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Brown Bears in Alaska:
A Statewide Management Overview

by

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SUMMARY

The brown bear population in Alaska is estimated between 25,000 and 39,100 bears with a best estimate of 31,700. This 1993 estimate is lower than a similarly derived 1978 estimate, not because bear populations have declined, but because of improved information on bear densities derived from field studies. Brown bear numbers in Alaska have probably increased since the earlier estimate in response to more conservative hunting regulations on the Alaska Peninsula in effect since 1974. About 42% of the Alaska brown bear population occurs in low density populations (<40 bears/1,000 km^2 that cover about 84% of the state; 49% occurs in high density populations (>175 bears/1,000 km_2) that cover 8.6% of the state, and 9% in intermediate density populations that cover 7.3% of the state.

An average of about 1,100 bears/year are reported killed in Alaska. The number of brown bears killed by hunters is increasing. An unknown number of additional bears are killed and not reported or die from wounds. Much of the increase in bear harvests in recent years (60%) compared to a decade ago came from harvest increases in coastal Game Management Units 9, 4, 16, and 8. This resulted even though hunting regulations became more conservative in Unit 8, slightly more conservative in Unit 4, and were only slightly liberalized in Unit 9. This suggests an especially high interest in hunting large coastal brown bears compared to smaller interior "grizzly" bears. However, interior areas as well as some coastal areas (Units 26, 16, 14, 6, 22, and 21) showed the largest percentages of increases in harvests relative to the baseline period.

Widespread liberalizations of bear hunting regulations, especially in interior areas, contributed to increased harvests. Harvest yield expressed as reported bear kills/unit area was highest in Unit 8 (Kodiak area). For Interior populations, the highest yield (kill density) was in Subunit 13E where populations are thought to be declining. Statewide, the apparent harvest rate (AHR = average annual reported kill/estimated population) was 3.4% (2.8-4.3). I calculated AHRs in excess of 5% for Units 13, 16, 12, 8, 6, and 4. Additional areas might be included in this list if the number of bears living in areas closed to hunting were excluded from the population estimates. In Subunits 20A and 13E where field studies determined that populations were declining (Reynolds 1993, Miller 1993), AHRs were 5.3% (4.6-6.5%) and 21.6% (15.1-38.9%), respectively.

The number of Alaska brown bears killed by nonresident hunters increased over the last 3 decades while the number of bears killed by resident hunters has declined since 1985. The numbers of brown bear tags sold to residents and nonresidents remained constant in recent years. Success rate for purchasers of resident brown bear tags is about 7.6% compared to 50.8% for purchasers of nonresident tags. Greater numbers of residents purchase tags but do not actively hunt bears. Statewide, successful hunters took an average of 5 days to take a bear, slightly more for nonresidents than for residents. Between the highest and lowest game management units, there was a 2-3 fold range in number of days hunted by successful hunters. Available technology for setting hunting

quotas and detecting trends in bear numbers is inadequate for precise management of populations. This, along with low reproductive rates for brown bears, argues for conservative harvest management in most areas.

Key words: Apparent harvest rates, population density, estimate, quota, brown bear.

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INTRODUCTION

This report provides a statewide perspective on brown bear management in Alaska. The biannual management reports required by Federal Aid in Wildlife Restoration provide analyses of status and trends in bear populations and harvests within a game management unit. These reports examine trends over time within an area but seldom make comparisons with other areas. This statewide report looks at some of the same kinds of information presented in the unit reports from the perspective of the entire Alaska brown bear population. Where feasible, I contrast characteristics of harvests in different game management units. I also provide comparison data from two subunits (20A and 13E) where bear populations have reportedly declined as a result of heavy harvests. These perspectives are presented for use in detecting patterns that would be difficult to notice in reports with narrower geographic scopes. Figure 1 shows the locations of individual game management units discussed.

The primary topics this report addresses include: 1) number of brown bears in Alaska, 2) distribution of brown bears in Alaska by density strata, 3) long-term trends in number of bears reported killed in the state, 4) comparisons of kill density and apparent harvest rates (AHR) in different geographic areas, 5) trends in tag sales and harvests by residents and nonresidents, and 6) recommendations on how to use population size estimates to establish harvest quotas.

METHODS

Population Estimation

Brown bear population density has been measured in 17 different Alaska study areas (18 separate applications including 2 in the same study area on Admiralty Island). The modified capture-mark-resight (CMR) techniques described by Miller et al. (1987) were used to obtain 14 of these density estimates. An additional 4 estimates were obtained using variations of intensive-capture, home range techniques (Reynolds and Boudreau 1992). All of these brown bear density estimates plus 3 black bear density estimates were compiled in a draft monograph (Miller et al. in prep.).

Population estimates for each management unit in Alaska were obtained by providing Alaska Department of Fish and Game (ADF&G) management and research staff in charge of each area with density estimates obtained using the above techniques (Figures 2-6). I asked biologists to extrapolate from these values to their areas to obtain a point estimate as well as minimum and maximum values around this point estimate. The minimum and maximum values were obtained in a variety of ways; some biologists used plus/minus some percentage of the point estimate while others used minimum and maximum density values to calculate the limits around the point estimate.

Extrapolations from the density estimates to wider geographic areas amount to informed guesses. These guesses are better in some areas than in others because of differences in proximity and number of density estimates, variability between habitats within some management units, and differences in experience and knowledge of the persons making the guesses. In one area, persons highly familiar with local bear populations demonstrated an ability to correctly guess the density of bears in a study area before a density estimate when provided with data from comparison areas like those in Figures 2-6 (Miller and Nelson, 1993).

Data on size of game management units came from ADF&G files for Uniform Coding Areas. In most units, the amount of bear habitat is less than this value which includes high elevation habitats, large lakes, and other areas of unacceptable bear habitat. Bear population density values for occupied bear habitat cannot be derived by dividing the bear population estimate by the total area of the management unit.

The population estimate reported here is a refinement of previous estimates that will be further refined when additional information becomes available. Additional density estimation work was accomplished on Kodiak Island during spring 1993 by V. G. Barnes (US Fish and Wildlife Service) and R. B. Smith (ADF&G). Additional work was done on portions of Unit 4 in 1993 by K. Titus. Further work is scheduled in Units 18 and 13 in 1995; further work is also under consideration for Denali National Park.

Kill Density

Kill density calculations also used the values for total area within a management unit without excluding areas of non-bear habitat or areas where hunting is prohibited. Kill density comparisons would be more useful if such areas were excluded to express kill density in terms of occupied habitat open to hunting. Number of kills in kill density calculations was calculated as average annual reported kill from 1981-82 through 1990-91. Unreported kills may be significant in some areas but are not estimated in this report.

RESULTS

Population Size

Extrapolations from existing density estimates yielded an estimate of 31,700 brown bears in Alaska. This estimate includes bears of all ages. The lower and upper limits for this estimate were 25,000 and 39,100 (Table 1).

This estimate is lower than the 32,000-43,000 reported by Peek et al. (1987), not because the number of bears in Alaska has declined, but rather because new information and techniques have indicated that bear densities in a number of areas are lower than previously thought. The estimate in Peek et al. (1987) derived from an earlier estimate (ADF&G, 1978) compiled in the same manner as the current estimate (extrapolations and guesses from biologists familiar with different areas). For this earlier estimate, reference density values were available for only three areas in Alaska (Kodiak, the Alaska Peninsula, and the North Slope), and these reference densities were obtained with less precise techniques than were used to establish the reference densities for the current estimate. The 1978 estimate provided estimated numbers for each of seven geographic areas in the state rather than by game management unit. The same geographic areas are used here to contrast the current estimate with this earlier estimate.

The bulk of the difference between the 1978 and current estimates resulted from lower estimates of bear populations in western, southcentral, and southwestern Alaska (Table 2). In 1978, density estimates were not available for two of these areas (western and southcentral). The density estimates used to obtain the 1978 population estimate for southwestern Alaska were probably exaggerated because they were based, in part, on a bear concentration area at Karluk Lake on Kodiak Island. Available trend analyses indicate that bear populations have increased or remained stable in southwestern Alaska. Bear numbers have increased since 1974 on the Alaska Peninsula (Unit 9) (Sellers and Miller 1991), and have remained stable on Kodiak (Unit 8) (Smith 1993).

The current population estimates in southeastern and northwestern Alaska are larger than the 1978 estimate (Table 2) which was made without reference densities from these areas.

The current estimates from arctic Alaska and from interior Alaska changed little from the 1978 estimates (Table 2).

Population Density

Density estimates in Alaska fall into two categories. In coastal areas of southcentral and southeast Alaska where bears have access to multiple runs of salmon during summer and fall and there are long growing seasons influenced by maritime climates, measured densities have ranged from 190 bears/1,000 km^2 at Black Lake on the Alaska Peninsula to 550/1,000 km^2 in an unhunted population in Katmai National Park (Figs. 3 and 4) (Miller et al. in prep.). Measured densities in interior Alaska and along the coast in western and northern Alaska have ranged from a low of 7 bears/1,000 km^2 in the eastern Brooks Range (Reynolds and Gardner 1987) to a high of 34/1,000 km^2 in an unhunted population in Denali National Park (Dean 1987) (Figs. 5, 6).

Throughout most high-density coastal habitat in Alaska densities probably exceed 175 bears/1,000 km^2. In most interior and northern coastal areas densities do not exceed approximately 40 bears/1,000 km^2. Intermediate bear densities (40-175 bears/1,000 km^2) probably occur in some coastal areas where salmon runs are less abundant. Density has not been measured in these intermediate areas. Figure 7 illustrates the probable distribution of the three density classes across Alaska.

These classifications are designed to reflect average densities across large areas of occupied bear habitat within which there will be smaller areas where densities will be more or less than in the wider area (Miller et al. in prep.). These classifications were not made from estimates and game management unit sizes presented in Table 1 as these areas include varying proportions of habitats not occupied by bears.

High density populations contain 49% of the bear population but contribute 58% of the total statewide bear harvest (Table 3). Low density populations contain 42% of the bear population and contribute 33% of the harvest (Table 3). This disparity reflects the preference of many hunters for taking the larger coastal bears in high density populations found on the Alaska Peninsula, Kodiak Island, and in southeast Alaska.

Trends in Kill

Over the last 3 decades the number of brown bears killed in Alaska has increased (Fig. 8). During the 1960s, 1970s, 1980s, and 2 years of the 1990s, mean annual reported harvests were 604, 825, 1,059, and 1,154, respectively (Table 4). This pattern of increased kills occurred in 11 units (1, 4, 5, 6, 9, 15, 16, 17, 22, 23, and 26) (Table 4). Harvests increased during the 1980s with an apparent decline to date in the 1990s in 5 units (8, 12, 13, 18, and 20) (Table 4). Harvests remained unchanged in 4 units (7, 10, 15, and 21) and have declined in 2 units (11 and 19) (Table 4).

I identified areas contributing to increased statewide harvest by comparing mean annual kill from 1975 through 1980 with the mean annual kill from 1988 through 1992 (Table 5). I chose these periods because the Alaska National Interest Land Claims Act (ANILCA) that passed in 1980 closed some popular areas to bear hunting (e.g., in Unit 11), and because in many Interior areas hunting regulations (including seasons, bag limits, and tag fee requirements) were liberalized during the 1980s (Miller 1990b, Table 5). Excluding areas where kills declined, bears killed per year increased by 383.6. This increase mostly came from Unit 9 (30%). Much of this change resulted from elimination of exclusive guide areas by the Alaska Supreme Court (D. Sellers, ADF&G, pers. commun.). Sixty percent of the increase came from the 4 coastal units of 9, 4 (11%), 16 (10%), and 8 (9%) (Table 5). Some increase resulted from significantly liberalized hunting seasons in Unit 16 (Table 6). Regulations became more conservative in the remaining 2 coastal areas where harvests increased (8 and 4) and only minimal change in regulations took place in Unit 9 (Table 6).

The total statewide harvest increased 39.9% between the 5-year period before 1980 and the most recent 5-year period (Table 5). The largest percent of increase in harvest occurred in Unit 26 (174%) followed by Units 16 (139%), 14 (118%), 6 (99%), 22 (89%), and 21 (84%) (Table 5). Seventeen game management units had harvest increases of >10%, compared to 4 units where harvests declined by >10% (12, 18, 19, and 11) (Table 5). Harvests changed by <10% in 3 units (25, 24, and 23) (Table 5). Hunting regulations are now more liberal than during 1978-79 in 8 of the 11 units where harvests increased by >50% (26, 16, 14, 6, 21, 15, 20, 9). Regulations remained the same in Unit 5 and became more conservative in Units 22 and 4 (Table 6).

