nov 6		Nov 7–Nov 18		Nov 19–Nov 25		Fall Total	Apr 1–Apr 15		Apr 16–Apr 30		May 1–May 15		Spring Total	
	n	%	*n*	%	*n*	%	*n*	*n*	%	*n*	%	*n*	%	*n*	
1990/91	37	73	11	22	3	6	51	5	5	41	42	52	53	98	149
1991/92	28	67	9	21	5	12	42	2	2	48	42	64	56	114	156
1992/93	53	84	4	6	6	10	63	3	3	48	42	63	55	114	177
1993/94	42	78	10	19	2	4	54	6	6	46	42	57	52	109	163
1994/95	38	67	11	19	8	14	57	2	2	40	41	56	57	98	155
1995/96	34	69	13	26	2	4	49	1	1	40	39	62	60	103	152
1996/97	39	81	8	17	1	2	48	6	5	47	41	61	54	114	162
1997/98	41	77	8	15	4	8	53	3	3	59	52	52	46	114	167
1998/99	43	80	9	17	2	3	54	4	4	34	36	57	60	95	149
1999/2000	43	73	10	17	6	10	59	6	5	41	37	63	57	110	169

[a] Totals may differ from those in other tables because of different classifications of illegal sport harvest.

Table 9 Unit 8 brown bear harvest[a] percent by transport method, 1990/91–1999/2000

Regulatory Year	Percent of Harvest								
	Airplane	Horse	Boat	3- or 4-wheeler	Snow-machine	ORV	Highway vehicle	Unknown	*n*
1990/91	72	0	25	0	0	1	1	1	149
1991/92	51	0	41	0	0	1	7	0	156
1992/93	69	1	22	3	0	0	5	0	177
1993/94	72	0	40	2	0	0	1	0	163
1994/95	57	0	38	1	0	0	3	0	155
1995/96	70	1	23	3	0	1	2	0	152
1996/97	48	0	46	0	0	<1	5	0	162
1997/98	70	0	27	0	0	<1	2	0	167
1998/99	73	0	20	3	0	<1	3	0	149
1999/2000	69	0	22	2	0	0	5	2	169

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 9 (33,638 mi^2)

GEOGRAPHIC DESCRIPTION: Alaska Peninsula

BACKGROUND

The Alaska Peninsula is a premiere area for large brown bears, and the Board of Game has placed a high priority on maintaining the quality of this population. Because of reasonably easy aircraft access and the high quality of bear trophies in the unit, an active guiding industry developed during the 1960s. As hunting pressure increased, several studies on brown bear ecology were initiated. During the late 1960s and early 1970s, Alaska Department of Fish & Game (ADF&G) engaged in research at McNeil River State Game Sanctuary to investigate reproductive biology and survival rates of brown bears (Glenn et al. 1976). A succession of graduate students from Utah State University studied bear behavior at McNeil River during the early 1970s. Sellers and Aumiller (1994) analyzed population data collected at McNeil River.

An intensive study was conducted during the early 1970s near Black Lake in the central portion of Subunit 9E. Three hundred and forty-four bears were captured and marked during 1970–75 to acquire information on reproductive performance, movements, and harvest rates. More recently, efforts have been directed at further analyzing the data from this study to better understand the population dynamics of an exploited bear population. In 1988 an interagency study was initiated at Black Lake to assess the current status of the bear population (Sellers and Miller 1991, Sellers 1994, Miller et al. 1997) and to make comparisons with conditions in the early 1970s. The 1989 *Exxon Valdez* oil spill (EVOS) led to another research project to assess damage to the brown bear population along the coast of Katmai National Park. This study continued under National Park Service (NPS) funding with the primary objective of measuring population parameters of an unhunted brown bear population (Sellers et al. 1999).

High harvests that coincided with poor salmon escapements in most drainages in 1972 and 1973 indicated that hunting seasons needed to be reduced. Harvest statistics and the high percentage of marked bears killed in the Black Lake area also supported a reduction in hunting. Emergency closures were declared for all of Unit 9 in the spring of 1974 and for the central portion of the Alaska Peninsula in the spring of 1975. At the spring 1975 board meeting, the present system of alternating seasons (open in the fall of odd-numbered years and the spring of even-numbered years) was adopted to keep harvests within the quota of 150 bears per year for the area south of

the Naknek River. This system reduced harvests substantially from 1976 to 1981 and allowed the bear population to recover.

In 1984 the board abandoned the harvest quota (150 bears) for the area south of the Naknek River and endorsed more flexible objectives (Sellers and McNay 1984): (1) maintain maximum opportunity to hunt bears and avoid a drawing permit system; (2) continue both spring and fall hunts, maintain a desirable sex ratio in the bear population, and allow hunters to select either season; (3) maintain hunting seasons long enough so that severe weather would be unlikely to eliminate the entire season; and (4) handle chronic bear threats to villages through better sanitation, public education, and, only as a last resort when other measures prove ineffective, through special permit hunts.

In the fall of 1988, the Alaska Supreme Court ruled the exclusive guide area system unconstitutional. This allowed the number of registered guides operating in Unit 9 to increase; however, federal land management agencies limited the number of commercial-use licenses to new guides on federal lands. Therefore, most new guide operations used either state or private lands. With over 70% of the Unit 9 harvest coming from guided hunts, stability in the guide industry is a key part of the management program.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

To maintain a high bear density with a sex and age structure that will sustain a harvest composed of 60% males, with 50 males 8 or more years old taken during the combined fall/spring season.

METHODS

Historically, brown bear managers have relied heavily on interpretation of harvest statistics (i.e., total harvest, sex ratio, age composition) to monitor bear populations. In recent years some attention has been given to using various computer models (Tait 1983, Harris 1984) to aid in evaluating usefulness of harvest data. However, models based on harvest data have inherent problems (Miller and Miller 1990). Recently a new model using the Lotka equation has been developed by W. Testa (ADF&G, Anchorage) to estimate the sustainable harvest of females based on estimates of survival and reproductive rates.

Despite the potential utility of models, supplementary means of detecting changes in heavily exploited bear populations are needed. Aerial surveys of bears concentrated along salmon streams have been used periodically since 1958, primarily to detect major changes in population composition. Erickson and Siniff (1963) identified limitations of these surveys, recommending procedures to standardize the technique. Subsequently, ADF&G has conducted surveys near Black Lake, and FWS has conducted surveys in the Izembek and Unimak areas.

In May 1999 and 2000, an experimental line-transect/double count technique, first tried on Kodiak Island (Becker and Quang, in prep.) was used in the northern portion of Unit 9B. A cooperative project with the Lake Clark National Park estimated brown and black bear densities; this project also provided limited information on population composition.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

The brown bear population in Unit 9 was depressed during the mid 1970s because of high harvests, low salmon escapements, and severe winters. With the reduced harvests during the late 1970s, bear densities have increased. From 1985 to 1990, the average annual count of independent bears at Black Lake was 102 (range = 86–109); from 1991 to 1996 the average annual count was 121 (range = 101–144) (Sellers 1994). Poor weather in 1997 and 1998 hampered completion of adequate repetitions of these surveys, but one completed survey in 1998 included 158 independent bears. Four counts in 1999 and 2000 averaged 162 and 140 independent bears, respectively (Table 1). These data indicate a relatively stable population during the late 1980s, followed by an incremental increase during the 1990s.

Population Size

Brown bear densities vary within Unit 9; densities are lower in western Subunit 9B and the Bristol Bay coastal plain. Results from the 1989 CMR (Capture/Mark/Resight) population estimate at Black Lake showed a density of 1 bear/2.08 mi^2 in a 469 mi^2 study area. Within the study area, density varied among count units from 1 bear/1 mi^2 to 1 bear/7 mi^2, depending on habitat type (Miller and Sellers 1992). Results were extrapolated by UCUs (uniform code units) to arrive at estimates of 296, 879, 429, 3176, and 900 bears for 9A, 9B, 9C, 9E, and 9D, respectively (Sellers and Miller 1991). These estimates do not include National Park lands or McNeil River State Game Sanctuary. Thus, in the portion of Unit 9 open to brown bear hunting, the total population was estimated at 5679 bears in 1991, with an overall density of a bear/4.13 mi^2 (93 bears/1000 km^2) (Sellers and Miller 1991). Although these were subjective extrapolations, surveys flown within Katmai National Preserve at the same intensity as the CMR flights produced estimated densities similar to the one made for this area in 1991 (Sellers et al. 1999). A more objective test of the extrapolated density estimate made for northern Unit 9B is pending final computations from line transect surveys flown in 1999 and 2000 (E. Becker, pers. comm.). Assuming that the bear population has grown since 1991, as suggested by stream surveys and opinions of various residents and guides, it is likely that the bear population now is close to 6000. I estimated that McNeil River State Game Sanctuary and national parks within Unit 9 contain an additional 2000–2500 brown bears.

Population Composition

Evidence from the Black Lake study and analysis of harvest data show a change in the population composition since the early 1970s believed to be correlated to differences in harvest rates. The Black Lake capture samples during the early 1970s showed an adult (i.e., ≥ 5 years old) sex ratio of 21 adult males:100 adult females. The 1988–89 capture sample showed a significantly higher ratio of 39 males:100 females (t = 1.62, df = 194, P = 0.052). The average age of adult males increased from a mean of 7.19 years in the early 1970s to 9.92 years in 1988 (Mann-Whitney, T = 87.5, P = 0.080) (Sellers 1994). The average age of adult females also increased from a mean of 9.57 years during the early 1970s to 12.21 years for 1988 (Mann-Whitney, T = 1345, P = 0.003).

Classification of bears during replicate stream surveys at Black Lake also showed changes in population composition believed to reflect significant changes in harvest rates beginning in the mid 1960s. This analysis was based on the percentage of "single" bears (i.e., not in family groups) in the population. Hunting regulations protected family groups of cubs and yearlings, so hunting tended to reduce the proportion of single bears in the population (Sellers and McNay 1984). During 1958–61, when harvests were extremely low, a mean of 46% (range = 37–55%) of 1365 brown bears classified during summer surveys were single bears. This was higher (t = 6.81, P = 0.002) than the mean of 21% single bears (range = 17–26%) of 2078 bears classified from 1967 to 1976 when the population was affected by excessive harvests. Restrictive regulations, beginning in 1974, led to reduced harvests, and the population began recovering during the late 1970s and early 1980s. During 1982–00, a mean of 37% of 12,095 bears classified during stream surveys were single, significantly higher than during 1967–76 (P = < 0.001)

I believe the circumstances of excessive harvests in the early 1970s and subsequent population recovery at Black Lake apply to Unit 9 in general (Sellers in prep).

In May 1999 we classified a total of 178 brown bears in the northern portion of Unit 9B, of which 64% were single bears. This high percentage probably reflects both low harvest pressure and the effect of 2 consecutive poor salmon runs in 1997 and 1998 that may have reduced productivity. The cohorts most likely affected by the scarcity of salmon were cubs and yearlings in 1999. The average litter size for cub and yearlings was 1.5 (n = 10) and 1.4 (n = 12). In contrast, the average litter size of offspring judged to be older than yearlings was 2.56 (n = 9).

MORTALITY

Harvest

Season and Bag Limit. The hunting season in Subunit 9C, Naknek River drainage, was 1 September–31 October and 1 May–30 June. The bag limit was 1 bear every 4 regulatory years by registration permit only.

The open season 9B was 20 September–21 October in odd-numbered years and 10–25 May in even-numbered years. The season for the remainder of Unit 9, including the registration permit hunt in the Cold Bay road system, was 1–21 October in odd-numbered years and 10–25 May in even-numbered years. The bag limit was 1 bear every 4 regulatory years.

Board of Game Action and Emergency Orders. In March 1999 the Board of Game reviewed the status of brown bears in Unit 9 and deliberated over a large number of public proposals to liberalize the seasons. Based on evidence that the population was growing, the board extended the fall season as described above.

The Cold Bay registration hunt in Subunit 9D continues to be closed routinely by emergency order after the quota is reached. The fall season was closed on 4 October 1999; however, the May 2000 season was not curtailed.

Hunter Harvest. During the 1998–99 regulatory year, only the Naknek registration hunt was open; hunters took 13 bears in the fall and 2 in the spring. The reported harvest for the 1999–00 regulatory year was 672 bears, including 451 males (67%) and 219 females (Table 2). During the

1999 regulatory year 19 bears were reported as nonsport kills, but because nonhunting and illegal kills, including DLP kills, are rarely reported. I estimate the nonsport mortality at more than 50 bears. The combined 1999–00 hunter harvest was 15% higher that the previous all time record set in 1997–98.

During 1985–92 and 1993–98, males accounted for 64% and 70% of the harvest, respectively. The mean annual harvest of trophy-sized males, ≥ 8 years old, was 51 (range = 41–58) during the period of population recovery during 1975–82. The mean increased to 73 (range = 61–80) during 1983–88 and jumped to 123 during 1989–98. During 1999–00 178 males ≥ 8 years old were taken. Not only has the number of mature males in the harvest increased, but the proportion of the harvest composed of mature males has also increased for these 3 time periods: 14.3% during 1975–82; 16.9% during 1983–88; 23.4% during 1989–96, and 26.4% in 1997–98. For the 1999–00 regulatory year, males ≥ 8 years old dropped to 25.8% of the total kill.

Total annual average harvest rate for calendar years 1999 and 2000 is estimated to be 5.7%, based on all bears reported killed by humans and an estimation of 6000 bears in areas open to hunting (Sellers and Miller 1991). If estimates of unreported DLP and illegal kills are included, the annual harvest rate now may approach 6%.

I used W. Testa's model as another approach to evaluate whether current harvest levels are sustainable. Input data included an estimated 2700 females in areas of Unit 9 open to hunting (derived by applying composition data from Black Lake [Sellers 1994] to the 1991 estimate of 5679 bears) and preliminary reproductive and survival rates from the Black Lake study (Sellers 1994). Testa's "model 1" estimated a sustainable harvest of 92 females per year. During the past 12 years, the mean annual harvest has been 85 females; but for 1999–00 an average of 111 females were killed per calendar year.

Permit Hunts. The registration permit hunt in the Naknek drainage was designed to minimize bear-human conflicts in the most heavily settled portion of Unit 9. Participation in fall hunts was higher than in spring hunts because some moose and caribou hunters obtained a permit "just in case" they encountered a bear. During 1995–98, an average of 11 bears were killed per regulatory year. During the 1999 regulatory year, 11 were killed during the fall and none were harvested during spring. Since 1987, about half the bears taken in this permit hunt were either confirmed or suspected of having been in conflict with humans.

The registration permit hunt in the Cold Bay area was also designed to minimize bear-human conflicts. In 1983, the Izembek National Wildlife Refuge staff expressed concern that the number of local brown bears was too low; they believed problem bears were not common. Consequently, the Board of Game only authorized this hunt when it was determined that problem bears were present. The hunt was not conducted from 1984 until fall 1989. During this period, the bear population appeared to have increased, and the FWS and the department agreed it was impractical to have a season by emergency announcement in response to nuisance bear complaints. Thus, the registration permit hunt was changed to coincide with the normal unitwide season, with a seasonal quota of 2 bears or a regulatory year quota of 4 bears. By the second day of the fall 1999 season, 4 bears had been killed and the hunt was closed by emergency order. During the spring 2000 season, only 1 bear was killed.

The Chignik Brown Bear Management Area was established in 1994 and was modeled after the Western Alaska Brown Bear Management Area to provide an opportunity for traditional subsistence hunting. Past village household surveys resulted in customary and traditional findings for the villages of Chignik Lake, Perryville, and Ivanof Bay. This hunt overlaps a federal subsistence permit hunt, which complicates issuing permits and collecting results. Since 1996, participation and compliance with the state permit hunt have been virtually nil. The ADF&G Subsistence Division estimated a harvest of 6 bears from these villages in 1996, yet the only permittee was unsuccessful. No permits were issued during this reporting period and no harvest estimates are available.

Unit 9B was included in the Western Alaska Brown Bear Management Area in 1997. During 1999–00 3 bears were reported taken in Unit 9B.

Hunter Residency. During the 1997–98 and 1999–00 general seasons, nonresidents took 78% of the harvest (Table 3). This is slightly above the long-term average.

