Alaska Department of Fish and Game
Division of Wildlife Conservation
July 1998

Brown Bears of Unit 4
Past, Present and Future:
A Status Report and Issues Paper

STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
Frank Rue, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Wayne L. Regelin, Director

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STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

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July 21, 1998

Dear Interested Party:

Admiralty, Baranof, and Chichagof Islands are home to one of the highest concentrations of brown bears in the world. Roughly 4,200 bears are believed to occupy this area, averaging about one bear per square mile. These bears are highly valued by hunters, wildlife watchers, guides, tourism operators, and the general public.

The long-term conservation of these animals will require careful management as industrial and recreational pressures on wildlife populations increase. The Division of Wildlife Conservation does not believe there is any imminent problem regarding the population of brown bears across Unit 4. Yet, over the past few years we have been receiving more and more comments on a variety of topics such as viewing, harvest level, the increase in the number of big game guides, crowding in specific areas, and long-term effects of land management practices on brown bears. I felt it was time to summarize our current state of knowledge and provide this information in a convenient format to the public. It is my hope you and other members of the public might suggest some approaches ADF&G and other government agencies and the public can take to jointly solve some of the current concerns

Comments can be sent to:

Kim Titus, Regional Supervisor
Alaska Department of Fish & Game
Division of Wildlife Conservation
PO Box 240020
Douglas, AK 99824

Please note that the Alaska Board of Game will be meeting in Ketchikan this fall from October 23-28. Proposed changes to brown bear regulations will be considered at this time. The deadline for submitting proposals to the board is August 7th. For more information, contact:

Alaska Board of Game
PO Box 25526
Juneau, AK. 99802-5526.
907-465-2027

Division staff in our offices in Douglas, Ketchikan, Petersburg, or Sitka can assist you if you desire more information about submitting a proposal to the board.

Thank you for your interest in brown bear management. I hope you will take the time to share your comments, concerns, and suggestions with us.

Sincerely,

Wayne L. Regelin

Wayne L. Regelin
Director

Brown Bears of Unit 4

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Table of Contents

List of Figures

ACKNOWLEDGMENTS

This report represents the efforts of many individuals on the staff of the Southeast Region, Division of Wildlife Conservation, Alaska Department of Fish and Game.

Tom Paul was the principal writer and coordinator of the project. Jim Faro, Kimberly Titus, LaVern Beier, Bruce Dinneford, Anne Post, and Jackson Whitman contributed to the text. Tom Straugh, Grey Pendleton, Linda Bergdoll-Schmidt, and Rod Flynn provided technical support and expertise for production. Regional Supervisor Kimberly Titus and Regional Management Coordinator Bruce Dinneford supervised the project. Former Assistant Director of the Division of Wildlife Conservation Chris Smith and Region III planner Margo Matthews provided early guidance and useful suggestions. Becky Strauch of Division of Wildlife Conservation Information Management Section also provided technical support.

As a summary of the accumulated knowledge of brown bears in Unit 4 this report is also the product of former biologists, researchers, and brown bear managers in Unit 4; among them ADF&G wildlife biologists Loyal Johnson, Charlie Land, Tom McCarthy, John Schoen, Marilyn Sigman, Bob Wood, and Butch Young.

We acknowledge the continued support of the Federal Aid in Wildlife Restoration Program as the principal funding source for many of the ADF&G brown bear management and research activities upon which this report is based. The Greens Creek Mining Company provided financial assistance for the brown bear research project during the initial phases of their activities on Admiralty Island. The financial and logistic support of the USDA Forest Service during the early 1990's was instrumental in initiating cooperative studies on Northeast Chichagof Island.

INTRODUCTION

Our objectives for this paper are threefold: 1) describe the status of bear populations and the basis for current Alaska Department of Fish & Game (ADF&G) management for brown bears in Game Management Unit 4 (Unit 4) in Southeast Alaska; 2) provide a comprehensive summary of ADF&G's accumulated knowledge of Unit 4 brown bears that would be a useful reference for current and future resource managers, planners, and the public; 3) describe the problems we see looming for human and brown bear coexistence in Unit 4, and suggest some approaches that ADF&G, other government agencies, and interested members of the public can take jointly to solve these problems.

This paper begins with sections on the natural history, biology, and research on which our knowledge and management of Unit 4 bears is based. Sections on land management, viewing, and hunting cover the major issues we see affecting brown bears. They include background information, summaries of current management and status, and discussions of potential problems needing resolution.

The Unit 4 islands are home to one of the highest concentrations of brown bears in the world. The population density averages about one bear per square mile. They are the only island group in Southeast Alaska with persistent populations of brown bears. The estimated total population of Unit 4 is about 4,200 bears. ADF&G biologists believe the populations for all islands are at or near carrying capacity predicted by habitat models and are now stable.