In 2 areas where regulations have been made more liberal a spring season was added (Units 7, 13) (Table 6). In many other areas discrete fall and spring seasons have been expanded so that bear hunting is open throughout the denning period (Units 6, 12, 13, 16, 19, 20, 21, 24, 25, and 26) (Table 6). In 1992, brown bear hunting regulations were liberalized for subsistence hunters in portions of western and northwestern Alaska (Units 17A, 17B, 18, 19A, 19B, 23, 24, and 26A) (Table 6).

Subsistence hunters living in western and northwestern Alaska have extended seasons, may take a bear every year, and are not required to seal the hides and skulls of bears they kill, although they are required to mail a report to document their bear hunting activities and kills. The department hopes that these regulations will result in more accurate reporting of bear kills from remote areas.

In some areas (e.g. Units 12, 13, and portions of 20), liberalized bear hunting regulations were designed to benefit ungulate populations by reducing predation on moose or caribou neonates (Miller 1990b). This was done in response to studies that indicated that artificially reduced bear numbers could increase moose calf survivorship under some conditions when moose densities were significantly below carrying capacity (Ballard and Larsen 1987, Ballard and Miller 1990, Gasaway et al. 1992). However, the effectiveness

of hunter-induced reductions in bear numbers to increase moose calf survival has not been demonstrated in any area. Such programs may not be useful especially in areas where moose populations are near carrying capacity or in areas where wolf numbers remain high (Miller and Ballard 1992, Gardner 1993, C. Schwartz [ADF&G] unpublished data).

Kill Density

A comparison of bear harvest yields in different areas can be made by comparing kill densities in different units (Table 7). I calculated kill density as reported kills/total area of unit. The highest harvest yield in Alaska came from Unit 8 (Kodiak Island = 31.8 bears killed/1,000 mi^2). The Kodiak Island yield is almost twice as high as the next highest area (Admiralty Island) and 4 times as high as on the Alaska Peninsula (Table 7).

In part, kill density on Kodiak Island is high because, relative to bear populations in other coastal areas, almost all of Unit 8 is open to bear hunting by regulation. Of the 33,640 mi^2 in Unit 9, only about 23,480 mi^2 is brown bear habitat open to hunting (Sellers and Miller 1991). Using this value as the denominator and the Unit 9 calculated sustainable bear kill of 275 bears/year (Sellers and Miller 1991) yielded a corrected kill density of 11.7 bears/1,000 mi^2. This value is 70% higher than the value presented in Table 7 but still represents a significantly lower yield than from Unit 8. Part of the remaining difference reflects an approximately 75% higher bear density in the Kodiak area relative to the Black Lake area on the Alaska Peninsula (Figs. 3 and 4). Other areas in Unit 9 probably have densities lower than at Black Lake. Available data suggest reproductive rates are similar in Units 8 and 9 (R. Sellers, unpublished data; R. Smith and V. Barnes, unpublished data).

In portions of Alaska classified as low density (Fig. 7), kill density was highest in Unit 13 where bear populations are thought to be declining because of intentional overharvest (Miller 1993) and in Subunit 16A (Table 7).

Kill density data presented in Table 7 will be biased low in areas where significant unreported kills occur (portions of western and northwestern Alaska) and in units where bear hunting is not permitted in large areas (e.g. Unit 9), or where there are few bears (e.g. at high elevations in Unit 11). In such circumstances, kill density comparisons would be more meaningful if such areas were deleted from the denominator of the statistic as was done for Unit 9. Kill density statistics may be misleading in areas where harvests are clustered around relatively few access points leaving large surrounding areas relatively unaffected by harvests. This may be the case in Subunit 20E (Gardner 1993). These are serious limitations and the data presented in Table 7 should be interpreted cautiously.

Sustainable Kill Density

Data on the amount of area that is not brown bear habitat or that is closed to hunting were not available for all units. Regardless of the absence of this information (needed to

best characterize and compare kill density statistics) I made this comparison to illustrate the process by which reported kill densities can be compared with estimated sustainable kill densities. When properly corrected, this comparison will indicate areas likely to be harvested in excess of sustainable levels.

In the interior Alaska areas examined, kill density was highest in Subunit 13E. Assuming that a 5% harvest rate is sustainable, population density would have to be higher than 40 bears/1,000 km^2 to sustain the observed kill density (Fig. 9). Measured population density in 1985 in a remote portion of Subunit 13E was much less (27.1 bears/1,000 km^2; Miller et al. 1987). The difference between estimated sustainable harvest density and actual harvest density was used to infer a population decline in this remote portion of Subunit 13E (Miller 1993). A consistent picture occurs between similarly inferred and measured levels of decline in density in a more accessible portion of Subunit 13E (Miller 1993). In Subunits 13A, 13B, and 13C population density would have to be ≥30 bears/1,000 km^2 to sustain observed levels of harvest assuming a 5% sustainable harvest (Fig. 9). Immigration or compensatory responses to heavy harvest that increased sustainable harvest rates (through enhanced productivity or survival) would permit higher harvests without causing declines. Such compensatory responses were not evident in declining populations in Unit 13 (Miller 1993) or Subunit 20A (Reynolds 1993).

Additional comparisons of kill density and calculated sustainable kill densities are possible in Subunit 20A where brown bear populations declined by an estimated 44% during 1981-1992 (Reynolds 1993). In Subunit 20A, calculated kill density was 0.86 bears/1,000 km^2 (Fig. 9). Actual effective kill density was higher than this because half of Subunit 20A is low-density bear habitat on the Tanana Flats (R. Eagan, ADF&G, pers. commun. 29 June 1993). If this low-density habitat is excluded from the kill density calculation, the corrected kill density would be about 1.7 bears/1,000 km^2 in the remaining higher-density habitat. To sustain this kill density, assuming a 5% sustainable harvest level, population density would have to be >30 bears/1,000 km^2 (Fig. 9). Using various techniques, Reynolds (1993) estimated population density in the Subunit 20A study area at <20 bears/1,000 km^2. Since kill density in Subunit 20A was higher than could be sustained with the measured population density and a 5% sustainable harvest rate, a decline in population density in Subunit 20A would have been inferred from these data. Because a decline was also measured in Subunit 20A using intensive field studies (Reynolds 1993), the Subunit 20A calculations also support the inferred approach outlined above for Unit 13. Reproductive rates and other demographic parameters in Subunits 13E and 20A are similar (Reynolds 1993, Miller 1993).

Apparent Harvest Rate (AHR) in Subunits 20A and 13E

Using population estimates (Table 1) and reported harvests (Table 7), I calculated AHRs in selected Alaska game management units. I calculated AHRs using the point estimate for population size and upper and lower limits for this value (Table 1). I calculated AHRs in excess of 5% for Unit 13 (11.9% [9.3-16.3]), in Unit 16 (7.3% [5.2-10.3]), in Unit 12

(6.0% [4.3-8.8]), in Unit 8 (5.9% [4.6-8.2]), in Unit 6 (5.8% [4.3-8.8]), and in Unit 4 (5.1% [4.1-6.8]). The AHR in Unit 20 was 3.2% (2.7-4.1). The AHR in Unit 9 was 3.0% (2.5-7.6) although if only the population in areas open to harvest was used (5,700) with recent harvests (275/year) (Sellers and Miller 1991), the AHR in the Alaska Peninsula was 4.8%. Actual numbers of bears killed in Alaska are greater than the reported harvest. The AHRs would be higher if data on wounding losses, poaching, and other unreported kills were available and could be included.

I also calculated AHRs for Subunits 20A and 13E where field studies determined that populations were declining as a consequence of heavy harvests (Reynolds 1993, Miller 1993). Because populations were determined to be declining in these areas, it would be inappropriate to use harvest data from a decade earlier when populations were larger to calculate AHRs as was done for entire game management units in Table 7. For these two subunits, I used only the most recent 3 years of harvest data (Table 7). I divided this harvest by the 1993 population estimate (249 bears in Subunit 20A [Table 1]) to calculate APH. For Subunit 13E, the range of population estimates presented by Miller (1993) was used to calculate AHR (109-274 bears); the midpoint of this range was used as the point estimate. Using this approach, the recent AHR in Subunit 20A was 5.3% (4.6-6.5%) and in Subunit 13E it was 21.6% (15.1-38.9%).

Trends in Hunters and Success Rates

In 1992, Alaska residents purchased 6,452 brown bear tags ($25 each), slightly fewer than in the previous year but close to the average of 6,632 for the preceding 5 years (Table 8). In this same year U.S. citizens not residents of Alaska purchased 1,075 brown bear tags ($500 each) and nonresident aliens purchased 192 tags ($650 each). Three military tags were also sold ($250 each). Nonresidents bought almost the same number of tags (1,260) in 1992 as the preceding 5-year average of 1,278 (Table 8).

Residents killed 550 brown bears in calendar year 1992. This represents a continuation of a decreasing trend in brown bear kills by residents since 1985 when residents killed a record 615 bears (Table 8). In that same year, nonresidents killed 723 bears, the largest number ever and a continuation of an increasing trend over the last 3 decades (Table 8).

Some resident hunters may have different motives for purchasing brown bear tags than nonresidents. Resident hunters are more likely to purchase a relatively inexpensive ($25) tag to harvest a bear opportunistically. Nonresident hunters are more highly motivated to take a bear because of the high cost of required guide services ($5,000-$15,000), brown bear tags ($500), and transportation to the state. This difference in motivation affects success rate calculated on the basis of number of bears taken/number of tags sold. Success rate for residents averaged 7.6% in the last 5 years compared to a 50.8% success rate for nonresidents (Table 8). No trend in success rate was evident for either group (Table 8).

Annual information is not available on success rates in individual units because Alaska regulations require only successful bear hunters to report their activities. A survey was conducted of persons purchasing brown bear tags in calendar years 1985 and 1986 to obtain success rate information by unit. These results were reported previously (Miller 1990a, Appendix E). Excluding game management units with <10 respondents to the questionnaire, the highest success rate for residents was in Units 10, 9, and 22 (17%, 13.3% and 10% respectively). The highest success rate for nonresidents was in Units 1 (68.1%), 8 (67.3%), 9 (63.9%), 22 (58.8%), and 6 (50%).

Effort by Successful Hunters

Successful brown bear hunters in Alaska are asked how many days they hunted. These data are compiled by transportation type but all types were lumped for the following analysis. I combined data from a 6-year period to assure that I included an equal number of open and closed regulatory years in Unit 9. Data termed "average" for this analysis actually represented the total of all days reported hunted over a 6-year period divided by the total number of successful hunters reporting during this period.

Successful resident brown bear hunters in Alaska hunted for an average of 4.1 days (4.1 for fall seasons and 4.3 days for spring seasons) (Table 9). The lowest number of days hunted was 2.8 (in Units 22, 18, and 1), while it took more than 5 days in Units 8, 24, 25, and 11 (Table 9). Successful resident brown bear hunters in Alaska spent an average of 2,130 days/year hunting, 56% during fall seasons (Table 9). The 3 highest density coastal units had the highest number of resident hunter days (16% each in Units 9 and 8, 10% in Unit 4) (Table 9). Unit 13 had the next highest number of days hunted by successful resident hunters (10%) (Table 9).

Successful nonresident hunters hunted an average of 5.8 days (5.5 in fall and 6.0 in spring) (Table 9). The lowest number of days hunted was in Units 10 and 23 (<4); the highest number in Units 1, 19, 14, 16, and 18 (>7.0) (Table 9). Successful nonresidents hunted 4,688 days/year during the last 6 years, 47% during fall seasons. Nonresidents contributed 63% of the days hunted by successful hunters (Table 9) and took 52% of bears harvested (Table 8). Most successful nonresident hunter-days were spent in the 3 high density coastal Units 9 (28%), 8 (17%), and 4 (8%). I suspect that much hunting by residents, especially during fall, was done as part of multiple species hunts.

DISCUSSION

Brown bear populations in Alaska are believed to have increased in some areas and to have declined in others but remained relatively stable, overall, in recent decades. Populations are known or believed to have declined in small portions of interior Alaska (Unit 13 and Subunit 20E) as part of predator control efforts. Populations have also declined in Subunit 20A as part of studies designed to evaluate the impacts of hunting on

bear population dynamics (Reynolds and Boudreau, 1992; Reynolds, 1993). Declines also may have occurred in other portions of interior Alaska (Table 1) but, overall, the low density populations found throughout most of Alaska (Fig. 7) provide a lower proportion of Alaska's reported harvest (33%) than they do of Alaska's estimated brown bear population (42%) (Table 3).