Harvest Chronology. Prior to 1985, the fall season began on 7 October. When the opening date was moved to 1 October, the pattern of harvest also shifted, and 47% of the fall harvest occurred during the first 6 days of October during 1985–89. The opening date for the general season in 9C, 9D, and 9E was moved back to 7 October in 1991, but again advanced to 1 October for the 1999 season. In addition, 9B was opened on 20 September in 1999. During the fall 1999 season, 61% of the kill in Unit 9B occurred during September and 54% of the kill in the remainder of Unit 9 occurred during the first 6 days of October. Overall, there has been a gradual shift to more harvest in the fall compared to spring hunts.(Table 4).

Transportation Methods. During 1995–1999, 77% of the successful hunters during the general hunts used aircraft, with boats being the next most common method of transportation (Table 5).

Other Mortality

Nonhunting and illegal kills, including DLP kills, are rarely reported. Unsubstantiated reports from villages, remote lodges, canneries, and commercial fishermen suggest that many other unreported bears are killed or wounded, and I estimate the total unreported kill at 50–100 bears per year.

Preliminary estimates of survival rates (excluding hunter kills) from the Black Lake study indicated natural mortality was a significant factor for females and young bears. During the 9 years of this study, annual survival rates for cubs was 0.57, for yearlings was 0.88, for subadult females 0.90, and adult females 0.92 (Sellers in prep).

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Bear-human conflicts continue to be the most serious and intractable problem in Unit 9, as in many other parts of the state. Given the pervasive nature of this problem, it will take a concerted effort to make headway.

CONCLUSIONS AND RECOMMENDATIONS

Brown bear populations do not lend themselves to convenient methods to monitor trends in density or composition. Harvest statistics are useful, but a manager cannot expect to gain a confident appraisal of population status solely from sex and age composition of the harvest. Stream surveys on the Alaska Peninsula should be continued. The Black Lake surveys indicated a relatively stable and high population. Harvests increased significantly during the 1980s, and the population appears to have stopped growing. I estimate that about 6000 bears inhabit the portion of Unit 9 open to bear hunting. With the dramatic increase in harvest recorded during the 1999–00 regulatory year and an estimated unreported illegal/DLP kill of 50 bears per year, the annual rate of human-caused mortality now is estimated at 6%. In recent years, the Board of Game has been asked to drastically increase the brown bear harvest, especially in Units 9C and 9E, to benefit moose and caribou survival. This is not a new sentiment among local residents, but it has taken on added weight with the decline of the Northern Alaska Peninsula caribou herd (NAPCH). A caribou calf mortality study in 1998 did identify brown bears as one of the major predators of young calves; however a more significant portion of the annual mortality of calves occurred overwinter, when bears were not active. Research at Black Lake showed that a relatively small percentage of radiocollared bears made any use of the NAPCH's primary calving grounds during spring. Thus an indiscriminant reduction of the brown bear population in 9C and 9E would realize little reduction in caribou mortality. Throughout Unit 9, brown bear predation on moose calves apparently remains high, but the moose population has remained stable. I do not recommend targeting brown bears in any portion of Unit 9 for reduction to benefit caribou or moose populations.

Pending final analysis of the line transect method of estimating population density in northern 9B, I recommend using this technique to estimate the population size in Unit 9D.

LITERATURE CITED

ERICKSON, A.W., AND D.B. SINIFF. 1963. A statistical evaluation of factors influencing aerial survey results on brown bears. North American Wildlife Conference 28:391–409.

GLENN, L.P., J.W. LENTFER, J.B. FARO, AND L.H. MILLER. 1976. Reproductive biology of female brown bears (*Ursus arctos*), McNeil River, Alaska. International Conference on Bear Research and Management 3:381–390.

HARRIS, R.B. 1984. Harvest age-structure as an indicator of grizzly bear population status. MS thesis, University of Montana, Missoula. 204pp.

MILLER, S.D. AND S. M. MILLER. 1990. Interpretation of Bear Harvest Data. Final Report, Federal Aid in Wildlife Restoration Project W-22-6, Study 4.18. 90pp.

———, AND R. S. SELLERS. 1992. Brown Bears Density on the Alaska Peninsula at Black Lake, Alaska. Alaska Department of Fish and Game, Division of Wildlife Conservation Juneau 57pp.

———, G.C. WHITE, R.A. SELLERS, H.V. REYNOLDS, J.W. SCHOEN, K.TITUS, V.G. BARNES, R.B. SMITH, R.R. NELSON, W.B. BALLARD, AND C.C. SCHWARTZ. 1997. Brown and black bear density estimation in Alaska using radiotelemetry and replicate mark-resight techniques. Wildlife Monographs 133, 1–55.

SELLERS, R.A. 1994. Dynamics of a hunted brown bear population at Black Lake, Alaska. 1993 Annual Progress Report December, 1994. Alaska Department of Fish & Game. Juneau 61pp.

———, AND M. E. MCNAY. 1984. Population status and management considerations of brown bear, caribou, moose and wolves on the Alaskan Peninsula. Report to the Alaska Board of Game, March 1984. 53pp.

———, AND S. D. MILLER. 1991. Dynamics of a hunted brown bear population at Black Lake, Alaska. Third annual Progress Report 1990. Alaska Department of Fish & Game. Juneau 23pp.

———, S.D. MILLER, T.S. SMITH, AND R. POTTS. 1999. Population dynamics of a naturally regulated brown bear population on the coast of Katmai National Park and Preserve. 1999 Final Report. Resource Report NPS/AR/NRTR–99/36. 49pp.

———, AND L.A. AUMILLER. 1994. Population characteristics of brown bears at McNeil River, Alaska. International Conference on Bear Research and Management. 9:283–293.

TAIT, D.E.N. 1983. An analysis of hunter kill data. Ph.D. Thesis, University of British Columbia, Vancouver. 129pp.

PREPARED BY:
Richard A. Sellers
Wildlife Biologist III

SUBMITTED BY:
Mike McDonald
Assistant Management Coordinator

Table 1 Black Lake aerial stream counts of brown bears, 1988–2000

Regulatory year	Number of surveys attempted	Single bears		Maternal bears		Cubs > 1year old		Cubs of the year		Total
		Number	%	Number	%	Number	%	Number	%	
1988	4	182	27	160	23	205	30	137	20	686
1989	5	326	37	178	20	273	31	109	12	888
1990	5	332	36	194	21	232	25	170	18	928
1991	4	357	49	128	17	143	19	106	14	734
1992	3	219	35	126	20	134	22	138	22	617
1993	0									
1994	4	296	36	167	20	206	25	147	18	816
1995	4	370	38	205	21	211	22	182	19	968
1996	4	277	42	131	20	175	26	78	12	661
1997	3	139	40	69	20	48	14	90	26	346
1998	3	172	33	114	22	115	22	121	23	522
1999	4	411	37	236	21	281	25	175	16	1103
2000	4	350	36	205	21	223	23	203	21	987

Table 2 Unit 9 brown bear harvest, 1995–00

Regulatory	Hunter kill						Non-hunting kill[a]			Total reported kill					
Year	M	(%)	F	(%)	Unk	Total	M	F	Unk.	M	(%)	F	(%)	Unk.	Total
1995–96															
Fall 95	133	(58)	97	(42)	0	230	3	2	3	136	(46)	99	(54)	3	238
Spring 96	221	(79)	60	(21)	0	281	--	--	--	221	(79)	60	(21)	0	281
Total	354	(69)	157	(31)	0	511	3	2	3	357	(69)	159	(31)	3	519
1996–97															
Fall 96	3	(43)	4	(57)	0	7	9	6	5	12	(55)	10	(45)	5	27
Spring 97	7	(87)	1	(13)	0	8	--	--	--	7	(87)	1	(13)	0	8
Total	10	(67)	5	(33)	0	15	9	6	5	19	(63)	11	(37)	0	35
1997–98															
Fall 97	184	(64)	102	(46)	0	286	14	10	2	198	(64)	112	(46)	2	312
Spring 98	212	(78)	60	(22)	0	272	--	--	--	212	(78)	60	(22)	0	272
Total	396	(71)	162	(29)	0	558	14	10	2	410	(70)	172	(30)	0	584
1998–99															
Fall 98	10	(77)	3	(23)	0	13	4	3	4	14	(70)	6	(30)	4	24
Spring 99	2	(100)	0	(0)	0	2	--	-	--	2	(100)	0	(0)	0	2
Total	12	(80)	3	(20)	0	15	4	3	4	16	(73)	6	(27)	0	26
1999–00															
Fall 99	224	(60)	148	(40)	1	373	11	4	4	235	(61)	152	(39)	5	392
Spring 00	227	(76)	71	(24)	1	299	--	--	--	227	(76)	71	(24)	1	299
Total	451	(67)	219	(33)	2	672	3	1	0	462	(67)	223	(33)	6	691

[a]Includes Defense of Life or Property kills, research mortalities, and other known human-caused accidental mortality.

Table 3 Unit 9 brown bear successful hunter residency, 1995–00

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	Successful hunters[b]
1995–96	22	(4)	113	(22)	384	(74)	519
1996–97	17	(48)	9	(26)	9	(26)	35
1997–98	17	(3)	112	(19)	455	(78)	584
1998–99	9	(35)	7	(27)	10	(38)	26
1999–00	17	(2)	142	(21)	530	(77)	691

[a] Local resident means resident of Unit 9.
[b] Includes unknown residency.

Table 4 Unit 9 brown bear harvest chronology percent by month, 1995–00

	Harvest periods											
Regulatory	July/August		September		< 7 October		≥7 October		May		June	
year	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
1995–96	1	(7)	1	(5)	5	(29)	37	(197)	52	(279)	0	(2)
1996–97	18	(6)	29	(10)	12	(4)	9	(3)	21	(7)	12	(4)
1997–98	>1	(11)	>1	(11)	1	(36)	43	(249)	47	(275)	0	(1)
1998–99	21	(5)	42	(10)	8	(2)	12	(3)	8	(2)	17	(23)
1990–00	1	(9)	9	(64)	24	(166)	22	(150)	43	(298)	0	(0)

Table 5 Unit 9 brown bear harvest percent by transport method, 1995–00

Regulatory year	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Unk.	*n*
1995–96	77	0	17	2	0	0	2	2	519
1996–97	3	0	20	9	0	0	17	51	35
1997–98	75	0	19	1	0	0	1	4	584
1998–99	8	0	42	8	0	0	0	42	26
1999–00	80	0	14	1	0	0	0	4	691

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 10 (1536mi^2)

GEOGRAPHIC DESCRIPTION: Unimak Island

BACKGROUND

Unimak Island is the only area in Unit 10 occupied by brown bears. The island is classified as a wilderness area and is managed by the Izembek National Wildlife Refuge (INWR). Brown bear hunting on Unimak Island was administered by the U.S. Fish and Wildlife Service (FWS) from 1949 to 1979 and by the department after 1979. Fifteen drawing permits are issued each year; 7 for the spring hunt and 8 for the fall hunt.

MANAGEMENT DIRECTION

MANAGEMENT GOAL

Provide opportunities to hunt large brown bears under aesthetically pleasing conditions. The number of hunters is limited, and harvests are maintained below maximum-sustained yield.

MANAGEMENT OBJECTIVE

Maintain a high bear density with a sex and age structure that will sustain a harvest of at least 60% males.

METHODS

The FWS periodically conducts aerial bear surveys on Unimak Island in late summer. Interpretation of harvest data to reflect population status is not possible with the very low number of bears killed annually.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

The Unimak Island brown bear population appears to be maintained by natural limiting factors at a relatively stable level.

Population Size

Brown bear population size and density were not specifically evaluated on Unimak Island. Results of past surveys and extrapolation of density estimates made elsewhere in Alaska indicated that over 250 bears inhabited the island.

MORTALITY

Harvest

Season and Bag Limit. The open seasons for residents and nonresidents were 1 October–31 December and 10–25 May. The bag limit was 1 brown bear every 4 regulatory years by drawing permit only; 15 permits were issued annually.

Board of Game Action and Emergency Orders. None

Hunter Harvest. During 1981–96, annual harvests from Unimak Island averaged 5.9 bears (range = 3–9). During the 1997–99 regulatory years, the average annual harvest was 12.3 bears. Part of this recent increase is due 2 special governor's permits which were auctioned off by Safari Club International and Foundation for North American Wild Sheep. These extra permittees were successful in fall 1997 and spring 2000. The Rocky Mountain Elk Foundation auctioned another governor's permit for the 2000–01 regulatory year, but the purchaser was unable to use his permit.

Males composed 73% of the harvest during 1981–96 regulatory years and 81% during 1997–99.

Hunter Residency and Success. Nonresidents accounted for 8% of the harvest during 1981–96 and 54% during 1997–99.

Approximately 38% of permittees did not hunt on Unimak Island between 1981 and 1996, and of those who actually hunted, 63% were successful. Since 1997, 89% of permittees hunted and their success rate increased to 90%.

Harvest Chronology. Total harvests have been evenly split between the spring and fall seasons. Since 1994, when the Board of Game extended the fall season through the end of December, 4 hunters have killed bears after October.

Transport Methods. Since 1995 all successful hunters used aircraft to access Unimak Island.

CONCLUSIONS AND RECOMMENDATIONS

The brown bear population on Unimak Island appears stable, and the drawing permit hunt meets management objectives. Although harvests have increased in recent years, I do not recommend changes in the permit hunt at this time, except to cease issuing special permits for auction unless these permits are subtracted from the number issued through the normal drawing. In addition to continuing late summer aerial surveys flown by the INWR, I recommend using the new line transect population estimator developed by E. Becker on the entire island as soon as funding is secured.

PREPARED BY:

Richard A. Sellers
Wildlife Biologist III

SUBMITTED BY:

Mike McDonald
Wildlife Biologist III

Table 1 Unit 10 brown bear harvest data by permit hunt, 1995–99

Hunt Nr. / Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Harvest		
						Male	Female	Total
375 Fall Unit 10								
	1995–96	8	12	14	86	2	4	6
	1996–97	8	25	12	83	4	1	5
	1997–98	9[a]	0	0	100	4	5	9
	1998–99	8	12	12	86	6	0	6
	1999–00	8	25	0	100	6	0	6
376 Spring Unit 10								
	1995–96	7	57	0	100	3	0	3
	1996–97	7	28	14	80	3	1	4
	1997–98	7	0	43	57	1	3	4
	1998–99	7	14	0	100	6	0	6
	1999–00	8[a]	12	0	100	6	1	7
Totals for all permit hunts								
	1995–96	15	33	10	90	5	4	9
	1996–97	15	27	18	82	7	2	9
	1997–98	16	0	19	81	5	8	13
	1998–99	15	13	7	93	12	0	12
	1999–00	16	19	0	100	12	1	13

[a] Includes 1 governor's permit.

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

GEOGRAPHIC DESCRIPTION: Wrangell Mountains

BACKGROUND

Brown bears were numerous in Unit 11 prior to 1948–1953, when federal poisoning programs directed at controlling wolves incidentally reduced bear numbers. Following cessation of wolf control, bear numbers increased, and by the mid 1970s bears were abundant.

Brown bear harvests averaged 16 (range = 8–27) bears per year throughout the 1960s and 1970s but declined substantially after 1978, when much of Unit 11 was included in Wrangell-Saint Elias National Park and Preserve. Since 1979, hunting pressure has declined and harvests have averaged only 5 bears (range = 2–12) per year.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

To maintain a brown bear population that will sustain an annual harvest of 25 bears composed of at least 50% males.

METHODS

We monitored the brown bear harvest by sealing skulls and hides of harvested bears. We measured skulls of sealed bears and determined the sex of the bears. A premolar tooth was extracted for aging, and information on date and location of the harvest, days afield and mode of transportation was collected from successful hunters.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population data were unavailable for brown bears in Unit 11 because surveys or censuses have not been conducted. Frequent observations of bears by department staff and the public suggested a relatively abundant and well-distributed population of brown bears. A population trend was not evident.

Distribution and Movements

Based on incidental observations and harvest locations, brown bears inhabit most of Unit 11 except high-elevation glaciers. There has not been a bear movement study conducted in Unit 11, but we suspect the movement patterns are similar to those in Unit 13. After den emergence, most bears, except females with cubs of the year (COYS), move into riparian areas to feed on sprouting plants and overwintered berries. They also scavenge carcasses of ungulates that died during winter. Females with COYS tend to stay at higher elevations to avoid contact with other bears. Throughout the summer, brown bears in Unit 11 feed in many habitats. In late summer, bears generally move into subalpine habitats to feed on ripening blueberries. Bears feed on salmon in many streams throughout Unit 11 but especially in the lower Chitina River Valley during late summer and fall.