The largest proportion of Alaska's brown bear harvest (58%) comes from high density coastal populations that contain about half of Alaska's bear population concentrated in about 9% of Alaska's area (Table 3). Bears are high priority game animals in most of these areas, and populations are usually managed conservatively. In Unit 8 (Kodiak), bears are hunted under a limited permit system during restricted seasons, and populations are believed to have been stable over the last 20 years (Smith 1993). Bears are managed conservatively through alternate regulatory year closures and short seasons on the Alaska Peninsula (Unit 9); in this area populations have increased over the last 20 years and are currently considered stable (Sellers and Miller 1991, Sellers 1993). High-density populations remain in Unit 4 (southeast Alaska), although declines associated with past and future logging are anticipated (Schoen et al. 1988, Schoen and Beier 1990).

One approach for setting harvest quotas for bear populations is to multiply estimated population size by calculated sustainable harvest rate (Miller 1990a, 1993). In addition to the obvious difficulties in estimating population size, serious problems are associated with estimating sustainable harvest rates. In a simulation study, maximum sustainable harvest rate for a highly productive brown bear population with minimal levels of natural mortality was estimated at 5.7% (Miller 1990a, b). Other studies have estimated lower sustainable harvests rates (2-3% for Yukon bears [Sidorowicz and Gilbert 1981] and 1.6% of adult female polar bears [Taylor et al. 1987]). In an intensively-studied portion of Subunit 20A where most bears had been marked, harvests of 6.5% of the marked population did not immediately affect numbers of adult females but harvests of 14.3% resulted in significant declines (Reynolds and Boudreau 1992). Further work needs to be done to construct more meaningful estimates of sustainable harvest rates.

These problems are illustrated by comparisons of AHRs in different units in Alaska using population estimates (Table 1) and reported harvests (Table 7). Using this approach, I calculated harvest rates in excess of 5% for Units 13, 16, 12, 8, 6, and 4. Additional areas might be included in this list if bears living in areas closed to hunting were excluded from the population estimates. The AHR in Subunit 20A was much lower (5.3%) than in Subunit 13E (21.6%). In one intensively studied portion of Subunit 20A, populations declined 38% during 1986-1992 (Reynolds 1993). Field studies also indicated a declining population in Subunit 13E (Miller 1993) although alternative explanations have been offered (Tobey 1993).

Except in portions of Subunits 13E and 20A where declines were documented with field studies (Miller 1990c, 1993; Reynolds and Boudreau 1992; Reynolds 1993), available data

are inadequate to conclude that other areas with AHRs more than 5% are overharvested. Alternatives to an overharvest scenario in these areas include:

1. Populations are larger than estimated,
2. Sustainable harvest rates are higher than estimated,
3. Populations are subsidized by immigration from unhunted or lightly hunted areas.

Additional density estimates will help determine whether populations are underestimated. Overestimation is at least as likely as underestimation in all areas of Alaska. The 1978 estimate for bear populations in Alaska was significantly higher than the current estimate which was based on more and better reference data on bear densities. Caughley (1978) observed that biologists are more inclined to overestimate than underestimate.

Sustainable harvest rate calculations are difficult and require making assumptions about natural mortality rates, compensatory responses to changes in density, and other factors for which little data exist. I encourage biologists to make independent calculations of sustainable harvest rates and to clearly state the assumptions underlying their estimates. Without such calculations, assertions that populations can sustain higher rates of harvest than indicated will usually be unconvincing.

Immigration of bears from unharvested or lightly harvested refugia can and probably does subsidize harvests in some heavily hunted areas such as Subunit 13E which is adjacent to Denali National Park. Available data suggest that most immigration is by subadult males and that subadult females usually remain in maternal home ranges (Schwartz and Franzmann 1992, Reynolds 1993). Immigration cannot be counted on to subsidize harvests of females in excess of sustainable levels. Although immigration of subadult males occurs in some heavily hunted portions of Alaska, it is appropriate to question the degree to which immigration should relied on as the factor which will render objective calculations of sustainable harvest quotas irrelevant. I am unaware of any objective data available on immigration rates to intensively harvested areas. Such data would be highly specific to the area where it was collected. Differences in distance, transportation corridors, and density differentials between refugia and harvest areas would make immigration rates observed in one area difficult to extrapolate to another.

Although underestimation of population size, underestimation of harvest rate, and immigration may lead to overly conservative harvest guidelines in some circumstances, overestimation of these parameters is equally likely to lead to overharvests. Consequently, without management objectives designed to cause declines in bear populations, managers of populations with apparent harvest rates >5% should be concerned about potential overharvests. In these areas, models of sustainable harvest rates should be constructed to determine what assumptions must be made for the observed AHR not to cause a decline in populations (e.g. Miller 1993) or harvests should be reduced to levels available analyses indicate are sustainable.

In many Alaska game management units, management objectives are based on characteristics of the harvest (e.g. sex ratio or age structure of kill), rather than on quotas established through the means described above. The value of such harvest composition data in detecting population trends has not been established, and simulation studies have challenged the usefulness of these data (Caughley 1974; Harris 1984; Harris and Metzgar 1987a,b; Miller and Miller 1988, 1990; Garshelis 1993). Although harvest composition statistics probably have value as a component of bear population management, the use of these data to establish management guidelines has not been demonstrated. Before relying on these statistics to indicate bear population trends, it is necessary to establish whether and how these data can be used to indicate trend.

Direct measurement of brown bear population trends through annual surveys is difficult (Harris 1986) and, to my knowledge, is being successfully done only in Unit 9 through stream surveys (Sellers and Miller 1991, Sellers 1993).

The management of hunted bear populations requires many types of information that are either not available or can only be imprecisely estimated using expensive techniques (Miller et al. in prep.). Under such circumstances, managers seeking to avoid over-harvest of bear populations should set conservative harvest guidelines. With the available technology, there will almost never be unequivocal evidence that bear populations are declining because of overharvest. Consequently, undesired overharvests leading to declines in bear numbers will be inevitable if conclusive evidence of a problem is required before reductions in harvest level are implemented.

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LITERATURE CITED

Alaska Department of Fish and Game. 1978. Petition to remove the brown bear Ursus arctos L. in Alaska from Appendix II to the Convention on International Trade and Endangered Species of Wild Fauna and Flora. On file, Alaska Dep. Fish and Game. Juneau. 71pp.

Ballard, W. B., R. O. Stephenson, and T. H. Spraker. 1981. Causes of neonatal moose calf mortality in south-central Alaska. J. Wildl. Manage. 45:335-342.

_____, and D. Larsen. 1987. Implications of predatory-prey relationships to moose management. Swedish Wildl. Res. Suppl. 1 Part 2:581-602.

_____, S. D. Miller, and J. S. Whitman. 1990. Brown and black bear predation on moose in southcentral Alaska. Alces 26:1-8.

_____, and S. D. Miller. 1990. Effects of reducing brown bear density on moose calf survival in southcentral Alaska. Alces 26:9-13.

Barnes, V. G. Jr., R. B. Smith, and L. J. Van Daele. 1988. Density estimates and estimated population of brown bears on Kodiak and adjacent islands, 1987. U.S. Fish and Wildl. Serv., Alaska Wildl. Res. Centr., Unpubl. Rep. 30 pp.

Boertje. R. D., W. C. Gasaway, D. V. Grangaard, D. G. Kelleyhouse, and R. O. Stephenson. 1987. Factors limiting moose population growth in subunit 20E. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Restoration Research Progress Report on Project W-22-5, Job 1.37R. 86pp.

Caughley, G. 1974. Interpretation of age ratios. J. Wildl. Manage. 38:557-562.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley and Sons, New York. 234pp.

Dean, F. C. 1987. Brown bear density, Denali National Park, Alaska, and sighting efficiency adjustment. Int. Conf. Bear Res. and Manage. 7:37-43.

Del Frate, G. 1993. Unit 7 Brown bear survey-inventory progress report. Pages xxx-xxx in S.M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Gardner, C. 1993. Brown/Grizzly Bears Unit 20E. Alaska Dept. of Fish and Game, Federal Aid in Wildlife Restoration, Management Report Project W-23-5, Study 4.0.

Garshelis, D. L. 1993. Monitoring black bear populations: Pitfalls and recommendations. Pages 123-144 in Jeffrey A. Keay, ed. Proceedings of the Fourth Western Black Bear Workshop. U.S. Dept. of The Interior, National Park Service Technical Report NPS/NRWR/NRTR-93/12. 144pp.

Gasaway, W. C., R. D. Boertje, D. V. Grangaard, D. G. Kelleyhouse, R. O. Stephenson, and D. G. Larsen. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildl. Monog. 120. 59pp.

Golden, H. N. 1990. 1993. Unit 24 Brown bear survey-inventory progress report. Pages 178-189 in S. O. Morgan, ed. Annual management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. 20. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-2. Study 4.0. Juneau. 189pp.

Griese, H. J. 1991. Unit 6 Brown bear survey-inventory progress report. Pages 124-131 in S. M. Abbott, ed. Annual management report of survey-inventory activities. Part 5. Brown/grizzly bears. Vol. 22. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-4. Study 4.0. Juneau. 271pp.

Harkness, D. 1993. Unit 14 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Harris, R. B. 1984. Harvest age-structure as an indicator of grizzly bear population status. M.S. Thesis, Univ. of Mont., Missoula. 204pp.

_____. 1986. Grizzly bear population monitoring: currents options and considerations. Mont. Forest and Conserv. Exp. Stn., Univ of Mont., Missoula Misc. Publ. 45. 80pp.

_____, and L. H. Metzgar. 1987a. Estimating harvest rates of bears from sex ratio changes. J. Wildl. Manage. 51:802-811.

_____, and L. H. Metzgar. 1987b. Harvest age structures as indicators of decline in small populations of grizzly bears. Intl. Assoc. Bear Res. and Manage. 7:109-116.

McNay, M. E. 1991. Units 20A, 20B, 20C, 20F, and 25C Brown bear survey-inventory progress report. Pages 174-199 in S. M. Abbott, ed. Annual management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. 22. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-4. Study 4.0. Juneau. 271pp.

Miller, S. D. 1990a. Population management of bears in North America. Int. Conf. Bear Res. and Manage. 8:357-373.

_____. 1990b. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bars populations in Alaska's Game Management Unit 13. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Restoration, Research Progress Report on Project W-23-2, Studies 4.18 and 4.21. April. 54pp.

_____. 1990c. Detection of differences in brown bear density and population composition caused by hunting. Int. Conf. Bear Res. and Mange. 8:393-404.

_____. 1993. Impacts of increased hunting pressure on the density, structure, and dynamics of brown bars populations in Alaska's Game Management Unit 13. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Restoration, Research Final Report on Project W-23-4, Studies 4.18 and 4.21. 182pp.

_____, and W. B. Ballard. 1992. Analysis of an effort to increase moose calf survivorship by increased hunting of brown bears in south-central Alaska. Wildl. Soc. Bull. 20:445-454.

_____, E. F. Becker, and W. B. Ballard. 1987. Black and Brown bear density estimates using modified capture-recapture techniques in Alaska. Int. Conf. Bear Res. and Manage. 7:23-35.

____, and R. Nelson. 1993. A grizzly bear density and population estimate for a portion of the Seward Peninsula, Alaska. Alaska Dep. of Fish and Game. xxpp

_____, and S. M. Miller. 1988. Interpretation of bear harvest data. Alas. Dep. of Fish and Game, Fed. Aid in Wildl. Restoration Proj. W-22-6, Job 4.18. 65pp.

_____, and _____. 1990. Interpretation of bear harvest data. Alas. Dep. of Fish and Game, Fed. Aid in Wildl. Restor. Proj. W-22-6 through W-23-3, Study 4.18. 90pp.

_____, and W. B. Ballard. 1992. Analysis of an effort to increase moose calf survivorship by increased hunting of brown bears in south-central Alaska. Wildl. Soc. Bull. 20:445-454.

_____, G. C. White, R. A. Sellers, H. V. Reynolds, J. W. Schoen, K. Titus, V. G. Barnes, R. B. Smith, R. Nelson, W. B. Ballard, and C. C. Schwartz. in prep. Grizzly and black bear density estimation in Alaska using radio-telemetry and replicated capture-mark-resight techniques. Wildl. Monogr.

Nelson, R. 1993. Unit 22 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. xx. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Nowlin, R. 1993. Unit 6 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. xx. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Peek, J. M., M. R. Pelton, H. D. Picton, J. W. Schoen, and P. Zager. 1987. Grizzly bear conservation and management: A review. Wildl. Soc. Bull. 15:160-169.