MORTALITY

Harvest

Seasons and Bag Limits. The open bear seasons in Unit 11 were 1 September to 31 October and 25 April to 31 May. The bag limit was 1 bear every 4 regulatory years.

Board of Game Actions and Emergency Orders. The board determined there was not subsistence use of brown bears in Unit 11 effective 1 July 1989. The National Park Service (NPS) adopted this board subsistence determination and closed all brown bear hunting in those portions of Unit 11 that were designated "park" (as opposed to "preserve") until 1999 when a federal subsistence season for brown bears was established.

Hunter Harvest. Two brown bears were reported killed during the 1998–99 season, and 5 were killed during 1999–00 (Table 1). The percentage of males in the harvest was below current management guidelines for one season but the harvest was only 2 bears. In recent years so few bears have been taken that the percent males in the harvest is considered neither a critical nor meaningful part of brown bear management in this unit. The mean age for males was 8.3 years in 1999–00. Mean ages of bears taken in Unit 11 cannot be used to evaluate the impacts of hunting on the bear population because so few bears are harvested.

Hunter Residency and Success. Nonresident hunters took zero (0) bears in 1998–99 and 2 brown bears during the 1999–00 season (Table 2). The annual harvest by nonresidents has declined from an average of 11 (range = 2–18) bears per year between 1961 and 1978 to an average of 2 per year (range = 0–3) since 1978. Local residents harvested no bears during the past 2 years. Successful bear hunters averaged 2 days hunting during the 1998–99 season and 4 days in 1999–00. Since 1979, hunter effort data show a mean of 4.9 days to take a bear in Unit 11.

Harvest Chronology. Fifty percent of the 1998–99 and 80% of the 1999–00 brown bear harvest occurred during the fall (Table 3). Since initiating sealing records in 1961, over 80% of the Unit 11 brown bear harvest occurred during the fall season, presumably because combination hunts for more than one species were possible. Spring harvests were higher in the 1970s when more guides were active in Unit 11.

Transport Methods. During the past few years, aircraft, highway vehicles and 4-wheelers were the most important method of transportation (Table 4). In previous years more successful hunters reported using aircraft than any other method of transportation. Use of ground transportation in Unit 11 is very restricted; the only access points are along the Nabesna or Chitina-McCarthy Roads.

Other Mortality

The last reported defense of life or property (DLP) killings occurred in 1995 when 2 bears were taken. Although much of the unit is remote with few cabins, most problem bears are killed near homesites and cabins along the Nabesna and McCarthy Roads. More bears are probably killed each year than are reported because of the work involved with salvaging and preserving the hides and skulls of bears taken DLP. Compliance with reporting requirements on DLP bears would be higher if individuals were not required to salvage the hide and skull. Because most summer hides are worthless, DLP requirements could be changed so that during June, July, and August, only skulls and claws need to be surrendered. This would undoubtedly increase reporting compliance but might also increase DLP kills as the requirement to salvage the hide may often be a deterrent to killing bears.

HABITAT

Assessment

Few cabins or homesites are in this remote unit. Future settlement will be limited because much of the land is now included in Wrangell-St. Elias National Park. Private inholdings and Park Service facilities are the only sources of development, especially along the McCarthy Road and at McCarthy. The number of people living and visiting McCarthy has increased appreciably in recent years and as a result, bear problems will become more frequent and could result in more DLP-killed bears. However the NPS has identified this as a problem area and has a good program to minimize bear problems. Overall, Unit 11 is considered good brown bear habitat because of the variety of vegetation types, large tracts of undeveloped land, and numerous salmon streams throughout the unit.

CONCLUSIONS AND RECOMMENDATIONS

From 1961 to 1978, brown bear harvests averaged 16 bears per year; since 1979, harvests have averaged 7 per year. The declines in the total and nonresident harvests were the result of the establishment of Wrangell-St. Elias National Park and Preserve. National Park Service regulations prohibit sport hunting in portions of the unit designated as "park". From 1979 until 1989, subsistence hunting for brown bears by local residents was allowed in "park" designated areas. However, aircraft were not allowed to access park areas, thus effectively closing most of the park to bear hunting. The NPS closed subsistence brown bear hunting in 1989 after the Alaska Board of Game determined that brown bears were not a customary and traditional animal for state subsistence in Unit 11. Aircraft access and sport hunting of brown bears were allowed and continue in areas designated as "preserve," which constitutes less than one-half of Unit 11.

The percent harvest of males has remained consistent since 1961, averaging 61%. This exceeded the management objective of maintaining a minimum of 50% males in the harvest. Sex

composition, mean age, and skull sizes often fluctuate annually because of small sample size. Generally, bears killed in Unit 11 were older and larger than those taken in adjacent Unit 13, where harvest rates were higher.

Brown bear harvests in Unit 11 have been low since 1979, and current harvests do not affect the brown bear population in the unit. I recommend no changes in season length or bag limit at this time.

Prepared by

Robert W. Tobey
Wildlife Biologist III

Submitted by

Michael G. McDonald
Assistant Management Coordinator

Table 1. Unit 11 brown bear harvest, 1995–2000.

Regulatory	Hunter kill					Non-hunting kill[a]			Estimated kill[b] Unreported		Total estimated kill					
Year	M	F	(%)	Unk	Total	M	F	Unk.	illegal		M	(%)	F	(%)	Unk.	Total
1995-96																
Fall 95	1	1	(50)	0	2	1	--	--	--	--	2	(67)	1	(33)	0	3
Spring 96	0	0	(0)	0	0	1	--	--	--	--	1	(100)	0	(0)	0	1
Total	1	1	(50)	0	2	2	0	0	0	0	3	(75)	1	(25)	0	4
1996-97																
Fall 96	1	1	(50)	0	2	0	--	--	--	--	1	(50)	1	(50)	0	2
Spring 97	0	0	(0)	0	0	0	--	--	--	--	0	(0)	0	(0)	0	0
Total	1	1	(50)	0	2	0	0	0	0	0	1	(50)	1	(50)	0	2
1997-98																
Fall 97	2	0	(0)	0	2	0	--	--	--	--	2	(100)	0	(0)	0	2
Spring 98	2	0	(0)	0	0	0	--	--	--	--	2	(100)	0	(0)	0	2
Total	4	0	(0)	0	4	0	0	0	0	0	4	(100)	0	(0)	0	4
1998-99																
Fall 98	0	1	(100)	--	1	--	--	--	--	--	0	(0)	1	(100)	0	1
Spring 99	0	1	(100)	0	1	--	--	--	--	--	0	(0)	1	(100)	0	1
Total	0	2	(100)	0	2	0	0	0	0	0	0	(0)	2	(100)	0	2
1999-00																
Fall 99	3	1	(25)	0	4	--	--	--	--	--	3	(75)	1	(25)	0	4
Spring 00	0	1	(100)	0	1	--	--	--	--	--	0	(0)	1	(100)	0	1
Total	3	2	(40)	0	5	0	0	0	0	0	3	(60)	2	(40)	0	5

[a] Includes Defense of Life or Property kills, research mortalities, and other known human-caused accidental mortality.
[b] Estimated kill by year, not by season.

Table 2. Unit 11 brown bear successful hunter residency, 1989–2000.

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	successful hunters
1989-90	4	(33)	3	(25)	5	(42)	12
1990-91	2	(22)	6	(67)	1	(11)	9
1991-92	2	(67)	0	(0)	1	(33)	3
1992-93	2	(33)	2	(33)	2	(33)	6
1993-94	0	(0)	2	(50)	2	(50)	4
1994-95	0	(0)	4	(67)	2	(33)	6
1995-96	0	(0)	2	(100)	0	(0)	2
1996-97	0	(0)	0	(0)	2	(100)	2
1997-98	0	(0)	4	(100)	0	(0)	4
1998-99	0	(0)	2	(100)	0	(0)	2
1999-00	0	(0)	3	(60)	2	(40)	5

[a] Local resident means resident of GMU 13 or GMU 11.

Table 3. Unit 11 brown bear harvest chronology percent by time period, 1989–2000.

Regulatory year	Harvest percent				n
	September	October	April	May	
1989-90	33	8	8	50	12
1990-91	89	--	--	11	9
1991-92	67	--	--	33	3
1992-93	50	17	--	33	6
1993-94	50	--	--	50	4
1994-95	67	--	--	33	6
1995-96	50	50	--	--	2
1996-97	50	50	--	--	2
1997-98	50	--	--	50	4
1998-99	50	--	--	50	2
1999-00	60	20	--	20	5

Table 4. Unit 11 brown bear harvest percent by transport method, 1989–2000.

Regulatory year	Percent of harvest									
	Airplane	Horse	Boat	3 or 4-wheeler	Snowmachine	ORV	Highway vehicle	Walking	Unk.	n
1989-90	42	8	17	0	0	8	17	0	8	12
1990-91	44	0	0	0	0	11	33	0	11	9
1991-92	33	0	0	0	0	0	33	0	33	3
1992-93	33	0	33	0	0	0	33	0	0	6
1993-94	50	0	0	0	0	0	50	0	0	4
1994-95	50	0	0	50	0	0	0	0	0	6
1995-96	0	0	0	50	0	0	50	0	0	2
1996-97	100	0	0	0	0	0	0	0	0	2
1997-98	0	25	25	0	0	0	25	25	0	4
1998-99	50	0	0	0	0	0	50	0	0	2
1999-00	40	20	0	20	0	0	20	0	0	5

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

GEOGRAPHIC DESCRIPTION: Nelchina Basin

BACKGROUND

The brown bear harvest in Unit 13 increased substantially over the last forty years. The average annual harvests for the decades of the 1960s, 1970s, 1980s and 1990s were 39, 59, 105, and 113 brown bears, respectively. Interest in brown bear hunting and yearly harvests by recreational hunters increased over the years as seasons were lengthened and bag limits increased. Liberalization of brown bear hunting regulations started in 1980 with the initiation of a spring season. The bag limit was increased to one bear a year between 1983 and 1988 and again starting in 1995. Brown bear harvests have been the highest in those years when the bag limit has been one bear per year.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

To maintain a minimum unit population of 350 brown bears.

METHODS

Department representatives sealed skulls and hides of harvested bears. Skulls were measured, sex was determined and a premolar tooth was extracted for aging. Sealing agents collected information on date and location of harvest and time spent afield by successful hunters.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Brown bear density estimates are available for 2 different study areas in Unit 13E and 1 study area in Unit 13A. The 1979 estimate of 10.5 independent bears/1000 km^2 on the upper Susitna River (13E) was slightly higher than the 1987 estimate of 6.36 independent bears/1000 km^2 (Ballard et al. 1982, Miller 1988, 1995). Miller (1995) concluded that because of differences in survey methods, it could not be statistically demonstrated that a decline in bear numbers occurred though the 1987 point estimate was lower. Density estimates for the Su-Hydro Study Area (13E) in 1985 and 1995 are 18.75 and 23.31 independent bears/1000 km^2, respectively (Miller 1995). These results are comparable because similar census techniques were used,

indicating increasing brown bear numbers in portions of 13E. A 1998 density estimate from the 13A West Nelchina Study Area was 21.3 independent bears/1000 km^2 (Testa, ADF&G memorandum July 1998). Comparison of the estimates between 13E and 13A indicates no difference in population size, and these values are among the highest estimates for brown bears in Interior and northern Alaska (Testa et al. 1998).

Population Size

Four separate population estimates were calculated for Unit 13 in the past 20 years. During the late 1970's an estimate of 1500 brown bears was calculated based solely on field observations, hunter reports, and harvests. Extrapolations from density estimates in the Upper Susitna River and Su-Hydro areas in 1979, 1985, and 1987 (Ballard et al. 1982, Miller 1987, 1988) resulted in a preliminary population estimate of 1228 brown bears, of which 823 were $\geq$ 2.0 years of age (Miller 1990*b*). Based on a model of sustainable harvest rates, 640–1120 bears were estimated to inhabit Unit 13 in 1993 (Miller 1993). Finally, a second destiny estimate for the 1985 Su-Hydro Study Area completed in 1995 resulted in an updated Unit 13 population estimate of 1450 brown bears in 1996 (Miller personal communication).

Population Composition

Miller (1993) reported that during 1980–1988, brown bear litters averaged 2.1 cubs of the year, 1.9 yearlings, and 1.8 two-year-olds. The estimated reproductive interval was 4.1 years, and the observed age at first reproduction was 5.6 years (range = 4–9). Litter size in 1998 on the Nelchina Study Area was 2.3 cubs of the year and 1.8 yearlings (Testa, 1998). Based on these reproductive parameters, the brown bear population in Unit 13 has a typical reproductive potential for an Interior population.

Miller (1995) presented the sex ratios of brown bears in the Su-Hydro Study Area during 2 different censuses 10 years apart. He estimated 82.4 males/100 females present in 1985, compared to 27.8 males/100 females in 1995. He did not find a change between censuses in the mean age of brown bears in the study area. Testa (1998) reported 48 males/100 females observed during the 1998 Nelchina Study Area census.

MORTALITY

Harvest

The 1999–2000 hunting season dates were 10 August to 15 June in all of Unit 13, except that portion of 13E west of the Alaska Railroad, where the season opened on 10 September and closed 31 May. Between 1995 and 1999 the brown bear season closed 15 days earlier on 31 May unitwide. The bag limit of one bear every regulatory year was set in 1995. The resident $25 tag fee requirement in GMU 13 has been reviewed according to legislative mandate and waived every year since 1995 by the Board of Game.

Board of Game Actions and Emergency Orders. The Alaska State Legislature mandated intensive management of moose and caribou for human use in portions of Alaska under SB-77, passed in 1995. During the spring 1995 meeting, the board subsequently designated Unit 13 as an intensive management area. Board of Game findings (during intensive management discussions) were that brown bears were important predators of moose calves, that brown bears

were abundant in Unit 13, and that brown bear numbers should be reduced to increase moose calf survival. At that time, the intent of the board was to attempt to increase the brown bear harvest in Unit 13 by liberalizing the season length and bag limit and eliminating the resident tag fee requirement. The rationale behind these liberalized seasons, bag limits, and tag fee elimination is that they increase the interest in hunting brown bears.

Hunter Harvest. The reported 1999–00 sport harvest of brown bears was 166 (Table 1). This is the highest harvest ever reported in Unit 13, exceeding the previous (1996–97) record of 140 by 18%. The average annual take was 139 bears/year (range = 127–166) during this reporting period. This figure is 11% higher than the 125 bears a year average (range = 97–138) reported during the 5-year period from 1982–87 when the 1 bear/year bag limit was in place. The average annual harvest during the 8-year period from 1987–95, following a reduction in the bag limit and a somewhat reduced hunting season, was 85 bears a year (range = 66–111). The lowest harvest reported in recent years was 66 bears taken in 1993–94.

The 1999–00 brown bear harvest by unit included 13A - 33 bears, 13B - 40, 13C - 12, 13D - 28, and 13E – 57 bears. In all units the reported harvests were well above harvest levels reported before 1995 when brown bear regulations were liberalized. More bears have been reported from 13E over the years than any other unit. The reported average take in 13E for the last 5 years was 53 bears. This is the highest harvest ever reported in 13E, exceeding the average annual harvest of 48 bears a year reported during the 3 peak harvest years 1984–86.

The 1999–00 brown bear harvest was 100 (60%) males and 66 (40%) females (Table 1). Males predominated in the harvest in all units except 13E.

Since regulations were liberalized in 1995, Unit 13E has had the most skewed harvest sex ratio, with females accounting for 54% of the harvest (range = 33–65%).

The mean skull size was 21.1 inches for males and 20.1 inches for females. The mean age was 5.6 years for males and 8.5 years for females. In most years, the mean age of males taken in the fall was lower than males taken in the spring. There is a less definite trend in female ages, but females taken during the fall tend to be older, larger bears compared to females taken in spring.