Reynolds, H. V. 1989. Unit 24, 25A, 25B, 25D, 26A, 26B, and 26C Brown bear survey-inventory progress report. Pages 174-184 in S. O. Morgan, ed. Annual management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. 19. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-31-1. Study 4.0. Juneau. 189pp.

____. 1993. Effects of harvest rates on grizzly bear population dynamics in the northcentral Alaska Range. Alaska Dep. of Fish and Game, Fed. Aid in Wildl. Restor. Research Final Report on Project W-23-5, Study 4.23R. 94pp.

_____, and T. Boudreau. 1992. Effects of harvest rates on grizzly bear population dynamics in the northcentral Alaska Range. Alaska Dep. of Fish and Game, Fed. Aid in Wildl. Restor. Research Final Report on Project, Study 4.19. 90pp.

_____, and G. W. Garner. 1987. Patterns of grizzly bear predation on caribou in northern Alaska. Intl. Conf. Bear Res. and Manage. 7:59-67.

Schoen, J.W., and L.R. Beier. 1990. Brown bear habitat preferences and brown bear logging and mining relationships in Southeast Alaska. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Restor. Final Report. Proj. W-22-1 through 6 and W-23-1 through 3. Juneau. 90pp.

_____, M.D. Kirchhoff, and J.H. Hughes. 1988. Wildlife and old-growth forests in southeastern Alaska. Natural Areas Journ. 8:3(138-145).

Sellers, R.A. and S.D. Miller. 1991. Dynamics of a hunted brown bear population at Black Lake Alaska. Third annual progress report: 1990, Cooperative interagency study by the Alaska Dep. of Fish and Game, the National Park Service, and the Fish and Wildlife Service. 23pp.

_____. 1993. Unit 9 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. xx. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Schwartz, C. C., and A. W. Franzmann. 1992. Dispersal and survival of subadult black bears from the Kenai Peninsula, Alaska. J. Wildl. Manage. 56:426-431.

Sidorowicz, G.A., and F.F. Gilbert. 1981. The management of grizzly bears in the Yukon, Canada. Wildl. Soc. Bull. 9:125-135.

Smith, R.B. 1991. Unit 8 Brown bear survey-inventory progress report. Pages 56-75 in S.M. Abbott, ed. Annual management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. 22. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-4. Study 4.0. Juneau. 271pp.

_____. 1993. Unit 8 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-4/5. Study 4.0. Juneau.

Taylor, M. K., F. Bunnell, and R. Schweinsburg. 1987. Modeling the sustainable harvest of female polar bears. J. Wildl. Manage. 7:117-125.

Titus, K., and L. R. Beier. 1991. Population and habitat ecology of brown bears on Admiralty and Chichagof Islands. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Restor. Prog. Rep. Proj. W-23-4. Juneau. 32pp.

Tobey, R. 1993. Brown/Grizzly Bears Unit 13. Alaska Dept. of Fish and Game, Federal Aid in Wildlife Restoration, Management Report of Survey-Inventory Activities. Project W-23-5, Study 4.0.

Van Daele, L. 1993. Unit 17 Brown bear survey-inventory progress report. Pages xxx-xxx in S. M. Abbott, ed. Management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. xx. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-xx-xx. Study 4.0. Juneau. xxxpp.

Whitman, J. S. 1991. Unit 19 Brown bear survey-inventory progress report. Pages 160-1173 in S. M. Abbott, ed. Annual management report of Survey-Inventory Activities. Part 5. Brown/grizzly bears. Vol. 22. Alaska Dept. of Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-4. Study 4.0. Juneau. 271pp.

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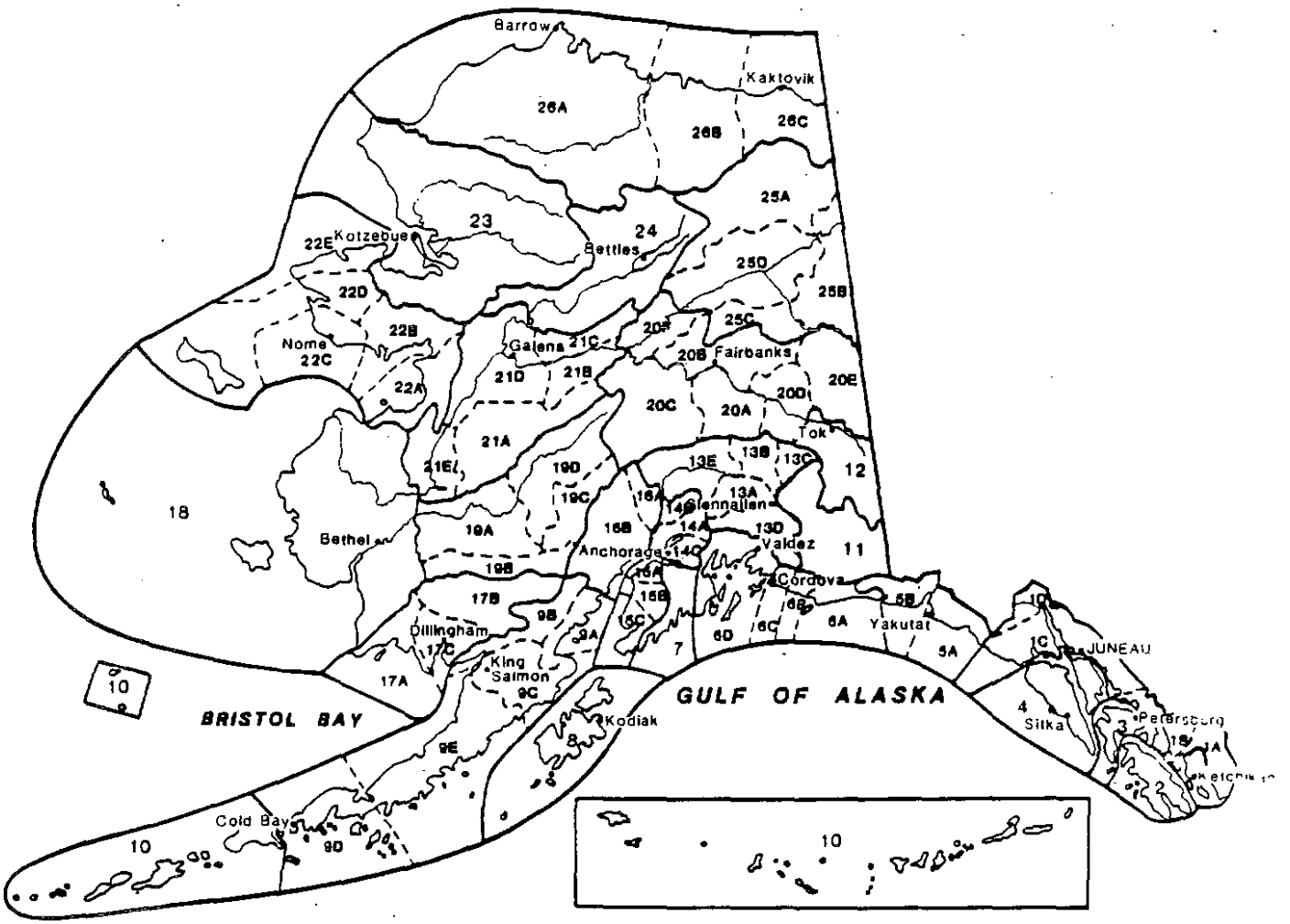

Figure 1. Alaska game management units.

Figure 2. Locations of study areas in Alaska where brown/grizzly bear density estimates have been made (see Figs. 3-6 for results) [The studies "KEN-47", "KEN-69", and "MIDSUBK" are for black bears; the east-central Alaska (ECAK) brown bear study area in Subunit 20E (Boertje et al. 1987) is not illustrated.].

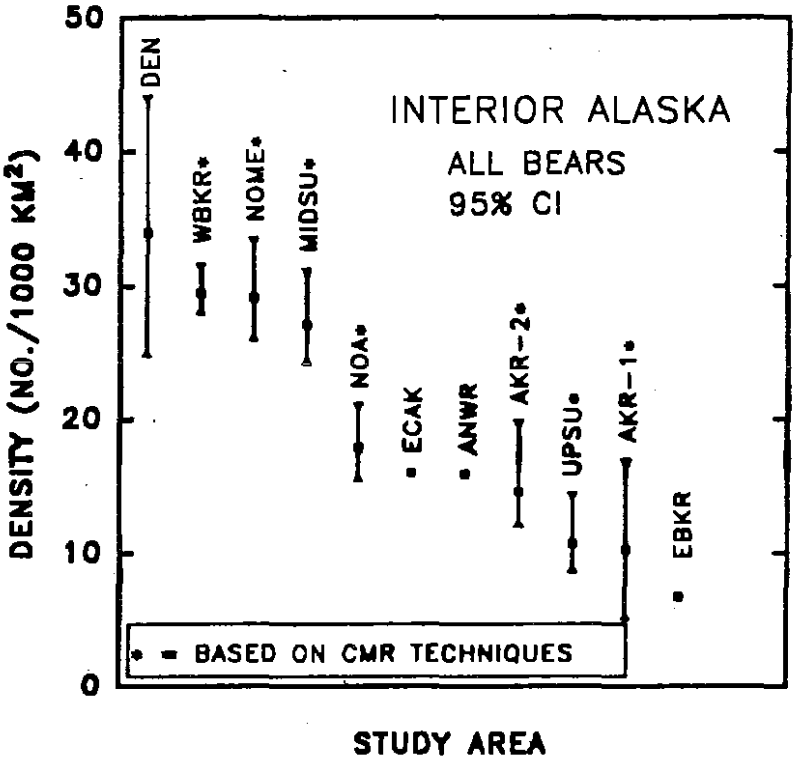

Figure 3. Density estimates for brown/grizzly bear populations in interior portions of Alaska in units of bears of all ages (see Fig. 2 for locations of study areas) (data from Reynolds and Garner 1987, Boertje et al. 1987, Dean 1987, Miller et al. in prep.).

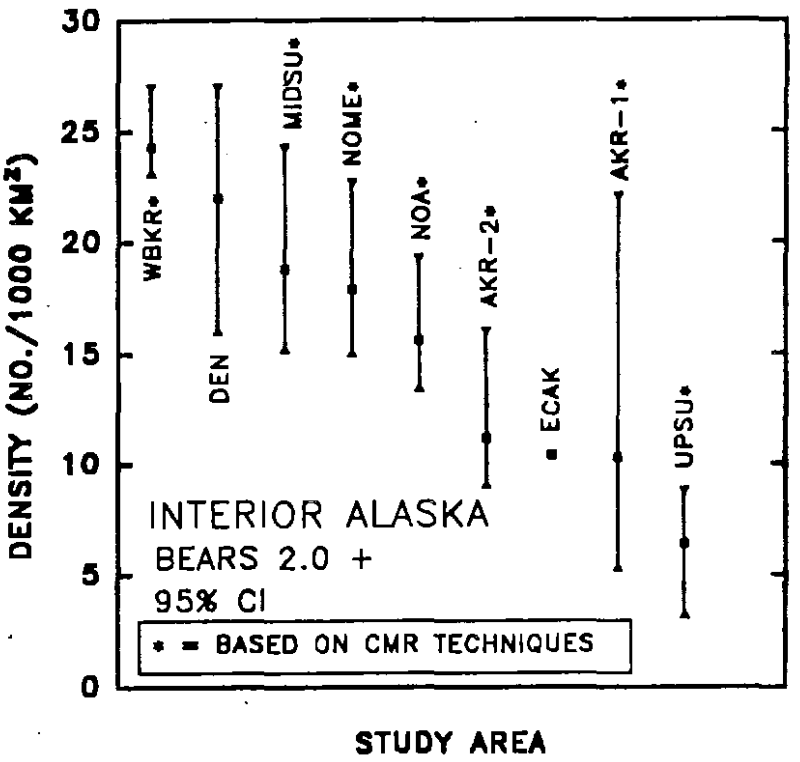

Figure 4. Density estimates for brown/grizzly bear populations in interior portions of Alaska in units of bears ≥2 years-old (see Fig. 2 for locations of study areas) (data from Reynolds and Gamer 1987, Boertje et al. 1987, Dean 1987, Miller et al. in prep.).

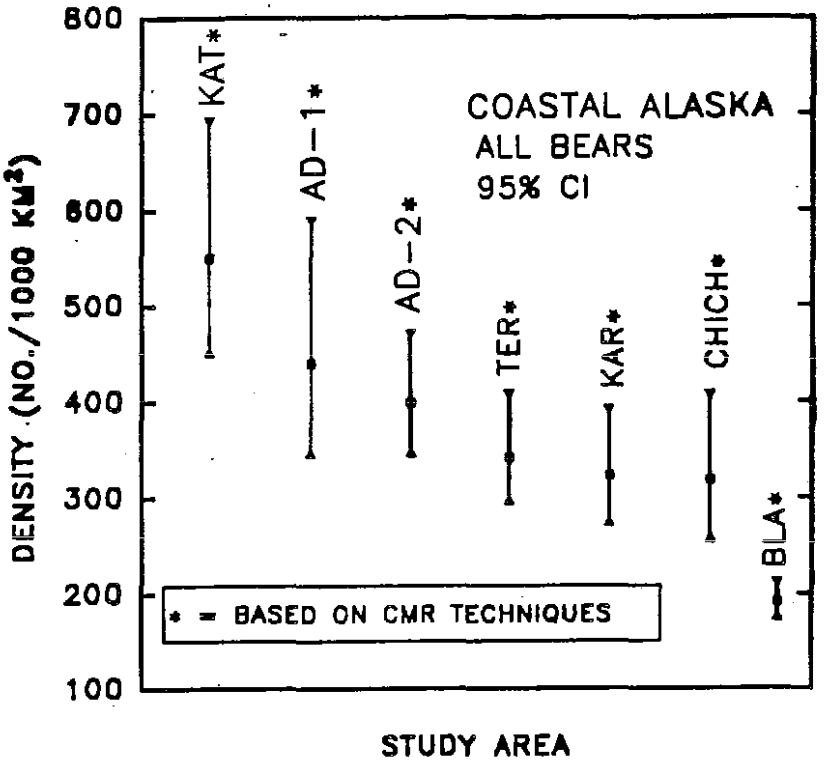

Figure 5. Density estimates for brown/grizzly bear populations in high density coastal portions of Alaska in units of bears of all ages (see Fig. 2 for locations of study).

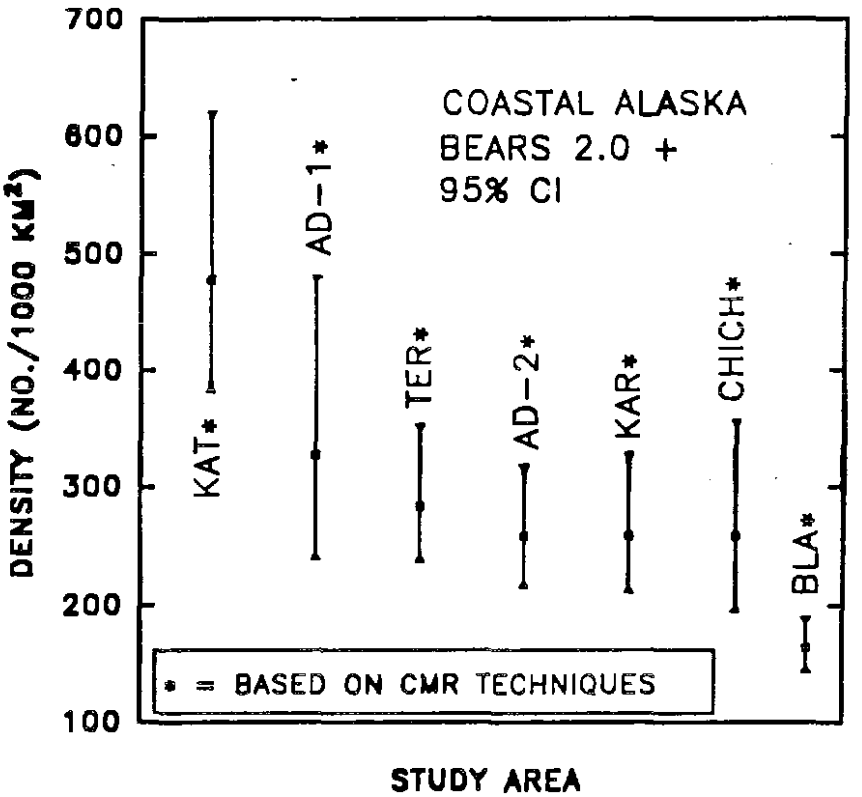

Figure 6. Density estimates for brown/grizzly bear populations in high density coastal portions of Alaska in units of bears ≥2 years-old (see Fig. 2 for locations of study areas).

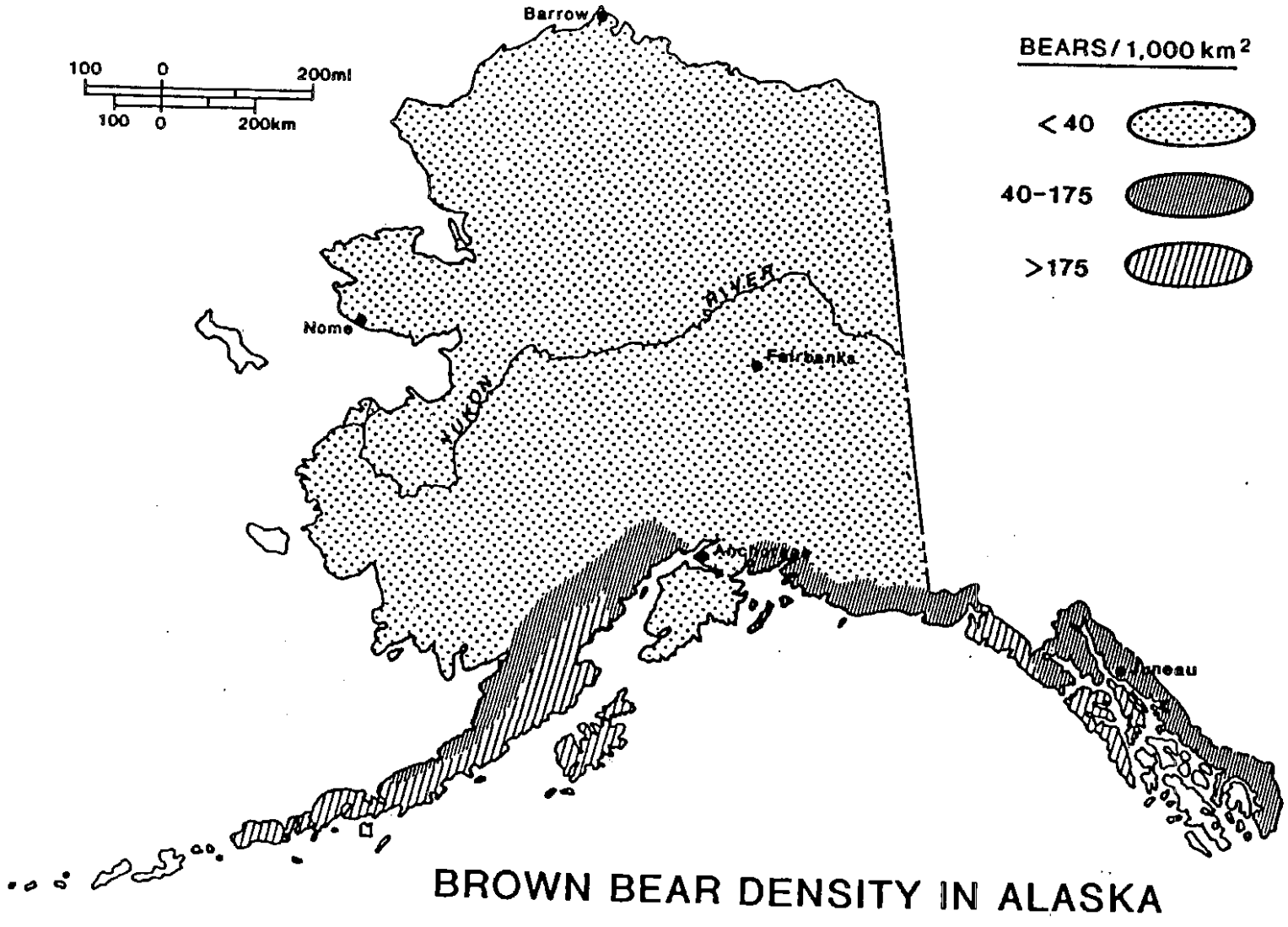

Figure 7. Probable distribution of high (>175 bears of all ages/1,000 km^2), intermediate (40-175), and low density (<40) brown bear habitats in Alaska.

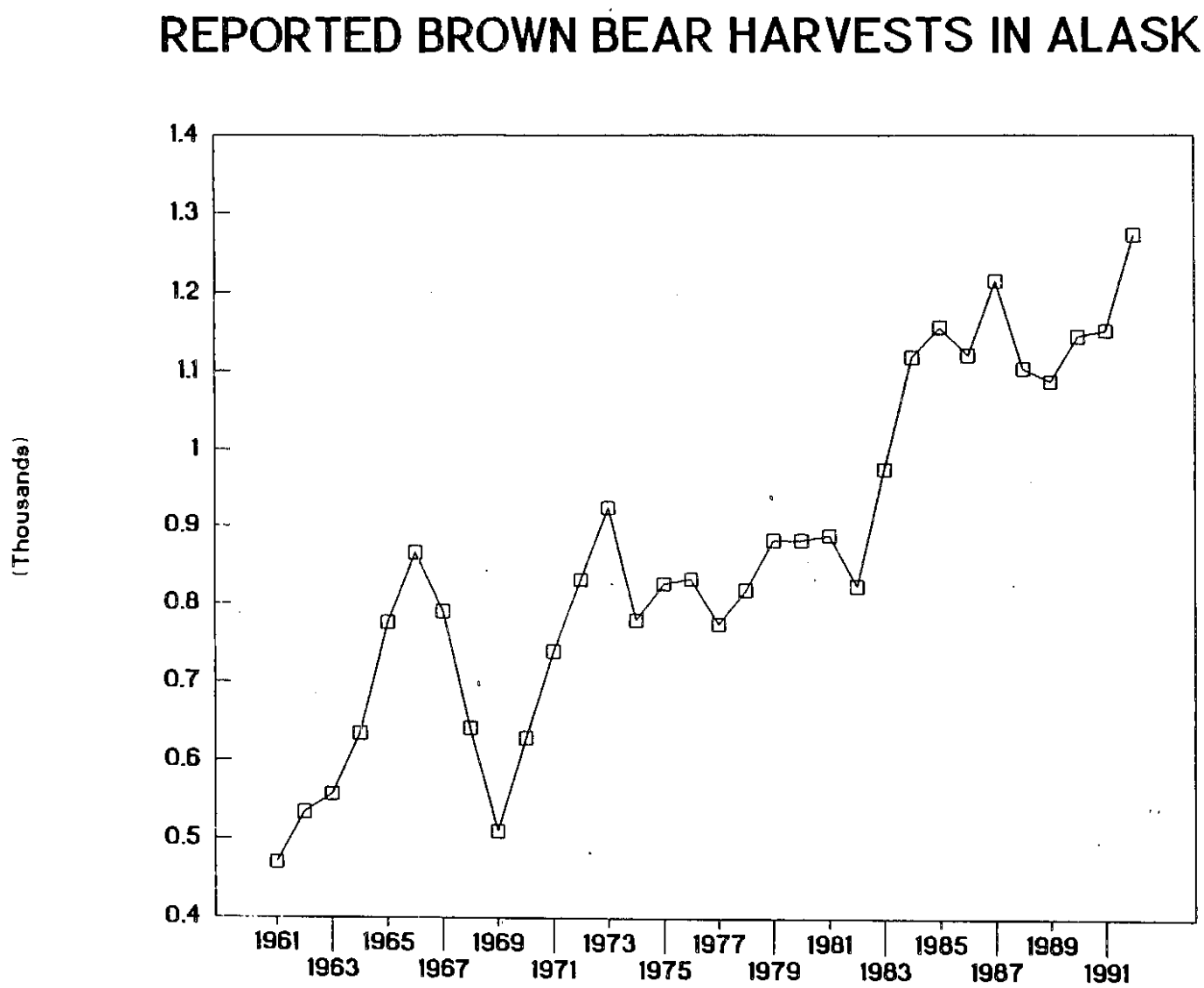

Figure 8. Trends in reported brown bear harvest harvests in Alaska by calendar year.