Interpretation of size and age data in the harvest is difficult (Miller 1993) and can lead to false conclusions. With this in mind, the guarded conclusion reached after looking at Unit 13 data is that a high proportion of the yearly take includes young males, indicating recruitment and/or emigration into the population. There are, however, some old bears taken every year, which means that heavy bear harvests in previous years have not completely cropped the bear population. Because older males are the first to emerge from dens they are more often taken during spring, and hunters can select for older bears by hunting early in April. Young males tend be killed in the fall incidentally by hunters pursuing other big game species. We speculate that more older females are taken in the fall because their cubs that accompanied them during spring may be lost during summer, making females legal during fall.

Hunter Residency and Success. Nonresident hunters took 45 (27%) bears in 1999–00 (Table 2). The number of bears taken by nonresidents has fluctuated between years but no trend is evident in recent years, although the percent of the harvest taken by nonresidents has declined as the

total unit harvest increased. Local residents took 21 (13%) bears, the highest reported harvest by local residents to date. The nonlocal Alaska resident harvest increased appreciably in 1995–96, when hunting regulations were liberalized. Nonlocal Alaska resident bear harvests over the last 5 years have averaged 90 bears and are the highest reported since the mid 1980's, when liberal seasons and bag limits were also in effect. Bear tags were purchased by only 7–13% of successful resident hunters since eliminating the tag fee in 1995. Successful hunters averaged 3.8 days in the field in 1999–00. In Unit 13 hunters have averaged 4.2 days hunting to take a bear during the last 15 years, indicating only a slight decrease in hunting effort recently.

Harvest Chronology. For the 1999–00 regulatory year, hunters harvested 92 bears (55%) during the fall and 74 in the spring (Table 3). Throughout the current reporting period, the fall season has been the most important for bear harvests. Spring harvests have fluctuated between years (Table 1). The reason for this variation is unknown but may be related to snow conditions. Because hunters rely on snowmachines during spring, an increase in the April harvest (Table 3), such as in spring 2000, may be partly due to excellent spring snow conditions and better access. On the other hand, a particularly late break-up would interfere with ORV access later in May.

Males composed 52% (n = 48) of the fall harvest in 1999. This was the third consecutive year that males have predominated in the fall kill since harvest regulations were liberalized (Table 1). Previously, when harvests were high, the percent of males taken in the fall harvest has declined. For example, from 1983–87 with the 1 bear/year bag limit, harvests were high and males averaged only 45% of the fall take.

The percent males in the spring 2000 harvest was 70% (n = 52). The percent males taken during the spring has fluctuated between a low of 49% in 1997 and a high of 81% in 1999. Since 1980 when spring seasons started, males have averaged 67% of the harvest. Miller (1990a) stated that during spring seasons, the percent females taken could increase as the season progressed because of late den emergence by sows. However, this trend is not evident in recent harvests, 7 of 10 bears taken the last week of the June 2000 season were males.

Transport Methods. Snowmachines were the most important method of transportation for brown bear hunters in Unit 13 during 1999–00 (Table 4). This is unusual and was attributed to the deep snow conditions and very late spring that allowed their use into June in the high country. However, snowmachine use has generally been increasing since 1989. Design changes made them more powerful and reliable, permitting hunters to travel into areas formerly considered too rough or remote. Prior to this year, 4-wheelers and aircraft were the most important method of transportation. The importance of 4-wheelers as a transportation method has increased the last 5 years. Unit 13 has many far-reaching trail systems that are ideally suited to 4-wheeler transportation during fall hunting seasons. Caribou and moose hunters report that 4-wheelers have also become the most important method of transportation for them. Because many bear are taken on combination hunts in the fall, it is little wonder that 4-wheelers have exceeded other means in importance. Historically, aircraft were the most important method of transportation for Unit 13 brown bear hunters. Their use, however, has declined because of expense and easier ORV access into the remote areas.

Hunter Attitudes. We sent hunter questionnaires to 235 successful bear hunters who took a bear in Unit 13 between 1995–97. Hunter response was 54% (n = 128). Brown bears were the primary

species hunted by 33% of those responding (n = 40 out of 120), the incidental take was 67%. Incidental harvests are those in which hunters seek different species but also take a bear. Hunters seeking moose and caribou reported taking 85% of the incidental take.

The 10 August opening was important to bear hunters; 60% reported this extension allowed them added hunting opportunity. Successful hunters reported that the regulation change that most influenced their decision to hunt or take a bear was changing the bag limit to 1 bear per year. Forty-nine percent felt they would not have taken a bear without this liberalization. The impact of the bag limit change becomes apparent when 42% of the hunters reported they may hunt brown bears in another unit next year. This is quite high and shows that having the opportunity to hunt bears in another unit is important. The bag limit change was not as important for Unit 13-only hunters; 36% felt they would probably take another bear in Unit 13. However, 72% Unit 13-only hunters said they would take another Unit 13 bear if it was a significantly larger bear or a better trophy. The bag limit change was important here in allowing additional hunting opportunity for a better trophy.

Other Mortality

There were 20 brown bears (15 males, 5 females) reported killed in defense of life or property (DLP) during the 1995–96 through 1999–00 reporting period. The average of 4.0 bears/year was higher than the 2.8 bears/year average since 1961. The reported DLP harvest has always been considered a minimum estimate because some bears are shot and not reported, especially at remote cabins, home sites and mining claims. The state requirement to salvage and surrender the hides of DLP bears often deters individuals from reporting DLP bears. Bears are also not reported because individuals fear they may be cited if Fish and Wildlife Protection does not deem their DLP claim as valid.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Intolerance of brown bears in proximity to people and dwellings is becoming more of a problem in Unit 13. Because of increased recreational use and development, bear encounters have become more numerous. Consequently, the Glennallen office has received more complaints of problem bears and requests to tranquilize and relocate bears. Publications, including news articles, about bear problems or conflicts encourage and maintain the public's fear of bears. The frequent "scare" articles in the media are hard to overcome, and perpetuate the bear/human conflict problem. In dealing with bear/human conflicts at remote sites, I recommend the department maintain its policy of not relocating problem bears.

CONCLUSIONS AND RECOMMENDATIONS

A major problem pertaining to brown bear management is the difficulty in obtaining population data. Because of their low density and secretive behavior, observing and counting bears is both difficult and expensive. This is especially true of interior grizzly populations that do not congregate on salmon streams and are wary of motorized vehicles. Because of this, population data are available for only limited portions of Unit 13. The unit bear estimate of 1450 bears was based on an extrapolation of known densities. Problems with this are obvious. Bear numbers may not be consistent throughout the unit, especially because we completed our density

estimates in heavily hunted portions of the unit to determine if bear numbers had declined because of higher harvest rates.

Brown bear density estimates obtained in 3 different study areas in Unit 13 indicate that bear numbers are high for an interior grizzly bear population. Data from these census areas indicate that bear numbers were stable or increasing even with heavy hunting pressure and high harvests. The only detectable consequence of high human harvest was a change in the sex ratio, with males less numerous than females. The mean age of the captured bears did not decline, however, indicating that hunters were not selecting for just older males but taking them as they occurred in the population. It does not appear that harvest rates in recent years are high enough to reduce the brown bear population in Unit 13.

The management objective for the Unit 13 brown bear population is to greatly reduce bear numbers. This board objective is based on data that shows brown bears kill over 50% of the moose calves born every year. Unit 13 is an intensive management area where the primary management objective is to provide high harvests of moose for human use. The board is trying to reduce bear numbers because a 1979 study where a large number of bears were translocated out of the study area resulted in increased calf recruitment. The approach adopted by the Board of Game was to attempt to reduce brown bear numbers in Unit 13 by increasing human harvests. As a result of the liberal regulations, brown bear harvests between 1982 and 1987 and since 1995 were high and exceeded the calculated sustainable harvest rates of 5.7% for all bears or 8% for bears $\geq$2.0 years (Miller 1988, 1993). Under these guidelines, any harvest in excess of 85 bears is not sustainable. However, the prediction that increased bear harvests would result in a population decline was wrong. To date, no detectable decline in brown bear numbers has occurred.

Whether future sport harvests at the current level can reduce bear numbers enough to appreciably reduce brown bear predation on moose calves is unknown. Current regulations that protect the reproductive portion of the population (sows with cubs and cubs) may protect enough sows to maintain recruitment thus prevent ever reducing the population. An adult sow is only legal every third or fourth year. Another reason high sport harvests of brown bears may not have the same impact on bear numbers as predicted using harvest models is that the Unit 13 brown bear population is not closed, and the extent and effects of migration are unknown. Brown bears are fully or partially protected in both Denali and Wrangell St. Elias National Parks. These large parks are adjacent to Unit 13 and provide a source of migration. Also, plotting of kill locations in Unit 13 indicates that timbered portions of the unit serve as refugia because higher harvests are in more open habitats.

I recommend maintaining the current season, bag limit and waived tag fee requirement as a management experiment to determine if sport harvests can reduce the brown bear population in Unit 13. We would be a lot further along in our management objective and knowledge of harvest rates on interior brown bears if we had maintained the liberal regulations we had between 1983–88. Becoming more restrictive without any detectable change in the bear population was a mistake we should not repeat. To monitor population changes, I recommend a periodic census in the 13A and 13E study areas. If a demonstrable decline occurs in the bear population, moose calf

survival in the area should be evaluated. If a rapid or drastic decline in the bear population is desired, some form of population control by the Department would be needed.

LITERATURE CITED

BALLARD, W. B., S. D. MILLER, AND T. H. SPRAKER. 1982. Home range, daily movements, and reproductive biology of brown bear in southcentral Alaska. Canadian Field Naturalist. 96:1–5.

MILLER, S. D. 1987. Big Game Studies. Vol. VI. Final 1986 Report. Susitna Hydroelectric Project. Alaska Department of Fish and Game. Juneau. 276pp.

———. 1988. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bear populations in Alaska's Management Unit 13. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-22-6. Job IVG-4.21. Juneau. 149pp.

———. 1990*a*. Denning ecology of brown bears in southcentral Alaska and comparison with a sympatric black bear population. International Conference on Bear Research and Management. 8:279–287.

———. 1990*b*. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bear populations in Alaska's Game Management Unit 13. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-23-3. Study 4.21. 88pp.

———. 1993. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bear populations in Alaska's Game Management Unit 13. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Final Report. Project W-23-5. Study 4.21. 182pp.

———. 1995. Impacts of heavy hunting pressure on the density and demographics of brown bear populations in southcentral Alaska. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-24-3. Study 4.26. 28pp.

TESTA, W. J., W. P. TAYLOR, AND S. D. MILLER. 1998. Impacts of heavy hunting pressure on the density and demographics of brown bear populations in Southcentral Alaska. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-24-5. Study 4.26. Juneau.

Prepared by	**Submitted by**
Robert W. Tobey	Michael G. McDonald
Wildlife Biologist III	Assistant Management Coordinator

Table 1. Unit 13 brown bear harvest, 1995–2000.

Regulatory	Hunter kill						Non-hunting kill[a]			Total estimated kill					
Year	M	(%)	F	(%)	Unk	Total	M	F	Unk.	M	(%)	F	(%)	Unk.	Total
1995–96															
Fall 95	40	(40)	60	(60)	0	100	0	1	0	40	(40)	61	(60)	0	101
Spring 96	14	(52)	13	(48)	0	27	0	1	0	14	(50)	14	(50)	0	28
Total	54	(43)	73	(57)	0	127	0	2	0	54	(42)	70	(58)	0	129
1996–97															
Fall 96	48	(49)	49	(51)	0	97	--	--	--	48	(49)	49	(51)	0	97
Spring 97	21	(49)	22	(51)	0	43	--	-	--	21	(49)	22	(51)	0	43
Total	69	(49)	71	(51)	0	140	5	0	0	74	(51)	71	(49)	0	145
1997–98															
Fall 97	62	(56)	48	(44)	0	110	--	--	--	62	(56)	48	(44)	0	110
Spring 98	18	(69)	8	(31)	0	26	--	--	--	18	(69)	8	(31)	0	26
Total	80	(59)	56	(41)	0	136	3	1	0	83	(59)	57	(41)	0	140
1998–99															
Fall 98	57	(63)	34	(37)	0	91	--	--	--	57	(63)	34	(37)	0	91
Spring 99	30	(81)	7	(19)	0	37	--	--	--	30	(81)	7	(19)	0	37
Total	87	(68)	41	(32)	0	128	4	1	0	91	(68)	42	(32)	0	133
1999–2000															
Fall 99	48	(52)	44	(48)	0	92	--	--	--	48	(52)	44	(48)	0	92
Spring 00	52	(70)	22	(30)	0	74	--	--	--	52	(70)	22	(30)	0	74
Total	100	(60)	66	(40)	0	166	3	1	0	103	(61)	67	(39)	0	170

[a]Includes Defense of Life or Property kills, research mortalities, and other known human-caused accidental mortality.

Table 2. Unit 13 brown bear successful hunter residency, 1995–2000.

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	successful hunters[b]
1995–96	4	(3)	87	(69)	34	(27)	127
1996–97	12	(9)	91	(65)	35	(25)	140
1997–98	13	(10)	90	(66)	33	(24)	136
1998–99	2	(2)	82	(64)	44	(34)	128
1999–00	21	(13)	100	(60)	45	(27)	166

[a] Local resident means resident of GMU 13.
[b] Includes unknown residency.

Table 3. Unit 13 brown bear harvest chronology percent by time period, 1995–2000.

	Harvest periods																
Regulatory	August		September		October		November		March		April		May		June		n
year	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	
1995–96	35	(43)	38	(50)	6	(7)	0	(0)	0	(0)	10	(13)	11	(14)	0	(0)	127
1996–97	29	(41)	38	(53)	1	(1)	1	(1)	0	(0)	14	(20)	17	(23)	0	(0)	140
1997–98	22	(30)	50	(68)	9	(12)	0	(0)	1	(1)	6	(8)	12	(17)	0	(0)	136
1998–99	22	(28)	44	(56)	5	(7)	0	(0)	0	(0)	11	(14)	17	(22)	0	(0)	128
1999–00	15	(25)	33	(55)	7	(11)	1	(1)	1	(1)	28	(46)	12	(21)	4	(7)	166

Table 4. Unit 13 brown bear harvest percent by transport method, 1995–2000.

Regulatory year	Airplane	Horse	Boat	3 or 4-wheeler	Snowmachine	ORV	Highway vehicle	Walk	Unk.	n
1995–96	21	11	5	35	6	4	13	3	2	127
1996–97	26	5	9	26	8	5	14	5	1	140
1997–98	22	7	7	27	4	8	18	6	0	134
1998–99	28	5	9	23	7	6	18	4	1	128
1999–00	25	6	6	16	29	3	13	4	1	166

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 14 (6625 mi^2)

GEOGRAPHIC DESCRIPTION: Upper Cook Inlet

BACKGROUND

Brown bear density and distribution has been influenced by urbanization, agricultural settlement and other human activities. Grauvogal (1990) estimated brown bear numbers during the late 1980s at 169–262. Harkness (1993) refined the Unit 14 brown bear population estimate to 185–239 bears. Griese (ADF&G files; Palmer, Alaska) estimated the population range at 125–232 during 1993.

Grauvogal (1990) first estimated the annual sustainable harvest for Unit 14 at 8–19 bears. Harkness (1993) calculated sustainable harvest at 8.2–12.6 bears. Griese (1995) applied a slightly more conservative annual allowable harvest (AAH) of 10 total bears and/or 3 independent females. In 1995 the harvest objective was established at 6–10 bears, including no more than 3 females >2 years old. Since 1986 the objective of 10 bears had been exceeded in all years except 1993 when 6 bears were reported killed. Griese (1998) suggested that future population objectives should reflect the permanent loss of bear habitat in Unit 14 and human-use objectives should reflect allowance of higher harvest to bring the bear population to within a societal carrying capacity. The Board of Game agreed and allowed for a higher human-use objective of 10–15 bears (Griese 1999).

Griese (1998) recommended a strong educational program, possibly using television and radio outlets, to inform visitors and residents how to live near bears. A high incidence of human-bear interactions occurs in Unit 14. Since 1985, 1–8 bears were killed annually unrelated to hunting. In 1995 two humans were fatally mauled by brown bears in Chugach State Park in Unit 14C.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Since 1976 Unit 14A goals have been to provide the maximum opportunity to participate in hunting brown bears and, secondarily, to provide for optimum harvests of brown bears. In Unit 14B the goal has been to provide the maximum opportunity to participate in hunting brown bears. In Unit 14C the goals have been to provide an opportunity to view, photograph, and enjoy brown bears, and, secondarily, to provide an opportunity to hunt brown bears under aesthetically pleasing conditions.

MANAGEMENT OBJECTIVES

To maintain a brown bear population that is largely unaffected by human harvest.

Human-Use Objectives

To allow optimum opportunity to hunt brown bears with an annual allowable harvest (AAH) of 10–15 bears, including less than 5 females greater than 2 years of age. See "Board of Game Actions and Emergency Orders" and "Conclusions and Recommendations" for explanation.

METHODS

Department personnel or authorized sealers interviewed hunters when they presented bears for sealing of skulls and hides. Skulls were measured, sex of bears determined, a premolar tooth was extracted for age determination, and information on date and location of kill and hunter effort were collected from successful hunters. Harvest data were compared to previous years.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

The lack of field activities (that would provide insight into population status and trend) prevent a meaningful discussion. However, public reports and human-bear encounters indicated that bears were more common than 10–15 years ago.

MORTALITY

Harvest

Season and Bag Limit. In regulatory year 1998 the Subunit 14B hunting season for brown bears was 15 September through 25 May. In the remainder of Unit 14 the season was 15 September through 10 October and 1–25 May. During 1999 the season for all of Unit 14, except in Unit 14C, changed to 15 September through May 25. Within Subunit 14C brown bear hunting was not allowed in Chugach State Park and several special management areas, and was allowed only within "the remainder of 14C." The bag limit for brown bears was 1 bear every 4 regulatory years. Harvesting cubs and sows accompanied by cubs was prohibited. Residents were required to get a $25 tag for brown bear hunting.

Board of Game Actions and Emergency Orders. During spring 1999 the Board of Game applied the Unit 14B season, 15 September through May 25, to all open hunting areas of Unit 14. The department proposed this liberalization because of an apparent increase in the availability of brown bears. The increased availability was believed to be a function of reduced habitat and increasing bear numbers. The department was hopeful that increased hunter opportunity would produce fewer bear human conflicts and fewer DLP kills in the future.

The board also agreed to department recommendations to increase human-use objectives for the Unit. The department recommended an annual hunter harvest objective of 10–15 bears unitwide with 5 or fewer being females >2 years old.

Hunter Harvest. During the report period hunters harvested 24 bears (Table 1) for an average annual harvest of 12 bears. This 2-year average is greater than the 8.6 average for the previous 5-year period (Griese 1999). The female bear component of the harvest during 1998–1999 was 35%, up from 26% during 1997-1998.

The average yearly total of female bears >2 years of age that were killed in the 3-year period 1997 through 1999 was 2.7 (including DLP and other non-hunting mortality). This average does not include 3 bears of unknown age (2 females and one unknown sex) killed in 1999. The previous 3-year average for 1994–96 was 3.3.

During the report period hunters legally harvested 10 males and 4 females in Unit 14A, and 5 males and 4 females in Unit 14B.

Hunter Residency. Nonresidents harvested 4 bears (17%) this period (Table 2); residents harvested the remaining 83% of the harvest (23 bears).

Harvest Chronology. Although harvest chronology in Unit 14 has been variable, harvest during this period regularly peaked during late September (Table 3). Three bears killed during April 1999 was a notable shift.

Transport Methods. Successful bear hunters preferred using highway vehicles and ORVs this report period (Table 4).

Other Mortality

There were 6 bears killed in defense of life or property during the report period (Table 1). Five of those were killed in Unit 14A (3 males and 2 females). A bear of unknown sex was reported killed by a natural or unknown cause in 14A, and a male in Unit 14B was killed illegally. In Unit 14C, a female was killed by vehicle collision, and a female was killed illegally. No bears were recorded killed by trains or highway vehicles during the reporting period. We estimated an additional 15% unreported illegal harvest above that reported (Table 1).

CONCLUSIONS AND RECOMMENDATIONS

Management objectives appear to have been met, while human-use objectives were exceeded. The recommended AAH was 6-10 bears but it was changed during the 99-00 reporting period to 10-15 bears. (Griese 1999). The prior AAH of 6-10 bears was exceeded during 1998 the new AAH of 10-15 bears was also exceeded in 1999. The AAH harvest of less than 5 females > 2-years-old was not exceeded during the last 3 seasons, although there were 3 bears (2 females of unknown age and another of unknown sex) that could have caused the AAH to be exceeded during 1999. If these unknowns were all > 2 years-old, the 3-year average would have exceeded the objectives.

Contrary to our own recommendations to take a conservative approach (Griese 1998), we recommended an increase in the AAH beginning in 1999 (Griese 1999). At the March 1999 Board of Game meeting, we recommended that the brown bear human-use objective be increased to current harvest levels, which appeared to be sustainable. By all indicators, such as frequency of bear sign observed by biologists, reports from the public, incidence of nuisance bears, and a

steady harvest level, the brown bear subpopulation in the unit seems to be stable or increasing. We suggested a hunter harvest objective of 10–15 bears (AAH of 15) with a maximum of 5 independent females. Reported harvest (excluding estimated unreported kills) since 1987 (Griese 1991, Griese 1995) has exceeded our current AAH nearly every year. The mean annual reported mortality during 1987–1998 was 14.2 bears. We reasoned that the maximum annual allowable harvest could be as high as or higher than this 12-year average.

We also recommended the hunting season be uniform for all of Unit 14 except Chugach State Park, which remains closed to brown bear hunting. The effect would be an increased early spring hunting opportunity in Unit 14A and a small portion of 14C. This overwinter season format is currently standard for most adjacent units and apparently has not affected any substantial population decline. In those adjacent units, increases in harvest have centered on the adult male segment, which we speculate reduces male/female ratios and may produce compensatory effects (Stringham 1983). The Board of Game agreed and adopted our recommendation.

We are meeting management goals for observation and photography of brown bears in the unit. Brown bears in and around Anchorage and the Matanuska-Susitna valleys are seen almost daily during the summer months, creating a tremendous number of calls from concerned citizens.

We should continue to strive for a strong educational program to inform Alaskans and visitors how to act around bears and how to minimize undesirable interactions (Griese 1999).

LITERATURE CITED

GRAUVOGAL, C.A. 1990. Unit 14 brown bear survey-inventory progress report. Pages 84-94. S.O. Morgan, ed. Annual report of survey-inventory activities. Part V. Brown/grizzly bears. Vol. XX. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-2. Study 4.0. Juneau. 189pp.

GRIESE, H. J. 1991. Unit 14 brown bear management report. Pages 124–131 *in* Susan M. Abbott, Ed. Annual report of survey-inventory activities. Part V. Brown Bear. Vol. XXII. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Project. Grant W-23-4 and W-23-5. Study 4.0. Juneau, Alaska USA

———. 1995. Unit 14 brown bear management report. Pages 135–141 *in* Mary V. Hicks, ed. Management report of survey-inventory activities, 1 July 1992–30 June 1994. Brown Bear. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration, Grants W-24-1 & W-24-2, Study 4.0. Juneau, Alaska USA

———. 1998. Unit 14 brown bear management report. Pages 132–138 in Mary V. Hicks, Ed. Management report of survey-inventory activities, 1 July 1994–30 June 1996. Brown Bear. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Grants W-24-3 and W-24-4. Study 4.0. Juneau, Alaska USA

———. 1999. Unit 14 brown bear management report. Pages 138–145 in Mary V. Hicks, Ed. Management report of survey-inventory activities, 1 July 1996–30 June 1998. Brown

Bear. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Grants W-24-5 and W-27-1. Study 4.0. Juneau, Alaska USA

HARKNESS, D. 1993. Unit 14 Brown bear management report. Pages 129-135. M. Hicks, ed. Management report of survey-inventory activities. Brown bear. 1 July 1990–30 June 1992. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. W-23-4 and W-23-5, Study 4.0. Juneau. 283pp.

STRINGHAM, S.F. 1983. Roles of adult males in grizzly bear population biology. International Conference on Bear Research and Management. 5:140-152.

PREPARED BY:

Thomas McDonough
Wildlife Biologist II

Herman Griese
Wildlife Biologist III

SUBMITTED BY:

Michael McDonald
Assistant Management Coordinator

Table 1 Unit 14 brown bear harvest, 1994–99

Regulatory year	Reported: Hunter kill M	F	(%)	Unk.	Total	Reported: Nonhunting kill[a] M	F	Unk.	Estimated unreported kill	Total estimated kill M	(%)	F	(%)	Unk.	Total
1994															
Fall 94	0	1	(100)	0	1	3	0	1	1	3	(75)	1	(25)	2	6
Spring 95	2	2	(50)	0	4	0	0	1	1	2	(50)	2	(50)	2	6
Total	2	3	(60)	0	5	3	0	2	2	5	(63)	3	(38)	4	12
1995															
Fall 95	4	5	(56)	0	9	2	0	0	1	6	(55)	5	(45)	1	12
Spring 96	1	1	(50)	0	2	0	1	0	1	1	(33)	2	(67)	1	4
Total	5	6	(55)	0	11	2	1	0	2	7	(50)	7	(50)	2	16
1996															
Fall 96	5	0	(0)	0	5	4	1	0	1	9	(90)	1	(10)	1	11
Spring 97	2	3	(60)	0	5	1	0	0	1	3	(50)	3	(50)	1	7
Total	7	3	(30)	0	10	5	1	0	2	12	(75)	4	(25)	2	18
1997															
Fall 97	2	1	(33)	0	3	0	0	0	1	2	(67)	1	(33)	1	4
Spring 98	7	2	(22)	0	9	3	1	1	1	10	(77)	3	(23)	2	15
Total	9	3	(25)	0	12	3	1	1	2	12	(75)	4	(25)	3	19
1998															
Fall 98	5	3	(38)	0	8	4	0	0	1	9	(75)	3	(25)	1	13
Spring 99	0	0	(-)	0	0	0	1	0	1	0	(0)	1	(100)	1	2
Total	5	3	(38)	0	8	4	1	0	2	9	(69)	4	(31)	2	15
1999															
Fall 99	5	4	(44)	0	9	2	1	0	1	7	(58)	5	(42)	1	13
Spring 00	5	1	(17)	0	6	0	2	1	1	5	(63)	3	(37)	2	10
Total	10	5	(33)	0	15	2	1	1	2	12	(67)	6	(33)	3	21

[a]Includes DLP kills, illegal kills, other known human-caused accidental mortality, and nonfatal removal of orphaned cubs.

Table 2 Unit 14 brown bear successful hunter residency, 1993–99

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	Total successful hunters
1993	5	(100)	0	(0)	0	(0)	5
1994	5	(100)	0	(0)	0	(0)	5
1995	10	(91)	1	(9)	0	(0)	11
1996	7	(78)	0	(0)	2	(22)	9
1997	9	(75)	1	(8)	2	(17)	12
1998	8	(100)	0	(0)	0	(0)	8
1999	11	(73)	0	(0)	4	(27)	15

[a]Unit 14 residents

Table 3 Unit 14 brown bear harvest chronology percent by month, 1993–99

Regulatory year	Harvest periods								
	September		October		November-March	April	May		
	1–15	16–30	1–15	16–31		1–30	1–15	16–31	*n*
1993	0	40	0	0	--	--	40	20	5
1994	0	20	0	0	--	--	60	20	5
1995	18	45	18	0	--	--	18	0	11
1996	0	44	11	0	--	--	33	11	9
1997	19	50	8	0	0	8	0	17	12
1998	0	63	38	0	0	0	0	0	8
1999	13	33	13	0	0	20	0	20	15

Table 4 Unit 14 brown bear harvest percent by transport method, 1993–99

Regulatory year	Percent of harvest						*n*
	Airplane	Horse	Boat	ORV	Highway vehicle	Other/ Unknown	
1993	0	0	0	40	20	40	5
1994	0	0	40	20	20	20	5
1995	9	0	27	0	36	27	11
1996	22	0	0	33	33	11	9
1997	17	0	0	33	33	17	12
1998	0	0	13	50	25	13	8
1999	13	0	0	27	40	20	15

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 16 (12,255 mi^2)

GEOGRAPHIC DESCRIPTION: West side of Cook Inlet

BACKGROUND

Although the actual size or density of the brown bear population in Unit 16 has never been measured, Griese (1993) estimated the population at 586–1156. Estimated brown bear densities ranged from no bears on Kalgin Island to a presumed unit-high in the coastal and foothill areas of Redoubt Bay and Trading Bay. Lacking survey data, biologists had tracked harvest data to estimate population trends but more recently have also relied on reports by long-time residents or visitors to refine estimates of trend (Griese 1998). During this report period we began an effort to develop a statistically rigorous estimate of bear density over a large portion of the unit.

Hunter harvest peaked in 1985 following a lengthening of bear hunting seasons in Unit 16 (Figure 1). Prior to the liberalization, 1961–1983, harvest ranged from 17 to 46 bears annually. During 1984 the season was extended allowing hunting during den emergence, March through May. Harvest during 1984 reached 66 bears and then peaked at 89 bears the following year. From 1986 through 1992 harvest varied from 84 to 60 bears, exhibiting a general declining trend. From 1993 through 1995 harvest increased from 40 to 52 bears. Poor spring hunting weather and a reduced number of hunters afield during the fall (Griese 1998) may have influenced this period of low harvest. Moose hunter participation declined in fall 1993 because of newly enacted antler restrictions (Griese 1995). Harvest has since increased reaching 76 bears during 1999 following yet another increase of season length.

The effect of the 1984 season change was a substantial increase in the spring bear harvest and particularly the harvest of the adult male component (Faro 1990). Females generally emerge after the males and their emergence tends to coincide with "rotting" snow conditions and reduced access by hunters. The result was a focused harvest on adult males during March and April. Faro (1990) and Griese (1991) both believed the effect of the higher harvest would be detrimental to the bear population. However, Griese (1999) reported that long-time residents observed an increasing trend in observations of bears over the past 10–20 years, which was most evident in family groups and young bears. Compensatory mechanisms described by Stringham (1983) may be indicated.

Griese (1993) first estimated an annual sustainable harvest of 55 bears including no more than 18 females >2 years old. Harvest annually exceeded this estimate of a sustainable level during 1984–1992. Harvest of the female segment >2-years old exceeded estimated sustainable levels in all but 4 years (1988, 1989, 1993, and 1994). Harvest of >2-year-old females reached or exceeded 30 bears during 1985 (32), 1987 (31), and 1992 (30). Yet, brown bear numbers, at least sows and young, appeared to increase during the 1990s.

Beginning in spring 1994, the Board of Game directed the department to allow the brown bear population in Unit 16 to decline. The board determined that moose was the priority species in Unit 16 and a high population of brown bears conflicted with moose population productivity. Griese (1995) modified the brown bear population objective to reflect that priority. Griese (1998) recommended further modification, producing current management goals and objectives for a declining bear population. Because harvest levels were not reaching objective levels and the ratio of bears to moose appeared to be growing in Unit 16, the Board of Game agreed with our recommendation to adopt an August 10 opening date for bear hunting at their 1999 spring meeting (Griese 1999).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

To allow the number of breeding females in the population to decrease by providing optimal opportunity to hunt brown bears.

POPULATION OBJECTIVES

To reach desirable predator/prey ratios by allowing the brown bear population to decline.

HUMAN-USE OBJECTIVES

To allow human use to reach a 3-year average harvest of 28 females >2 years old.

METHODS

In May 2000 ADF&G research staff, with cooperative funding from Denali National Park, began an investigation of the application of ‘an aerial survey sampling of contour transects using double-count and covariate data’ (Quang and Becker 1999) to survey bears in northeastern Unit 16 and eastern Unit 13. The results will provide some insight into the density of bears in the area during the survey, providing an opportunity to refine population estimates. Biologists continued to monitor brown bear harvests by sealing skulls and hides of harvested brown bears. Department personnel or designated sealers measured skulls, determined sex of bears, extracted a premolar for age determination, and recorded date and location of kill, hunter effort, and transportation method.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Preliminary results for the "Quang and Becker survey" were unavailable, but harvest trends indicated a stable or increasing population. Staff observations during the past 20 years and comments from unit residents and others who regularly visit the unit suggested a growing brown bear population during the 1990s.