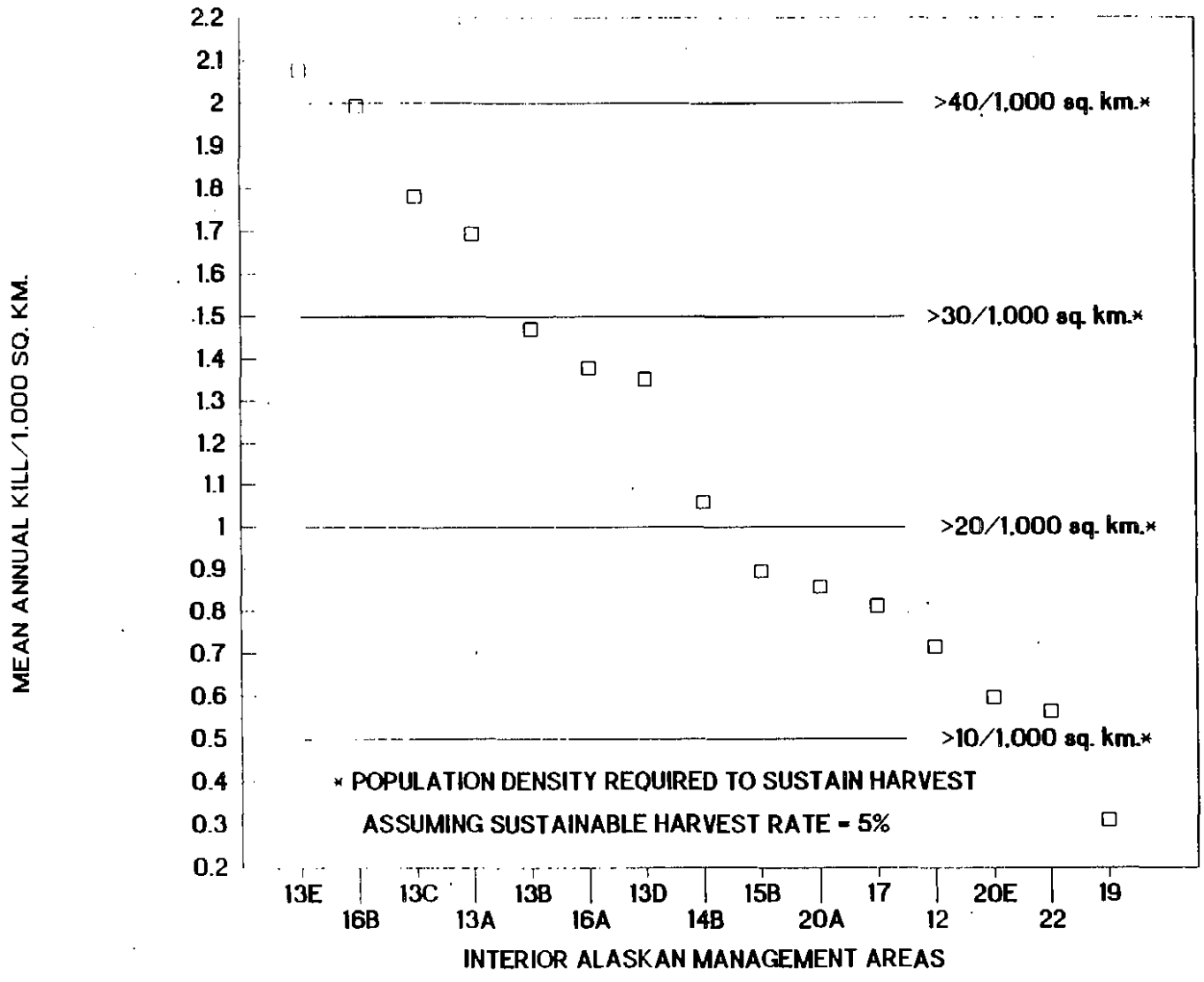

Figure 9. Brown bear kill density in selected interior Alaska game management units. Kill density is based on the entire area of the unit, including areas closed to hunting and areas that are not brown bear habitat. The sustainable kill density axis illustrates the population density required to sustain a given kill density based on the assumption that sustainable harvest rate = 5%.

Table 1. Estimated brown bear population in different Alaskan game management units and subunits.

GMU	Area		Best Guess	Minimum	Maximum	Status
	mi^2	km^2				
1A	5,292	13,696	291	227	354	Stable
1B	2,979	7,710	180	135	225	Stable
1C	7,562	19,570	334	251	418	Stable
1D	2,670	6,910	237	178	296	Stable
3	2,968	7,681	45	30	60	
4AD	1,664	4,306	1,660	1,494	1,824	Stable
4BAR	1,607	4,159	816	719	913	Stable
4CHI	2,104	5,445	1,625	1,501	1,772	Stable-declining?
4KRUZ	200	518	127	121	133	Stable
5A	2,974	7,697	522	392	653	Stable-declining
5B	2,797	7,239	270	203	338	Stable
6A	3,287	8,507	245	161	329	Stable
6B	850	2,200	102	79	124	Stable
6C	713	1,845	101	69	133	Stable
6D	5,289	13,688	301	184	417	Declining?
7	3,520	9,110	96	50	150	Stable?
8	5,097	13,191	2,732	1,968	3,538	Stable
9A	2,134	5,523	400	320	480	Stable
9B	7,091	18,352	1,000	800	1,200	Stable
9C	7,560	19,565	2,400	1,920	2,880	Stable
9D	4,849	12,549	900	720	1,080	Stable
9E	12,005	31,069	3,200	2,560	3,840	Stable
10 Unimak	1,586	4,105	250	200	300	Stable
11	12,782	33,080	547	434	724	Stable
12	9,978	25,823	329	290	426	Stable
13	23,376	60,497	880	640	1,120	Declining
14A	2,561	6,628	47	43	51	Decreasing
14B	2,152	5,569	105	87	123	Stable
14C	1,912	4,948	60	55	65	Increasing
15	4,876	12,619	181	90	270	Stable?
16A	1,850	4,788	76	54	102	Stable-declining?
16B	10,405	26,928	746	532	1,055	Declining
17	18,771	48,579	1,350	1,080	1,620	Stable-increasing
18	41,159	106,519	343	313	392	Stable
19	36,486	94,426	905	724	1,086	Stable
20A	6,796	17,588	145	124	165	Declining
20B	9,114	23,587	80	47	112	Stable?
20C	11,902	30,802	261	195	326	Stable?
20D	5,637	14,589	169	118	220	Declining

Table 1. (continued).

GMU	Area mi²	Area km²	Best Guess	Minimum	Maximum	Status
20E	10,680	27,640	517	475	558	Stable
20F	6,267	16,219	60	36	83	Stable?
21	43,925	113,678	722	580	870	Increasing
22A	5,838	15,109	249	206	292	Stable?
22B	6,840	17,702	328	282	373	Declining?
22C	1,674	4,332	81	74	88	Declining
22D	6,739	17,441	210	198	224	Stable
22E	4,138	10,709	98	90	108	Stable
23	43,422	112,376	1,246	623	2,492	Unknown
24	26,055	67,430	1,210	970	1,450	Increasing
25A	21,300	55,124	584	456	713	Stable-increasing
25B	9,099	23,548	198	176	220	Stable-increasing
25D	17,569	45,469	382	340	424	Stable-increasing
25C	5,149	13,326	74	48	101	Stable?
26A	53,465	138,367	1,007	806	1,108	Increasing
26B	15,515	40,153	262	210	288	Stable
26C	I0,273	26,587	391	312	430	Stable
Total	574,503	1,486,814	31,677	24,990	39,136	

Basis or authority for estimates by GMU:

GMU

1 Robus, Larsen, Land, Dinneford pers. commun. 4/19/93

3 Robus, Larsen, Land, Dinneford pers. commun. 4/19/93

4 Young (1991 PR report modified by 1993 pers. comm.), Schoen & Beier, 1990.

5 Robus and Dinneford pers. commun. 4/19/93

6 Griese (1991) and Nowlin (1993)

7 Estimate of Del Frate (1993) based on 4,800 km² of habitat, 20/1,000 km², limits = +/- 50%/

8 Smith (1991) and Barnes et al. (1988)

9 Sellers(1993 and pers. commun. 4/2/93), +/-20%. "Stahle" for last 8 years; increasing" over last 20-30 year period (Sellers pers. commun. 4/2/93)

10 Sellers (pers. commun. 4/2/93)

11 Tobey (pers. commun. dated 4/27/93) based on 16,089 km² of habitat 5,000' elevation, and low, best, and high densities of: 27, 34, and 45/1,000 km2, respectively.

12 Gardner (June 1993 pers. commun.)

13 Miller (1993)

14 Harkness (1993 and 4/23/93 pers. commun.)

15 Estimate of Del Frate (1992 and pers. comm.), based on 9,048 km² of habitat, 20 bears/1,000 km², and limits = +/- 50%/

16 Griese (1991 and 4/23/93 pers. commun.)

17 Van Daele (1993), +/- 20% for limits

18 Kacyon (4/1/93 pers. commun.) based on 14,519 km² habitat in GMU 18

19 Whitman (1991), limits based on +/- 20%

20 A-C & F Eagan and Reynolds (pers. commun. 6/29/93)
20D DuBois (5/25/93 pers. commun.)
20E Gardner (June 1993 pers. commun.)
21 Osborne (4/16/93 pers. commun., limits based on +/- 20%
22 Nelson (1993) based on extrapolation from density estimate + 20% for COY and ylgs
23 J. Dau (memo to John Coady dated 3/18/92 and to S. Miller dated 4/21/93). There is a large degree of uncertainty associated with the estimate for GMU 23 and Area Biologist J. Dau feels his guesses reflect the need for more information rather than a realistic population estimate. Estimate for bears 2+ converted to all bears by adding 15%. Limits are based on -50% and +100%.
24 Osborne (4/16/93 pers. commun., limits based on +/- 20%
25A Reynolds (1989), and Stephenson (4/27/93 pers. commun.)
25B Reynolds (1989), and Stephenson (4/27/93 pers. commun.)
25D Reynolds (1989), and Stephenson (4/27/93 pers. commun.)
25C Eagan and Reynolds (pers. commun. 6/29/93)
26A-C Reynolds (pers. commun. 7/27/93, limits = -20% and +10%)

Table 2. Alaskan brown bear population estimates made in 1978 (ADF&G 1978) and revised based on additional information in 1993 (see Table 1). In most cases, differences resulted from changes in quality of information available rather than declines or increases in numbers of bears.

Region (GMUs)	1978	revised 1993
Arctic (26)	893-1,786	1,328-1,826
Northwestern (22, 23)	946-1,419	1,473-3,577
Western (18, 19, 21)	4,990-6,986	1,617-2,348
Interior (12, 20, 24, 25)	3,939-6,565	3,275-4,798
Southcentral (6, 7, 11, 13-16)	4,410-5,670	2,478-4,663
Southeastern (1-5)	3,780-4,725	5,251-6,986
Southwestern (8-10, 17)	12,600-15,750	9,568-14,938
Totals	31,558-42,901	24,990-39,136

Table 3. Proportion of total area of brown bear habitat in Alaska (1.48 million km^2), estimated brown bear population (31,700), and reported annual kill (10 year average = 1,078) in each of 3 density strata (>175, 40-175, and <40/1,000 km^2).