Population Size

Griese (1993) has estimated the population to be within the range of 586–1156 bears.

MORTALITY

Harvest

The most recent reported 3-year (1997–99) average annual brown bear mortality in Unit 16 was 64.0 bears. Included in this average were 16.7 females >2 years. The female harvest did not reach human-use objectives for this period. Estimates of unreported kills from wounding loss and poaching (Tables 1 and 2) added 6–7 additional bears annually to the average; half would probably have been females.

Age and Skull Size of Hunter-Killed Bears. The most recent 3-year-average age of male bears was measured at 5.9 years (n = 118), and the average skull size was 22.6 inches (n =109). The average age remains below the 1985–89 average of 7.8 years (n = 218) (Griese 1995). The average age of female bears for this report period was 5.7 years (n = 64), and average skull size was 20.1 inches (n = 62). Female statistics had also declined since 1984 but are beginning to rebound.

Season and Bag Limit. With the exception of the Denali State Park portion of Unit 16A, the open brown bear hunting season was 1 September–25 May during regulatory year 1998. The season in Denali State Park was 1 September–31 May. During 1999 the season in Unit 16B only changed to 10 August–25 May. The legal bag limit in Unit 16 was 1 bear every 4 regulatory years, and the resident tag fee was required. Cubs and females accompanied by cubs were not legal to take.

Board of Game Actions and Emergency Orders. During March 1999 the Board of Game amended and adopted a proposal that lengthened the Unit 16B fall hunting season, opening it on 10 August. The original proposal was to eliminate resident tag fees and was in reaction to complaints about high bear densities. The department recommended an increase in season length as an alternative in order to reach management objectives.

Hunter Harvest. With the exception of 1997, hunter harvest has increased from the low harvest during 1993. The low harvest during 1997 was the product of poor weather and poor snow conditions during spring. During 1999 the hunter harvest increased to 76 bears. The average harvest for the reporting period was 8.5 bears in Unit 16A (Table 1) and 61.5 bears in Unit 16B (Table 2).

Hunter Residency and Success. The composition of successful hunter residency during this report period changed slightly from previous years with an increase in the nonlocal resident harvest. Nonlocal Alaska residents claimed 51–52% of the harvest (Table 3), while nonresident hunters accounted for 42–48% of bears killed. Unit resident hunters killed 0–7% of the bear harvest.

Harvest Chronology. The shift to fall for the major portion of bear harvest during 1997 and 1998 reported by Griese (1999) continued into 1999 because of the addition of the August season (Table 4). Griese believed the original shift to September was due to poor April and May hunting conditions. During 1998, September harvest was high with 44 brown bears taken. Twelve bears were taken during the August season.

Transport Methods. Successful brown bear hunters still preferred using airplanes for transportation (Table 5). During the report period 53–83% of successful hunters used aircraft. While fears that snowmachine technology would allow more hunters to successfully take bears in the unit (Griese 1998), only during 1999 was there an evident increase in use. A noticeable increase in use of horses to harvest bears suggested that guides were taking advantage of bear abundance, perhaps in the absence of ungulates.

Other Mortality

During the report period, reported nonhunting kills averaged 7.0 bears annually (Tables 1 and 2). The composition was 79% female bears. I indicated an average of 8 bears killed and unreported during the report period based on suggestive remarks of local residents.

A Fish and Wildlife Protection officer discovered a dead male bear evocative of a wounding loss. And an investigation of a dead sow suggested she had been killed by a large boar while protecting her yearling cubs.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Griese (1998) highlighted dangerous interactions between humans and bears caused by fishing activities at the Big River Lakes sockeye salmon sport fishery. The department responded with actions designed to educate users and commercial operators specifically and to develop a multi-divisional management strategy to promote safer conditions for fisherman and bear viewers (Griese 1999). During this report period we began staffing the site during critical periods of conflict.

CONCLUSIONS AND RECOMMENDATIONS

Management objectives were not met during this report period. Although measurement of the predator/prey ratio was not attempted, the human-use objective did not reach the allowed 3-year average of 28 females >2 years. The 1997–1999 average reached only 17 females >2 years. However, by substantially liberalizing fall season in Unit 16B beginning in 1999, the Board of Game has increased the likelihood of future harvests of females to reach the desired objective.

LITERATURE CITED

FARO, J. 1990. Unit 16 brown bear survey-inventory progress report. Pages 95–98 *in* SO Morgan, ed. Brown bear. Vol. XX, Part V. Annual report of survey-inventory activities: 1 January 1988–31 December 1988. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-23-2. Study 4.0. Juneau, Alaska USA

GRIESE, H. 1991. Unit 16 brown bear survey-inventory progress report. Pages 132–141 *in* SM Abbott, ed. Survey-inventory management report. 1 July 1989–30 June 1991. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-23-3 and W-23-4. Study 4.0. Juneau, Alaska USA

———. 1993. Unit 16 brown bear survey-inventory progress report. Pages 136–151 *in* MV Hicks, ed. Management report of survey-inventory activities. 1 July 1990–30 June 1992. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-23-4 and W-23-5. Study 4.0. Juneau, Alaska USA

———. 1995. Unit 16 brown bear survey-inventory progress report. Pages 142–152 *in* MV Hicks, ed. Management report of survey-inventory activities. 1 July 1992–30 June 1994. Brown bear. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Project W-24-1 and W-24-2. Study 4.0. Juneau, Alaska USA

———. 1998. Unit 16, West side of Cook Inlet. Pages 139–146 *in* MV Hicks, ed. Federal aid in wildlife restoration management report, survey-inventory activities 1 July 1994–30 June 1996. Brown bear. Alaska Department Fish and Game. Grants W-24-3 and W-24-4. Study 4.0. Juneau, Alaska USA

———. 1999. Unit 16, West side of Cook Inlet. Pages 139–146 *in* MV Hicks, ed. Federal aid in wildlife restoration management report, survey-inventory activities 1 July 1994–30 June 1996. Brown bear. Alaska Department Fish and Game. Grants W-24-3 and W-24-4. Study 4.0. Juneau, Alaska USA

QUANG, P. X., AND E. F. BECKER. 1999. Aerial survey sampling of contour transects using double-count and covariate data. Pages. 87-97 *in* G. W. Garner, S. C. Amstrup, J. L. Laake, B. F. J. Manly, L. L. McDonald, and D. G. Robertson, A. A. Balkema eds. Marine Mammal Survey and Assessment Methods, Rotterdam. Netherlands,

STRINGHAM, S.F. 1983. Roles of adult males in grizzly bear population biology. International Conference on Bear Research and Management. 5:140–152.

PREPARED BY

Herman Griese
Wildlife Biologist III

SUBMITTED BY

Michael McDonald
Assistant Management Coordinator

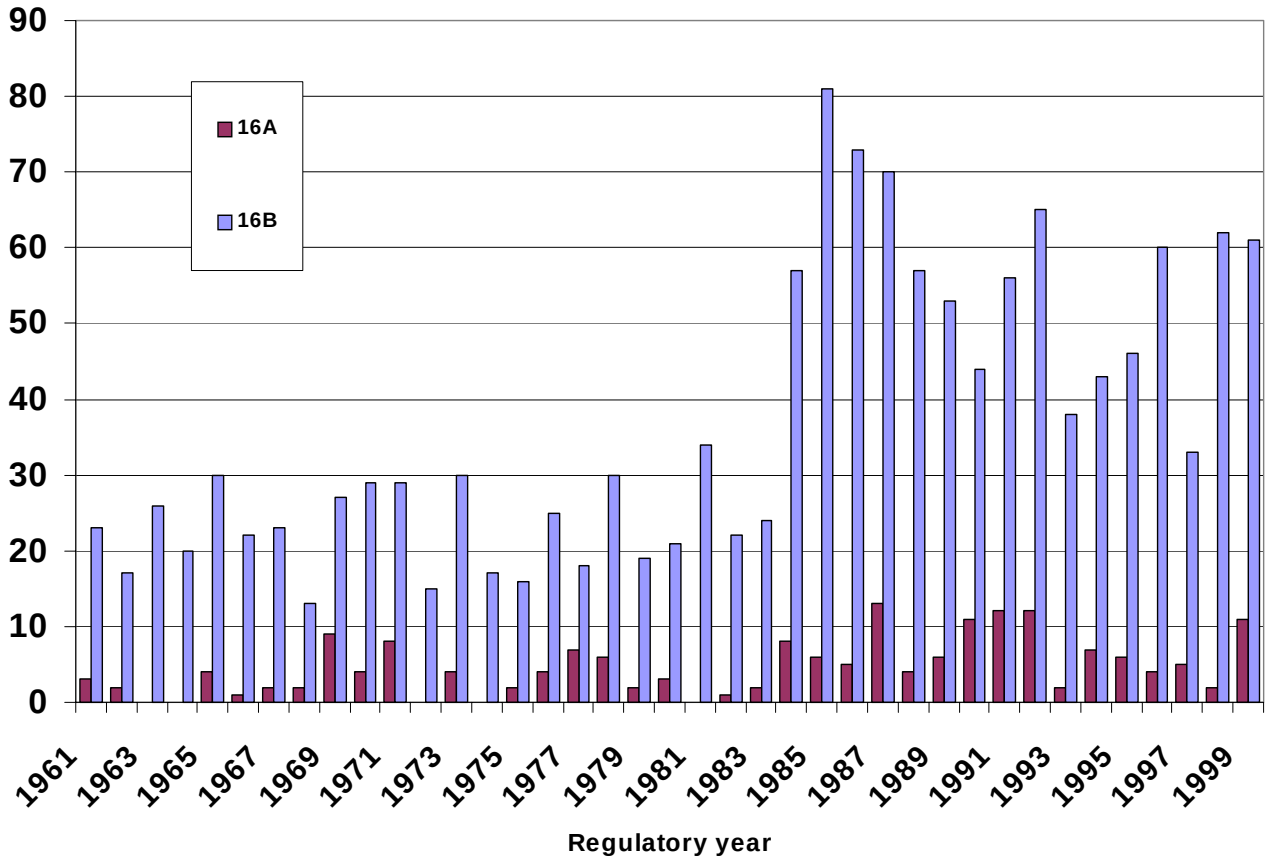


Figure 1. Unit 16A and 16B historical brown bear harvest as reported by hunters, 1961–1999.

Table 1 Unit 16A human-caused brown bear mortality, 1995–99

Regulatory year	Reported: Hunter kill M	F	(%)	Unk.	Total	Reported: Nonhunting kill[a] M	F	Unk.	Estimated unreported kill	Total estimated kill M (%)	F (%)	Unk.	Total
1995													
Fall 95	1	1	(50)	0	2	0	1	0		1 (33)	2 (67)	0	3
Spring 96	2	2	(50)	0	4	0	0	0		3 (60)	2 (40)	0	5
Total	3	3	(50)	0	6	0	1	0	1	4 (50)	4 (50)	1	9
1996													
Fall 96	1	1	(50)	0	2	0	0	0		1 (50)	1 (50)	0	2
Spring 97	2	0	(0)	0	2	0	0	0		2 (100)	0 (0)	0	2
Total	3	1	(25)	0	4	0	0	0	1	3 (75)	1 (25)	1	5
1997													
Fall 97	2	2	(50)	0	4	0	1	0		2 (40)	3 (60)	0	5
Spring 98	1	0	(0)	0	1	1	0	0		2 (100)	0 (0)	0	2
Total	3	2	(40)	0	5	1	1	0	1	4 (57)	3 (43)	1	8
1998													
Fall 98	0	1	(100)	0	1	0	0	0		0 (0)	1 (100)	0	1
Spring 99	0	1	(100)	0	1	0	0	0		0 (0)	1 (100)	0	1
Total	0	2	(100)	0	2	0	0	0	2	0 (0)	2 (100)	2	4
1999													
Fall 99	9	2	(18)	0	11	0	0	0		9 (82)	2 (18)	0	11
Spring 00	4	0	(0)	0	4	0	1	0		4 (80)	1 (20)	0	5
Total	13	2	(13)	0	15	0	1	0	2	13 (81)	3 (19)	2	18

[a]Includes DLP kills, illegal kills, other known human-caused accidental mortality, and non-fatal removal of orphaned cubs.

Table 2 Unit 16B human-caused brown bear mortality, 1995–99

Regulatory year	Reported: Hunter kill M	F	(%)	Unk.	Total	Reported: Nonhunting kill[a] M	F	Unk.	Estimated Unreported kill	Total estimated kill M	(%)	F	(%)	Unk.	Total
1995															
Fall 95	12	19	(61)	0	31	2	1	2		14	(41)	20	(59)	2	36
Spring 96	14	1	(7)	0	15	0	0	0		14	(93)	1	(7)	0	15
Total	26	20	(43)	0	46	2	1	2	5	28	(57)	21	(43)	7	56
1996															
Fall 96	13	16	(55)	0	29	2	0	0		15	(48)	16	(52)	0	31
Spring 97	28	3	(10)	0	31	1	0	1		29	(88)	4	(12)	1	33
Total	41	19	(32)	0	60	3	0	1	6	44	(70)	19	(30)	7	70
1997															
Fall 97	13	15	(54)	0	28	0	1	0		13	(45)	16	(55)	0	29
Spring 98	4	1	(20)	0	5	0	0	0		4	(80)	1	(20)	0	5
Total	17	16	(48)	0	33	0	1	0	3	17	(50)	17	(50)	3	37
1998															
Fall 98	29	21	(42)	0	50	0	3	0		29	(55)	24	(45)	0	53
Spring 99	10	2	(17)	0	12	0	0	0		10	(83)	2	(17)	0	12
Total	39	23	(35)	0	62	0	3	0	6	39	(60)	26	(40)	6	71
1999															
Fall 99	28	19	(40)	0	47	1	3	0		29	(57)	22	(43)	0	51
Spring 00	13	1	(7)	0	14	2	4	0		15	(75)	5	(25)	0	20
Total	41	20	(33)	0	61	3	7	0	6	44	(62)	27	(38)	6	77

[a]Includes DLP kills, illegal kills, other known human-caused accidental mortality, and nonfatal removal of orphaned cubs.

Table 3 Unit 16 brown bear successful hunter residency, 1995–99

Regulatory year	Local[a] resident	(%)	Nonlocal resident	(%)	Nonresident	(%)	Total[b] successful hunters
1995	2	(4)	24	(47)	25	(49)	52
1996	2	(3)	24	(38)	37	(59)	64
1997	1	(3)	17	(44)	21	(54)	39
1998	0	(0)	33	(52)	31	(48)	64
1999	5	(7)	39	(51)	32	(42)	76

[a]Unit 16 residents

[b]Includes unknown residency

Table 4 Unit 16 brown bear harvest chronology percent by month, 1995–99

Regulatory	Harvest periods							
year	August %	September %	October %	November %	March %	April %	May %	*n*
1995	--	46	15	2	0	27	10	52
1996	--	42	6	0	6	39	6	64
1997	--	62	21	0	3	13	3	39
1998	--	69	9	2	2	16	3	64
1999	16	55	4	1	0	20	4	76

Table 5 Unit 16 brown bear harvest percent by transport method, 1995–99

Regulatory year	Percent of harvest							
	Airplane %	Horse %	Boat %	Snowmachine %	ORV %	Highway vehicle %	Other/ Unknown %	*n*
1995	71	4	6	2	4	4	10	52
1996	73	6	9	3	2	6	0	64
1997	67	5	15	0	10	3	0	39
1998	83	3	8	2	3	0	2	64
1999	53	11	9	9	8	4	7	76

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

BROWN BEAR MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

GEOGRAPHIC DESCRIPTION: Northern Bristol Bay

BACKGROUND

Brown bears are common throughout the northern Bristol Bay area and are seasonally abundant along salmon spawning areas in the Nushagak, Mulchatna, Togiak, and the Kulukak River drainages as well as along the Wood River Lakes. Bears are also observed near aggregations of the Mulchatna caribou herd.

Bears in Unit 17 are neither as abundant nor as large as those found along the Alaska Peninsula; so historically there hadn't been as much hunting pressure on this bear population. Along with increased interest in hunting bears elsewhere in the state, bear hunting in Unit 17 has increased in the last few years. Prior to 1997, annual reported harvests rarely exceeded 50 bears per year. Since 1997, reported bear harvests have increased each year. Prior to 1970, few bears were reported as harvested from the unit. When the Board of Game established alternate year seasons in Unit 9 in 1973, the number of bears reported harvest from Unit 17 increased. From 1972–73 to 1980–81, the harvest was generally balanced between the spring and fall seasons. Between 1982 and 1997 there have been higher harvests during fall seasons than during the spring. Since the increased spring hunting season length during the 1998 regulatory year, spring harvest harvests have exceed that of the fall (Figure 1).

One reason for the increase in the fall harvest up through the mid-1990s was increased hunting pressure on the rapidly growing Mulchatna caribou herd (Van Daele, 1997). Reported moose harvests also increased dramatically during this same period. With more hunters afield hunting caribou and moose, more bears were killed either incidentally or during "combination" hunts. Increased spring harvest, however, also demonstrates the rising interest in hunting brown bears in Unit 17.

Reported harvests are only a part of the brown bears killed in the unit. All villages, including Dillingham, have open landfills that attract bears during the spring, summer and fall. Residential garbage, dog food, and fish-drying racks also bring bears close to humans. Some local residents have a low tolerance for bears near villages and fish sites, and they occasionally kill bears in these areas. Although reporting rates seem to have improved in recent years, many nonhunting mortalities are reported either indirectly or not at all. Because of the widespread occurrence of unreported kills, any conclusions based solely on harvest data must be viewed with caution.

POPULATION OBJECTIVE

Maintain a brown bear population that will sustain an annual harvest of 50 bears composed of at least 50% males.

METHODS

Each brown bear legally harvested or killed in defense of life or property (DLP) in the unit is sealed, the skull is measured, sex determined, and a premolar tooth extracted and aged. We record data on hunter residency, number of days hunted, transportation used, and date and location of kill at the time of sealing. When possible, we investigate circumstances surrounding DLP and illegal kills. We collect subjective population data during caribou and moose surveys. Reports from agency field workers, local residents and hunters are also used to estimate bear population trends.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

No objective data on the status of the bear population in Unit 17 is available. The brown bear population is probably stable to increasing unitwide. This appears to be the case in most of Units 17A, 17C, and the remote portions of Unit 17B. Bears living in portions of Unit 17B along the Nushagak and Mulchatna Rivers experience the greatest harvest pressure.

Population Size

No population size or density estimates have been made for the brown bear population in Unit 17. Densities are probably significantly lower than those observed along the Alaska Peninsula. Incidental observations suggest a population density of at least that observed in the Susitna River study area (2.79 bears/100 km^2) (Miller et al. 1987). This would indicate a population estimate of at least 1350 independent (>2 years old) bears in Unit 17.

Distribution and Movements

We know little about the distribution and movements of brown bears in this unit. Bears concentrate along salmon spawning streams throughout the summer and fall. Individual bears and family groups are commonly observed near calving aggregations of caribou in late May. We have seen den sites in the mountains west of the Wood River Lake system and along the upper Nushagak River.

MORTALITY

Harvest

Season and Bag Limit

Units 17A & 17C	Apr 15–May 25 Sep 10–Oct. 10	1 bear per 4 regulatory years
Unit 17B	Apr 15–May 25	1 bear per 4

	Sep 20–Oct. 10	regulatory years
Western Alaska Brown Bear Management Area (including Unit 17)	Sep 1–May 31	1 bear per regulatory year

Board of Game Actions and Emergency Orders. The Board of Game made no regulatory changes during this reporting period. No emergency orders were issued during this reporting period.

Human-Induced Mortality. During the 1998–99 hunting seasons, 78 hunters reported harvesting brown bears in Unit 17, including 56 males (72%) and 22 females (28%) (Table 1). During the 1999–00 hunting seasons, 82 hunters reported harvesting brown bears in Unit 17, including 58 males (71%) and 24 females (29%) (Table 1). This reported harvest was higher than the mean annual reported harvest of the previous 5 years (47 bears). Four bears were reported harvested in Unit 17 under the provisions of the Western Alaska Brown Bear Management during this reporting period.

The average skull size of bears harvested in 1998–99 was 23.3" (n = 52) for males and 21.1" (n = 21) for females. The average skull size of bears harvested in 1999–00 was 24.0" (n = 56) for males and 21.1" (n = 23) for females. In 1998–99, 4 bears (all males) were reported harvested in Unit 17A; 55 (36 males, 19 females were reported harvested in Unit 17B; and 19 (16 males and 3 females) were reported from Unit 17C. In 1999–00, 10 bears (7 males, 3 females) were reported harvested in Unit 17A, 50 (34 males and 16 females) were reported harvested in Unit 17B, and 22 (17 males and 5 females) were reported from Unit 17C. In the past 5 years, 7.5% of the bears reported harvested in the unit have been taken in unit 17A, 65.6% in 17B, and 26.9 in 17C (Table 2).

Hunter Residency and Success. Nonresidents account for most of the reported brown bear harvest in Unit 17. During the 1998–99 seasons, nonresidents took 90% of the bears reported harvested in the unit. During the 1999–00 seasons, nonresidents took 76% of the bears reported harvested in the unit (Table 3).

Harvest Chronology. Thirty-six bears were reported harvested during the fall 1998 hunting season, and 42 bears were reported harvested during the spring 1999 season. Thirty-eight bears were reported harvested during the fall 1999 hunting season, and 44 bears were reported harvested during the spring 2000 season (Table 1). Prior to 1998, fall has consistently been the time most bears are harvested in Unit 17. Since the spring season was lengthened, spring harvests have exceeded those taken in fall (Table 4).

Transport Methods. Most successful bear hunters in Unit 17 used aircraft for access. Boats and snowmachines were the only other consistently used method of access (Table 5).

Other Mortality

Seven brown bears were reported killed in defense of life or property in Unit 17 during the 1998–99 regulatory year. At least 8 bears were reported killed illegally in Unit 17 during 1998–

99. One brown bear was reported killed in defense of life or property in Unit 17 during the 1999–00 regulatory year.

HABITAT

Assessment

Brown bear habitat in Unit 17 is virtually unaltered and in excellent condition. Salmon stocks are carefully managed, and escapements are adequate for the needs of the current bear population. Increasing ungulate populations in the unit have also provided an abundant food supply for bears. Human settlements are small and unobtrusive, and the increased localized food sources around these settlements (human food and garbage) enhance the areas as bear habitat. However, bears using areas frequented by humans run the risk of being shot.

NONREGULATORY PROBLEMS/NEEDS

A joint ADF&G/U.S. Fish and Wildlife Service (FWS) research project started in 1992 was continued during this reporting period. The objectives of this project are to estimate bear densities, collect baseline population data, and to delineate habitat-use patterns for brown bears in portions of the Togiak and Yukon Delta National Wildlife Refuges (northwestern Unit 17A and Unit 18). Bears radiocollared in 1993, 1994, 1997, and 2000 were tracked at least twice per month.

To reduce nuisance bear complaints and illegal kills, a public education effort was continued in the unit. Radio announcements and public meetings have been used to inform rural residents about bear behavior and to disseminate advice on how to deal with bear problems. The department is working with local city and village government representatives and the Dillingham city police to enforce existing regulations when bear problems are caused by improper food or garbage storage.

The lack of objective data on the population parameters of the Unit 17 bear population and the paucity of information on nonhunting mortality make effective management difficult.

We should continue efforts to encourage local residents to report all bears killed and to educate them on bear behavior and ways to minimize problems with bears. We should also emphasize nonlethal methods of dealing with "nuisance" bears. Concurrent with these efforts, we should work with local village governments and the Department of Environmental Conservation to improve landfills so they are less attractive to bears.

The Dillingham dump was consistently used by an unknown number of individual bears during this reporting period. We will continue to work with the City of Dillingham to explore ways to minimize bear/human conflicts. This will be especially important as the proposed 2001 closure date for the dump draws near.

RESULTS AND CONCLUSIONS

We are meeting our population objective of maintaining a brown bear population that will support a harvest of 50 bears per year. Subjective evidence indicates the population is large

enough to support such a harvest if the level of nonhunting mortality is reduced. The population objective of at least 50% males in the reported harvest has been met in most years, but the sex ratio for all bears killed in the unit is unknown.

Despite harvests during the reporting period of almost twice the historical average, mean skull size of harvested males has increased and, during the 1998 and 1999 regulatory years, exceeded the long term average (Figure 2). The proportion of males in the harvest has generally increased during the last 5 years, and during the 1998 and 1999 regulatory years exceeded the long term average (Figure 3)

It's unknown if the unequal distribution of harvest is due to the distribution of the population or hunter effort. The bear population along the Nushagak and Mulchatna Rivers should be monitored closely to watch for signs of overharvest. Efforts to better distribute hunting pressure to other areas of the unit show some signs of success and should be continued.

Changing the intolerant attitude of many local residents toward bears is a significant challenge. We have instituted a multifaceted approach including education, enforcement and implementation of nonlethal methods to minimize antagonistic bear-human encounters. It is difficult to objectively measure the success of these efforts, but in recent years there probably has been improvement.

LITERATURE CITED

MILLER, S.D., E.F. BECKER, AND W.B. BALLARD. 1987. Black and brown bear density estimates using modified capture-recapture techniques in Alaska. International Conference on Bear Research and Management. 7:23–35.

VAN DAELE, L.J. 1997. Mulchatna caribou survey-inventory management report. Pages 23–36 *in* MV Hicks, editor. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Management Report. Grants W-24-3 and W-24-4. Study 3.0. Juneau, Alaska USA.

PREPARED BY

James D. Woolington
Wildlife Biologist III

SUBMITTED BY

Michael G. McDonald
Assistant Management Coordinator

Figure 1 Unit 17 reported brown bear harvest, 1962–63 through 1999–00

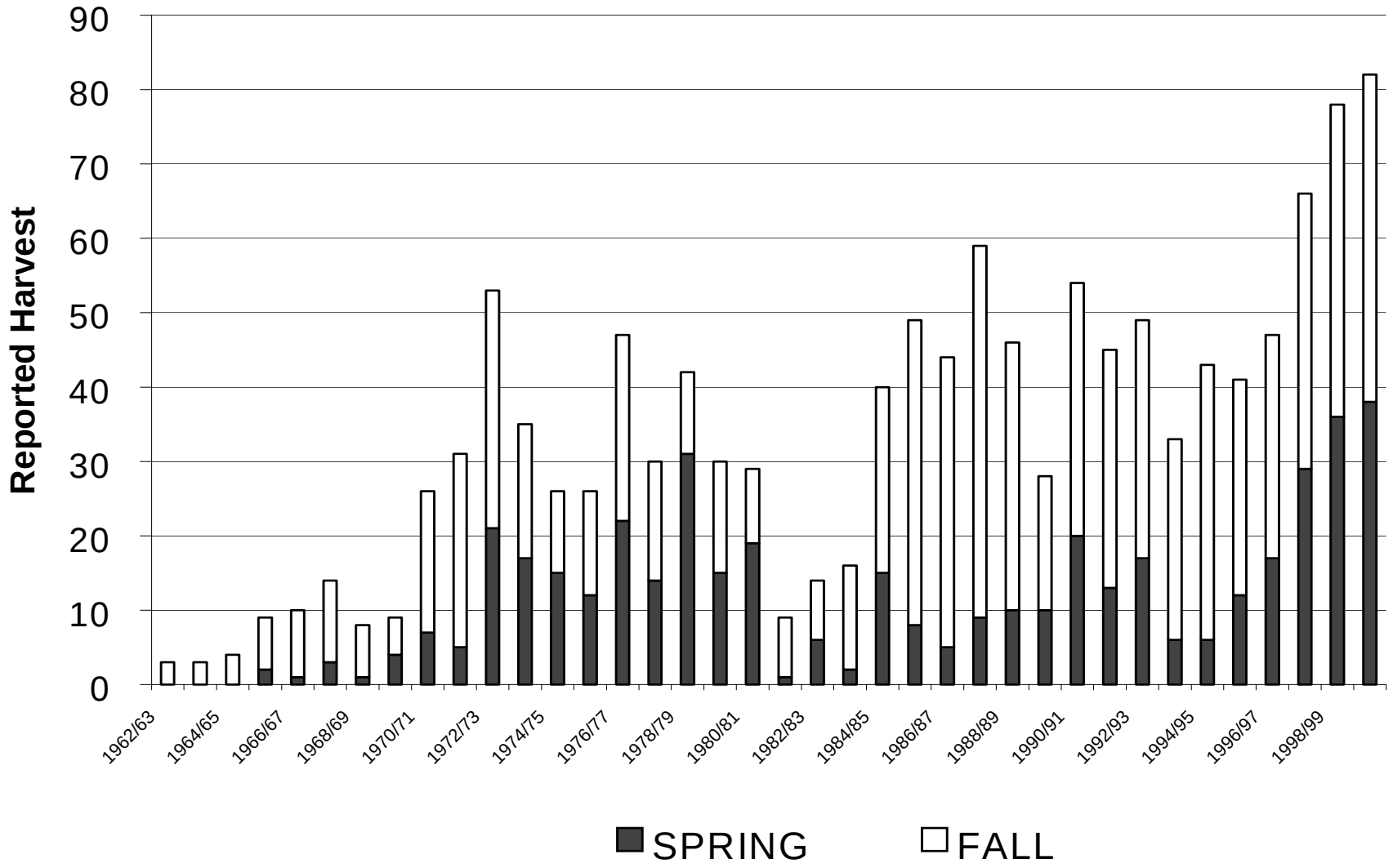


Figure 2 Unit 17 average skull sizes of brown bears, 1970–71 through 1999–00

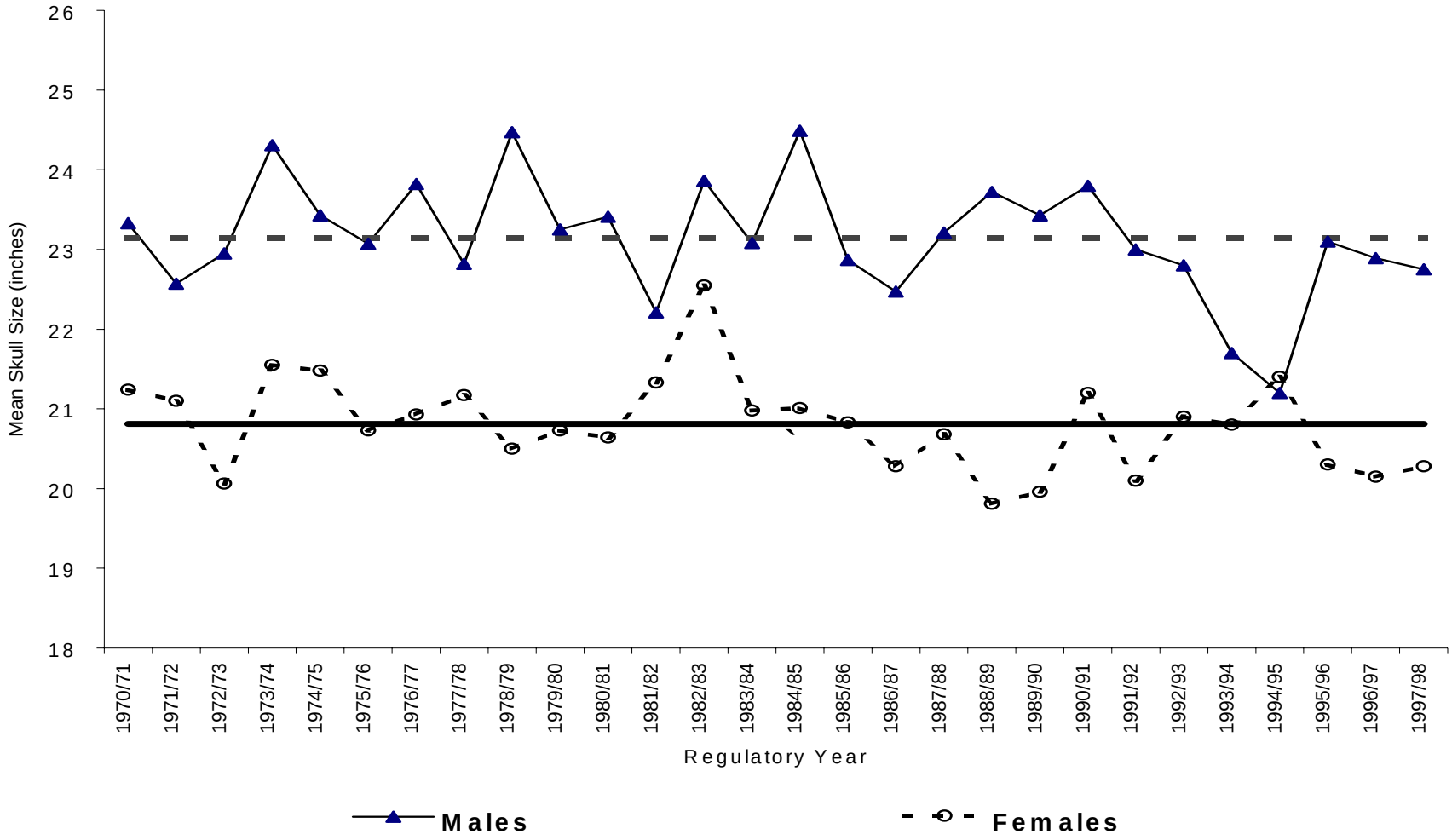


Figure 3 Percentage of male brown bears in the Unit 17 harvest, 1970–71 through 1999–00