Density Strata	Percent of Area (km^2)	Percent of Estimated Population	Percent of Reported Annual Kill
High Density	8.6	49.4	58.1
Intermediate Density	7.3	8.9	9.2
Low Density	84.1	41.7	32.7

Table 4. Annual reported kill of brown bears in Alaska by regulatory year, 1960/61-1991/92

Reg. Year	Game Management Unit																							
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOTAL
1960	6	28	4	6	0	81	77	1	0	3	0	0	0	0	0	0	0	6	0	0	0	0	1	1	214
1961	12	43	7	14	1	133	142	3	7	14	42	14	4	28	3	0	14	17	0	2	8	5	2	0	515
1962	9	32	11	25	1	111	133	0	13	22	32	6	5	20	3	0	12	38	0	0	7	3	3	8	494
1963	11	48	4	38	0	122	154	10	8	20	43	13	4	27	3	0	10	38	1	0	16	7	12	19	608
1964	18	58	16	36	0	144	189	11	24	15	39	12	2	22	4	0	20	51	0	1	24	9	18	7	720
1965	10	72	13	35	0	203	212	9	15	18	47	13	3	37	9	0	17	29	2	3	15	10	13	5	790
1966	25	69	22	49	1	203	237	4	12	17	63	5	3	28	10	0	17	46	2	2	12	20	29	9	885
1967	18	64	16	63	1	123	170	5	20	21	32	12	4	30	14	0	14	17	0	3	25	8	20	5	685
1968	17	56	21	40	0	105	145	6	14	12	39	10	11	20	8	1	14	22	1	5	20	7	15	20	609
1969	18	79	14	28	2	70	109	2	11	16	16	2	6	40	9	0	11	27	2	2	20	15	16	7	522
1970	15	76	13	22	1	104	140	5	9	16	26	5	4	39	26	1	28	15	1	2	13	9	9	15	594
1971	11	68	14	26	0	116	203	4	17	13	70	18	3	42	31	5	28	29	2	2	13	10	8	22	755
1972	14	98	23	35	2	159	313	5	16	13	48	4	2	16	55	0	44	40	0	2	35	11	6	12	953
1973	16	92	20	34	2	175	144	5	17	27	44	1	6	45	36	0	69	28	4	5	21	20	13	1	825
1974	12	99	14	28	0	139	210	4	18	20	72	3	8	19	26	1	50	28	0	11	17	18	9	25	831
1975	17	141	19	25	1	108	304	5	20	19	80	5	5	18	26	0	41	33	0	6	14	24	22	31	964
1976	21	86	17	28	2	131	8	7	23	23	60	9	4	31	51	1	64	16	5	15	29	6	19	16	672
1977	14	60	17	33	1	123	366	3	23	14	42	2	7	26	30	4	49	23	2	13	30	7	10	13	912
1978	18	53	23	23	0	138	5	6	17	10	62	8	3	37	42	5	75	42	6	46	43	15	22	15	714
1979	13	54	21	23	4	125	365	4	4	23	88	4	6	25	30	11	60	33	6	33	51	9	26	13	1031
1980	19	67	26	22	2	149	6	4	5	21	93	7	11	26	29	15	55	47	14	22	23	21	18	21	723
1981	14	51	32	25	3	123	394	2	11	21	81	5	9	34	9	23	31	53	5	22	30	8	22	10	1018
1982	17	70	33	29	2	163	8	6	4	18	95	2	6	23	14	14	23	52	13	12	31	5	24	28	692
1983	21	110	26	37	1	195	421	4	8	29	128	9	5	26	16	17	30	57	2	49	38	12	16	17	1274
1984	22	80	27	29	1	154	5	3	9	28	131	12	8	65	40	18	23	65	10	53	58	6	16	23	886
1985	23	108	28	44	4	186	424	7	7	19	138	7	11	87	49	8	23	52	4	60	22	7	11	24	1353
1986	15	108	31	55	0	163	15	6	7	22	137	10	16	80	44	7	26	52	8	38	33	14	19	34	940
1987	33	112	33	60	3	170	505	8	5	19	77	11	9	84	59	4	36	52	6	35	23	15	21	43	1423
1988	16	104	30	60	1	166	16	4	8	11	73	15	11	61	46	1	30	48	4	41	34	15	29	47	871
1989	20	121	29	44	3	151	550	5	12	13	98	13	3	59	28	5	34	54	10	48	31	10	20	45	1406
1990	27	133	33	50	1	150	9	8	9	17	85	10	10	55	54	1	38	40	8	45	37	14	19	48	901
1991	26	127	39	48	1	155	542	4	3	10	75	12	11	68	45	4	31	39	7	44	33	8	16	58	1406

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Table 4. (continued)

Reg. Year	Game Management Unit																							
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOTAL
Avg. 1975-79	16.6	78.8	19.4	26.4	1.6	125	209.6	5	17.4	17.8	66.4	5.6	5	27.4	35.8	4.2	57.8	29.4	3.8	22.6	33.4	12.2	19.8	17.6	858.6
Avg. 1987-91	24.4	119.4	32.8	52.4	1.8	158.4	324.4	5.8	7.4	14	81.6	12.2	8.8	65.4	46.4	3	33.8	46.6	7	42.6	31.6	12.4	21	48.2	1201.4
Difference	7.8	40.6	13.4	26	0.2	33.4	114.8	0.8	-10	-3.8	15.2	6.6	3.8	38	10.6	-1.2	-24	17.2	3.2	20	-1.8	0.2	1.2	30.6	342.8
% Change	47.0	51.5	69.1	98.5	12.5	26.7	54.8	16.0	-57.5	-21.3	22.9	117.9	76.0	138.7	29.6	-28.6	-41.5	58.5	84.2	88.5	-5.4	1.6	6.1	173.9	39.9
Avg. 1960s	14.4	54.9	12.8	33.4	0.6	129.5	156.8	5.1	12.4	15.8	35.3	8.7	4.2	25.2	6.3	0.1	12.9	29.1	0.8	1.8	14.7	8.4	12.9	8.1	604.2
Avg. 1970s	15.1	82.7	18.1	27.7	1.3	131.8	205.8	4.8	16.4	17.8	59.2	5.9	4.8	29.8	35.3	2.8	50.8	28.7	2.6	13.5	26.6	12.9	14.4	16.3	825.1
Avg. 1980s	20	93.1	29.5	40.5	2	162	234.4	4.9	7.6	20.1	105.1	9.1	8.9	54.5	33.4	11.2	31.1	53.2	7.6	38	32.3	11.3	19.6	29.2	1058.6
Avg. 1990s	26.5	130	36	49	1	152.5	275.5	6	6	13.5	80	11	10.5	61.5	49.5	2.5	34.5	39.5	7.5	44.5	35	11	17.5	53	1153.5

Table 5. Increase in bear kills by Alaskan Game Management Units between regulatory years 1975/76 through 1979/80 and 1987/88 through 1991/92.

In Order of Absolute Change:					In Order of % Change:				
GMU	Average Kill 1975-79	Average Kill 1987-91	Absolute Difference	% Change	GMU	Average Kill 1975-79	Average Kill I987-91	Absolute Difference	% Change
9	209.6	324.4	114.8	54.8	26	17.6	48.2	30.6	173.9
4	78.8	119.4	40.6	51.5	16	27.4	65.4	38.0	138.7
16	27.4	65.4	38.0	138.7	14	5.6	12.2	6.6	117.9
8	125	158.4	33.4	26.7	6	26.4	52.4	26.0	98.5
26	I7.6	48.2	30.6	173.9	22	22.6	42.6	20.0	88.5
6	26.4	52.4	26.0	98.5	21	3.8	7	3.2	84.2
22	22.6	42.6	20.0	88.5	15	5	8.8	3.8	76.0
20	29.4	46.6	17.2	58.5	5	19.4	32.8	13.4	69.1
13	66.4	81.6	15.2	22.9	20	29.4	46.6	17.2	58.5
5	19.4	32.8	13.4	69.1	9	209.6	324.4	114.8	54.8
17	35.8	46.4	10.6	29.6	4	78.8	119.4	40.6	51.5
1	16.6	24.4	7.8	47.0	1	16.6	24.4	7.8	47.0
14	5.6	12.2	6.6	117.9	17	35.8	46.4	10.6	29.6
15	5	8.8	3.8	76.0	8	125	158.4	33.4	26.7
21	3.8	7	3.2	84.2	13	66.4	81.6	15.2	22.9
25	19.8	21	1.2	6.1	10	5	5.8	0.8	16.0
10	5	5.8	0.8	16.0	7	1.6	1.8	0.2	12.5
24	12.2	12.4	0.2	1.6	25	19.8	21	1.2	6.1
7	1.6	1.8	0.2	12.5	24	12.2	12.4	0.2	1.6
18	4.2	3	-1.2	-28.6	23	33.4	31.6	-1.8	-5.4
23	33.4	31.6	-1.8	-5.4	12	17.8	14	-3.8	-21.3
12	17.8	14	-3.8	-21.3	18	4.2	3	-1.2	-28.6
11	17.4	7.4	-10.0	-57.5	19	57.8	33.8	-24.0	-41.5
19	57.8	33.8	-24.0	-41.5	11	17.4	7.4	-10.0	-57.5
Total	858.6	1201.4	342.8	39.9		858.6	1201.4	342.8	39.9

Table 6. Changes in Alaskan brown bear seasons and bag limits between 1978/79 and 1992/93 regulatory years. Subsistence hunts in portions of some units were initiated in 1992 that eliminated the $25 tag fee, sealing requirements, and changed the bag limit to 1/year.

Area	Bag Limit* 78/79	92/93	Season 78/79	Season 92/93	Change (Days)**	Footnote
1	Std.	Std.	9/1-12/31	9/15-12/31	-15	1
			1/1-6/10	3/15-5/31	-74	1
4	Std.	Std.	9/1-12/31	9/15-12/31	-15	2
			1/1-6/5	3/15-5/20	-95	2
5	Std.	Std.	9/1-12/31	9/1-12/31	0	
			1/1-5/31	1/1-5/31	0	
6	Std.	Std.	10/10-11/30	9/1-12/31	+72	3
			5/10-5/25	1/1-5/31	+136	3
7	Std.	Std.	9/10-10/10	9/15-10/15	O-C	4
				5/10-5/25	+15	
8	Std.	Std.	10/25-12/31	10/25-10/15	-77	5
			4/1-5/15	4/1-45/15	0	5
9A,B	Std.	Std.	10/7-10/21	10/1-10/21	+6	6
			5/10-5/25	5/10-5/25	0	6
9C-E	Std.	Std.	10/7-10/21	10/7-10/21	0	6
			5/10-5/25	5/10-5/25	0	6
10	Std.	Std.	10/1-10/21	10/1-10/21	O-C	7
			5/10-5/25	5/10-5/25	O-C	7
11	Std.	Std.	10/1-10/21	10/1-10/31	+10	8
			5/10-5/25	4/25-5/31	+15	8
12	Std.	1/yr	9/1-10/10	9/1-12/31	+82	9
			5/10-5/25	1/1-5/31	+130	9
13	Std.	Std.	9/1-10/10	9/10-12/31	+82	9
				1/1-5/31	+181	9
14	Std.	Std.	9/10-10/10	9/15-10/10	-5	
				5/1-5/25	+25	

Table 6. continued.

Area	Bag Limit* 78/79	92/93	Season 78/79	Season 92/93	Change (Days)**	Footnote
15	Std.	Std.	9/10-9/30 5/15-5/25	9/15-10/15 5/10-5/25	+10 +5	4
16	Std.	Std.	9/1-10/10 5/10-5/25	9/1-12/31 1/1-5/25	+77 +130	
17	Std.	Std.+ Subsis.	10/7-10/21 5/10-5/25	9/10-10/10 5/10-5/25	+17 0	10 10
18	Std.	Std.+ Subsis.	9/10-10/10 5/10-5/25	9/10-10/10 4/10-5/25	0 +26	10 10
19	Std.	Std.+ Subsis.	9/10-10/10 5/10-5/25	9/1-12/31 1/1-5/31	+87 +130	10 10
20A-C & D portion	Std.	Std.	9/1-10/31 5/10-5/25	9/1-12/31 1/1-5/25	+61 +125	
20E & 20D portion	Std.	1/yr	9/1-10/31 5/10-5/25	8/10-12/31 1/1-6/30	+82 +166	9 9
21	Std.	Std.	9/10-10/10 5/10-5/25	9/1-12/31 1/1-5/31	+87 +130	10 10
22	Std.	Std.	9/1-10/31 4/25-5/25	9/1-10/31 4/15-5/25	0 -10	
23	Std.	Std.+ Subsis.	9/1-10/10 5/10-5/25	9/1-10/25 4/15-5/25	+15 +25	11 11
24	Std.	Std.+ Subsis.	9/1-10/10 5/10-5/25	9/1-12/31 1/1-5/31	+76 +136	12 12
25	Std.	Std.	9/1-10/10 5/10-5/25	9/1-12/31 1/1-5/31	+76 +136	12 12
26	Std.	Std.+ Subsis.	9/1-10/10 5/10-5/25	9/1-12/31 1/1-5/31	+76 +136	13 13

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Table 6. continued.

*Std. bag limit = 1 bear every 4 regulatory years
**No change = 0, No change in days but timing now more conservative = O-C.

Footnotes:
(1) By registration permit only in 92/93
(2) Greater season reduction and registration permit required in portion of Chichagof Island, later fall opening on Admiralty Island
(3) Season reduction on Montague Island (no fall hunting), less liberalization in portions of 6D
(4) Season shift resulted in more conservative regulation
(5) Additional areas added to drawing permit system during period
(6) open in alternate years only
(7) Now by drawing permit only
(8) Much of area in National Park closed to sport hunting
(9) BOG policy is to reduce bear numbers in this area
(10) Longer season and 1/yr bag limit for local subsistence hunters
(11) Permit hunt in portion of GMU 23 eliminated except for nonresidents
(12) Permit hunt in portion of GMU eliminated
(13) Permit hunt in portion of GMU eliminated except for nonresidents

Table 7. Annual average kill density (1981-82 through 1990-91) and kill density for brown bears in difference Alaskan Game Management Units.