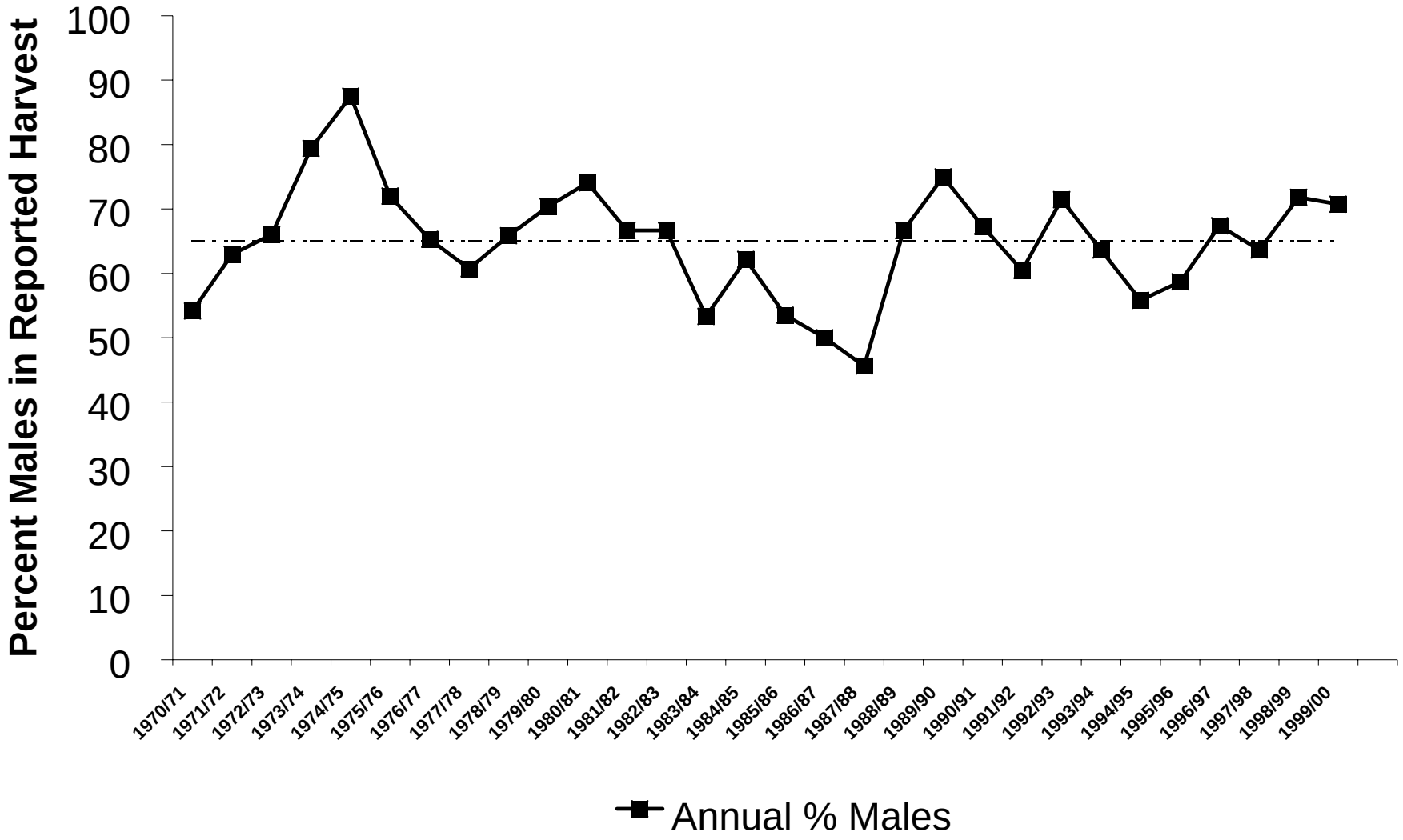


Table 1 Unit 17 brown bear harvest, 1991–92 through 1999–00

Regulatory year	Hunter Kill				Nonhunting Kill				Total reported kill			
	Male	Female	Unk	Total	Male	Female	Unk	Total	Male	Female	Unk	Total
1991												
Fall ‘91	13	17	2	32	1	1	1	3	14	18	3	35
Spring ‘92	13	0	0	13	0	1	1	2	13	1	1	15
Total	26	17	2	45	1	2	2	5	27	19	4	50
1992												
Fall ‘92	24	8	0	32	2	1	0	3	26	9	0	35
Spring ‘93	11	6	0	17	0	1	0	1	11	7	0	18
Total	35	14	0	49	2	2	0	4	37	16	0	53
1993												
Fall ‘93	16	11	0	27	1	1	0	2	17	12	0	29
Spring ‘94	5	1	0	6	0	0	0	0	5	1	0	6
Total	21	12	0	33	1	1	0	2	22	13	0	35
1994												
Fall ‘94	18	19	0	37	4	2	1	7	22	21	1	44
Spring ‘95	6	0	0	6	0	0	0	0	6	0	0	6
Total	24	19	0	43	4	2	1	7	28	21	1	50
1995												
Fall ‘95	14	17	0	31	2	5	0	7	16	22	0	38
Spring ‘96	13	2	0	15	0	0	0	0	13	2	0	15
Total	27	19	0	46	2	5	0	7	29	24	0	53

Table 1 Continued

Regulatory year	Hunter Kill				Non-hunting Kill				Total reported kill			
	Male	Female	Unk	Total	Male	Female	Unk	Total	Male	Female	Unk	Total
1996												
Fall '96	19	10	1	30	3	0	2	5	22	10	3	35
Spring '97	12	5	0	17	1	0	0	1	13	5	0	18
Total	31	15	1	47	4	0	2	6	35	15	3	53
1997												
Fall '97	20	17	0	37	8	4	0	12	28	21	0	49
Spring '98	22	7	0	29	8	0	1	1	22	7	1	30
Total	42	24	0	66	8	4	1	13	50	28	1	79
1998												
Fall '98	20	16	0	36	2	2	1	5	22	18	1	41
Spring '99	36	6	0	42	2	0	0	2	38	8	0	46
Total	56	22	0	78	4	2	1	7	60	26	1	87
1999												
Fall '99	23	15	0	38	0	0	1	1	23	15	1	39
Spring 2000	35	9	0	44	0	0	0	0	35	9	0	44
Total	58	24	0	82	0	0	1	1	58	24	1	83

Table 2 Unit 17 brown bear harvest by subunit, 1991–92 through 1999–00

Regulatory year	Unit 17(A) M	F	Unk	Total	17(B) M	F	Unk	Total	17(C) M	F	Unk	Total	Unit 17 total M	F	Unk	Total
1991–92	2	2	0	4	18	12	2	32	6	3	0	9	26	17	2	45
1992–93	1	3	0	4	21	7	0	28	13	4	0	17	35	14	0	49
1993–94	1	2	0	3	16	6	0	22	4	4	0	8	21	12	0	33
1994–95	0	3	0	3	17	13	0	30	7	3	0	10	24	19	0	43
1995–96	1	3	0	4	18	13	0	31	8	3	0	11	27	19	0	46
1996–97	3	0	0	3	18	9	1	28	11	6	0	17	31	15	1	47
1997–98	3	0	0	3	28	18	0	46	11	6	0	17	42	24	0	66
1998–99	4	0	0	4	36	19	0	55	16	3	0	19	56	22	0	78
1999–00	7	3	0	10	34	16	0	50	17	5	0	22	58	24	0	82

Table 3 Unit 17 brown bear successful hunter residency, 1991–92 through 1999–00

Regulatory year	Local[a] resident (%)	Nonlocal resident (%)	Nonresident (%)	Total successful hunters[b]
1991–92	5 (11.1)	2 (4.4)	38 (84.4)	45
1992–93	8 (16.3)	4 (8.1)	35 (71.4)	49
1993–94	2 (6.0)	2 (6.0)	28 (84.8)	33
1994–95	4 (9.3)	2 (4.7)	37 (86.0)	43
1995–96	2 (4.4)	11 (23.9)	33 (71.7)	46
1996–97	4 (8.5)	4 (8.5)	39 (83.0)	47
1997–98	1 (1.5)	9 (13.6)	56 (84.9)	66
1998–99	5 (6.4)	3 (3.9)	70 (89.7)	78
1997–98	9 (11.0)	11 (13.4)	62 (75.6)	82

[a] residents of Game Management Unit 17.

[b] total may be higher than the sum of the columns because of hunters of unknown residency.

Table 4 Unit 17 brown bear harvest chronology percent by season, 1991–92 through 1999–00

Regulatory year	Fall Season			Spring Season				Total
	Sep 1–15	Sep 16–30	Oct 1–15	Apr 1–15	Apr 16–30	May 1–15	May 16–30	
1991–92[a]	6.7%	53.3%	11.1%	----	----	11.1%	15.6%	45
1992–93[a]	12.2%	46.9%	6.1%	----	----	20.4%	14.3%	49
1993–94[a, b]	9.1%	48.5%	24.2%	----	----	6.1%	12.1%	33
1994–95[a,b]	11.6%	58.1%	16.3%	----	----	4.7%	9.3%	43
1995–96[a,b]	10.9%	45.6%	10.9%	----	----	15.2%	17.4%	46
1996–97[a,b]	6.4%	34.0%	23.4%	----	----	17.0%	19.2%	47
1997–98[c]	7.6%	30.3%	18.2%	----	22.7%	13.6%	7.6%	66
1998–99[c]	1.3%	25.6%	18.0%	----	26.9%	19.2%	9.0%	78
1999–00[c]	3.7%	30.5%	12.2%	4.9%	20.7%	23.2%	4.9%	82

[a] Season dates: Spring - Unit 17 May 10–May 25
Fall - Units 17A & C Sep 10 - Oct 10
Unit 17B Sep 20 - Oct 10

[b] Season dates for 1993–94 through 1996–97 are the same as 1990–91 through 1992–93 with the following addition:

Western Alaska Brown Bear Management Area (including 17A and that portion of 17B that drains into Nuyakuk and Tikchik Lakes) Sep 1–May 31

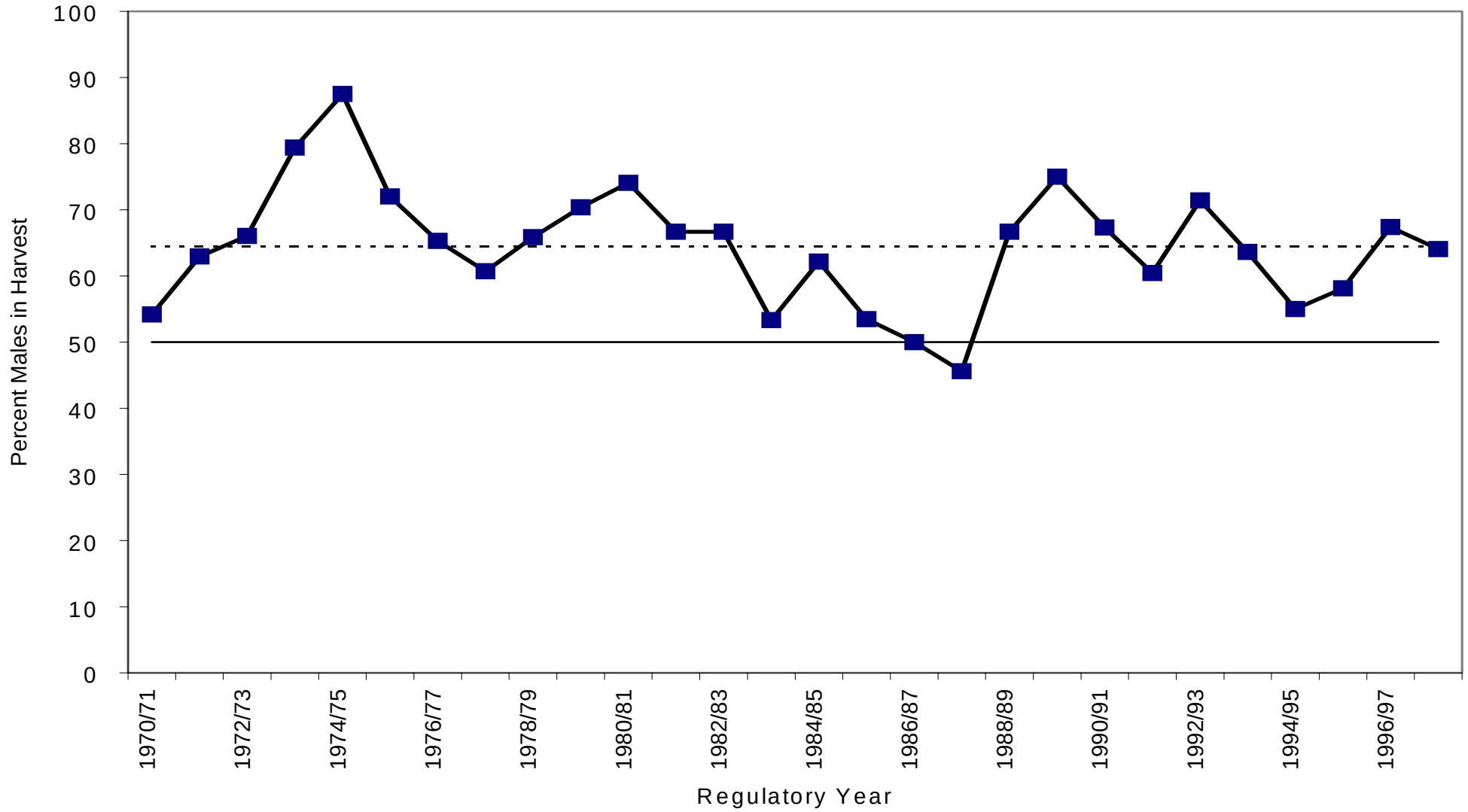
[c] Season dates: Spring - Unit 17 April 15 - May 25

Fall - Units 17(A)&(C) Sep 10 - Oct 10
Unit 17(B) Sep 20 - Oct 10

Western Alaska Brown Bear Management Area (including Unit 17) Sep 1–May 31

Table 5 Unit 17 brown bear harvest percent by transport method, 1991–92 through 1999–00

Regulatory year	Percent of harvest									
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Walk	Unknown	Total
1991–92	80.0	---	15.5	---	---	---	---	---	4.4	45
1992–93	83.6	---	14.2	---	---	---	---	2.0	---	49
1993–94	81.8	---	15.1	---	---	---	---	3.0	---	33
1994–95	83.7	---	16.3	---	---	---	---	---	---	43
1995–96	91.3	---	6.5	---	---	---	2.2	---	---	46
1996–97	78.7	---	17.0	---	---	---	2.1	---	2.1	47
1997–98	74.2	---	18.2	---	6.1	---	---	1.5	---	66
1998–99	73.1	---	7.7	1.3	18.0	---	---	---	---	78
1999–00	58.5	---	17.1	2.4	20.7	---	---	---	1.2	82


100
90
80
70
60
50
40
30
20
10
0
Percent Males in Harvest
1970/71
1972/73
1974/75
1976/77
1978/79
1980/81
1982/83
1984/85
1986/87
1988/89
1990/91
1992/93
1994/95
1996/97
Regulatory Year