	Mean Annual Kill, 1981/82-1990/91	Kill Density Per 1,000 mi^2	Kill Density Per 1,000 km^2
High Density GMUs			
All 8	162.1	31.8	12.3
All 4	99.7	17.9	6.9
5A	26.5	8.9	3.4
All 9	234.7	7.0	2.7
10 Unimak	5.3	3.3	1.3
Subtotals	528.3	10.8	4.2
Intermediate Density GMUs			
16B	53.7	5.2	2.0
All 6	43.3	4.3	1.7
5B	3.3	1.2	0.5
All 1	20.8	1.1	0.4
Subtotals	121.1	2.9	1.1
Low Density GMUs			
13	104.7	4.5	1.7
16A	6.6	3.6	1.4
12	19.7	2.0	0.8
17	35.9	1.9	0.7
22	40.3	1.6	0.6
14	9.4	1.4	0.5
7&15	10.7	1.3	0.5
20	52.5	1.0	0.4
19	29.4	0.8	0.3
23	33.7	0.8	0.3
11	8.0	0.6	0.2
24	10.5	0.4	0.2
26	31.9	0.4	0.2
25	19.7	0.4	0.1
18	9.8	0.2	0.1
21	7.0	0.2	0.1
Subtotals	429.8	0.9	0.3
Totals	1,079.2	1.89	0.73
Subunit 20A*	13.3	1.96	0.76
Subunit 13E*	41.3	5.72	2.21

Table 8. Statewide Brown Bear Harvest and Tag Sale Historical Summary for 1961-1992.

	Residents					Nonresidents				
Year	No. Tags Sold	% Change	No. Bears Taken	% Change	% "Success"	No. Tags Sold	% Change	No. Bears Taken	% Change	% "Success"
1961	--		213		--	437		258		59.0
1962	--		249		--	446		287		64.3
1963	--		260		--	475		296		62.3
1964	--		315		--	551		321		58.3
1965	--		381		--	746		401		53.8
1966	--		368		--	968		503		52.0
1967	--		333		--	881		458		52.0
1968	--		274		--	930		369		39.7
1969*	--		259		--	797		253		31.7
1970	--		261		--	697		368		52.8
1971	--		308		--	967		432		44.7
1972	--		323		--	905		511		56.5
1973	--		363		--	932[1]		564		60.5
1974	--		292		--	940		487		51.8
1975	--		338		--	843		489		58.0
1976	--		385		--	853		447		52.4
1977	2,903[3]		327		11.3	876[2]		446		50.9
1978	3,431	+18	350	+7	10.2	843	-4	470	+5	55.8
1979	3,533	+3	342	-2	9.7	1,036	+23	541	+15	52.2
1980	3,894	+10	371	+9	9.5	1,006	-3	509	-6	50.6
1981	4,437	+14	392	+6	8.8	970	-4	492	-3	50.7
1982**	5,049	+14	376	-4	7.4	813	-16	435	-12	53.5
1983	6,076	+20	492	+30	8.1	870[4]	+7	482	+11	55.4
1984***	6,322	+4	593	+21	9.3	883	+1	525	+9	59.5
1985	6,054	-4	615	+2	10.2	1,043	+18	541	+3	51.9
1986	6,986	+15	596	-3	8.5	1,031	-1	523	-3	50.7
1987	6,811	-3	569	-5	8.4	1,235	+20	643	+23	52.1
1988#	6,703	-2	492	-14	7.3	1,288	+4	600	-7	46.6
1989	6,759	+1	479	-3	7.1	1,268	-1	598	0	47.2
1990	6,124	-9.4	496	+3.5	8.1	1,310	+3.3	649	+8.5	49.5
1991[5]#	6,762	+10.4	463	-6.7	6.8	1,291	-1.5	686	+5.7	53.1
1992[6]	6,452	-4.6	550	+18.8	8.5	1,260	-6.61	723	+5.4	57.4

[1] Fee increase from $75 to $150 in 1973.

[2] Fee increase from $150 to $250 in 1977.

[3] Resident tag fee of $25 initiated in 1977.

[4] Nonresident fee increase to $350 in 1983.

[5] Nonresident fee increase to $500 ($650 for aliens) in July 1991.

[6] Fee and sealing requirement eliminated for subsistence hunters in portions of northwestern and western Alaska, and bag changed to 1/year.

* Bag limit change from 1/year to 1/every 4 years in 1969

** Bag limit increased to 1/year effective for fall season in GMUs 12, 13, and 20E in 1982.

***The $25 resident tag fee requirement was deleted for GMUs 12, 20E, 22, and 23 effective in January 1984, and in 21(D) in July 1985.

The $25 resident tag fee reinstated in July 1988 (in 12, 22, and 23) and, in July 1991 (in 20E).

Table 9. Number of days hunted by successful resident and non-resident brown bear hunters in Alaska. Data are combined for regulatory years 1986/87 through 1991/92.

	Residents								
	Fall		Days/	Spring		Days/	Fall + Spring		Days/
GMU	Hunters	Days	Hunter	Hunters	Days	Hunter	Hunters	Days	Hunter
22	65	209	3.2	72	173	2.4	137	382	2.8
18	7	24	3.4	3	4	1.3	10	28	2.8
1	55	151	2.7	51	146	2.9	106	297	2.8
14	53	164	3.1	4	6	1.5	57	170	3.0
5	36	111	3.1	11	39	3.5	47	150	3.2
7&15	36	125	3.5	16	41	2.6	52	166	3.2
12	41	142	3.5	16	55	3.4	57	197	3.5
10	19	58	3.1	10	44	4.4	29	102	3.5
21	15	61	4.1	3	4	1.3	18	65	3.6
13	225	889	4.0	123	410	3.3	348	1,299	3.7
23	66	357	5.4	54	101	1.9	120	458	3.8
4	108	280	2.6	232	1,023	4.4	340	1,303	3.8
20	176	750	4.3	58	200	3.4	234	950	4.1
16	116	469	4.0	56	239	4.3	172	708	4.1
17	58	263	4.5	8	26	3.3	66	289	4.4
6	90	318	3.5	58	337	5.8	148	655	4.4
9	248	986	4.0	219	1,108	5.1	467	2,094	4.5
19	28	144	5.1	4	11	2.8	32	155	4.8
26	96	490	5.1	26	111	4.3	122	601	4.9
8	134	622	4.6	264	1,413	5.4	398	2,035	5.1
24	35	176	5.0	9	51	5.7	44	227	5.2
25	50	265	5.3	3	15	5.0	53	280	5.3
11	20	146	7.3	11	24	2.2	31	170	5.5
Total	1,777	7,200	4.1	1,311	5,581	4.3	3,088	12,781	4.1

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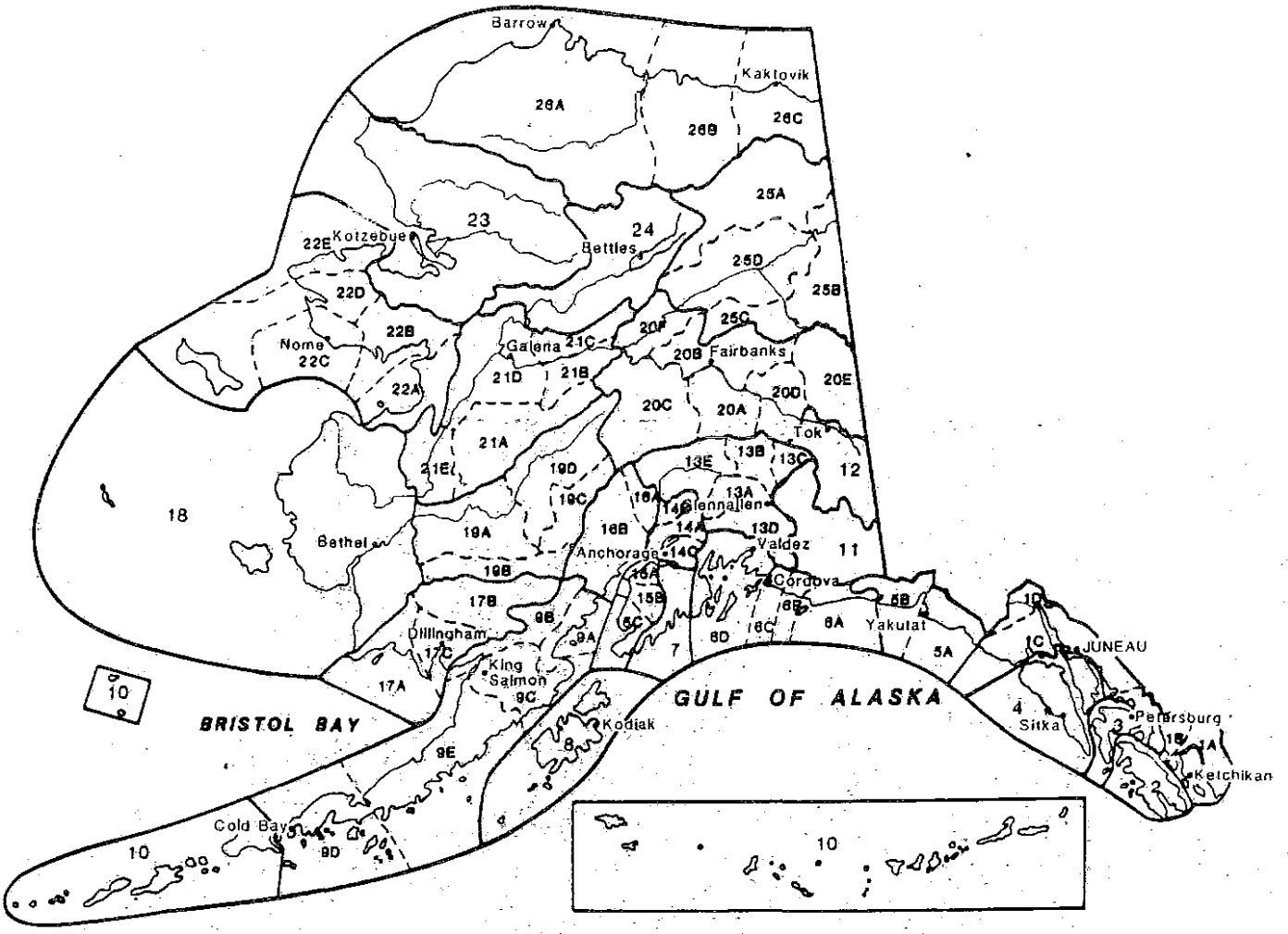
Table 9 (continued).

	Non-Residents								
GMU	Fall Hunters	Days	Days/ Hunter	Spring Hunters	Days	Days/ Hunter	Fall + Spring Hunters	Days	Days/ Hunter
10	4	14	3.5	2	7	3.5	6	21	3.5
23	44	147	3.3	27	109	4.0	71	256	3.6
26	99	417	4.2	53	277	5.2	152	694	4.6
5	77	357	4.6	71	365	5.1	148	722	4.9
4	112	512	4.6	249	1257	5.0	361	1,769	4.9
22	36	175	4.9	76	393	5.2	112	568	5.1
9	606	3040	5.0	560	3117	5.6	1166	6,157	5.3
20	34	179	5.3	10	58	5.8	44	237	5.4
13	94	493	5.2	103	605	5.9	197	1,098	5.6
25	58	325	5.6	13	71	5.5	71	396	5.6
24	25	164	6.6	7	22	3.1	32	186	5.8
21	7	52	7.4	16	82	5.1	23	134	5.8
17	151	901	6.0	59	326	5.5	210	1,227	5.8
6	59	326	5.5	110	692	6.3	169	1,018	6.0
12	30	174	5.8	4	33	8.3	34	207	6.1
11	8	51	6.4	5	34	6.8	13	85	6.5
8	170	994	5.8	387	2749	7.1	557	3,743	6.7
7&15	9	82	9.1	7	29	4.1	16	111	6.9
1	17	101	5.9	13	111	8.5	30	212	7.1
19	127	939	7.4	36	242	6.7	163	1,181	7.2
14	13	98	7.5	1	6	6.0	14	104	7.4
16	106	818	7.7	126	1068	8.5	232	1,886	8.1
18	9	85	9.4	3	31	10.3	12	116	9.7
Total	1895	10444	5.5	1938	11684	6.0	3833	22128	5.8

Alaska's Game Management Units



Federal Aid in Wildlife Restoration

The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program then allots the funds back to states through a formula based on each state's geographic area and the number of paid hunting license holders in the state. Alaska receives 5% of the revenues collected each year, the maximum allowed. The Alaska Department of Fish and Game uses the funds to help restore, conserve, manage, and enhance wild birds and mammals for the public benefit. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes necessary to be reponsible hunters. Seventy-five percent of the funds for this project are from Federal Aid.