As one of the few remaining and thriving brown bear populations in North America, the bears of Unit 4 are clearly one of the most charismatic and valuable wildlife species in Southeast Alaska. Hunters and wildlife viewers from many parts of the world have long been drawn to them and interest continues to grow. How we manage for brown bears long ago transcended the sphere of local and state influences to become a national issue.

Although brown bears currently appear overall to be doing well in Unit 4, the same human-caused pressures that led to their disappearance elsewhere are rising in Southeast Alaska. Increases in habitat loss, road construction, tourism, and other development pressures, continued community garbage control problems, and unresolved management issues between types of hunters and between hunters and nonhunters, all threaten the well-being of Unit 4 brown bears to varying degrees.

We recognize that many wildlife management issues are too complex to be dealt with by one agency alone. No one agency or interest group has the authority or expertise to mandate management solutions. And solutions imposed without broad public support are not likely to succeed. When deep-seated, persistent differences prevent humans from agreeing on wise solutions to management problems, wildlife populations usually suffer. We hope that this paper will provide a solid foundation for a broad-based public effort to deal with Unit 4 management issues before they cause problems in brown bear populations.

Chichagof Island *Tom Paul*

UNIT 4 PHYSIOGRAPHIC FEATURES AND HABITAT DESCRIPTION

Game Management Unit 4 is located in the northern portion of the Alexander Archipelago in Southeast Alaska (Fig. 1). Admiralty, Baranof, and Chichagof, often referred to as the ABC islands, are dominant features. Admiralty and Baranof each have an area of approximately 1,600 square miles. Chichagof is approximately 2,100 square miles. Two other large islands are part of Unit 4: Kruzof (172 sq mi) off the west coast of Baranof Island, and Yakobi Island (72 sq mi) at the northwest corner of Chichagof. Like elsewhere in the archipelago, a myriad of small islands dots the coastlines and bays of the larger islands.

The major islands of Unit 4 are characterized by rugged topography, with peaks rising to 3,000–4,000 ft within one mile of saltwater. The shoreline is irregular with many small islands and long, narrow, fjord-like bays. The soils are shallow and their moisture content dictates the plant communities present. Prior to logging, most of the drier sites were originally characterized by old growth Sitka Spruce (Picea sitkensis) and Western Hemlock (Tsuga heterophylla) forests with poorly drained areas at lower elevations characterized by muskegs. Several species of brush and berries (Menziesia, Rubus, and Vaccinium) occur in open and drier areas and within the better drained understory of old growth forests. Over 75,000 acres of National Forest have been logged and are now in various stages of regrowth. Numerous anadromous fish streams are present and utilized by five species of salmon (Oncorhynchus spp.), cutthroat and rainbow/steelhead trout (Oncorhynchus clarki and O. mykiss), and Dolly Varden char (Salvelinus malma). Bays often have deltas with grass/sedge plant communities at their heads or where streams enter saltwater. Higher elevations support muskeg, subalpine, and alpine plant communities.

A cool, maritime climate is characteristic of the unit. Snow often accumulates at sea level during winter, and elevations above 2,000 ft are covered by snow for 7–9 months of the year. Annual precipitation averages about 55 inches, and January and July temperatures average 20^0 F. and 55^0 F. respectively.

Except around communities and in areas that have been logged, most of Unit 4 remains unaltered from its natural state. In addition to the 75,000 acres of National Forest that have been logged, thousands of acres of private lands have also been clearcut. Six hundred forty miles of logging roads have been constructed on National Forest lands as well as a considerable number of miles on private lands. Commercial logging has been the most important human activity in altering brown bear habitat in the unit.

Mammals inhabiting Unit 4 include brown bear, Sitka black-tailed deer, mountain goat, marten, river otter, beaver, mink, muskrat, ermine, red squirrel, dusky and masked shrew, Keen's, long-legged and little brown bat, Keen's mouse, and long-tailed, meadow, and tundra vole. Some of these populations are indigenous and some (red squirrel, mountain goat, marten, and beaver) are the result of transplants (MacDonald and Cook 1996).

Permanent human communities include Angoon on Admiralty Island, Sitka and Port Alexander on Baranof Island, and Hoonah, Tenakee Springs, Pelican, and Elfin Cove on Chichagof Island. In addition people reside for at least part of the year in logging camps, resorts, fish hatcheries, fisheries research stations, small private allotments, and other settlements at scattered locations on the islands.

Origins and genetics of Unit 4 brown bears

Recent studies of brown bear mitochondrial and nuclear microsatellite DNA have revealed information about the species' classification and the genetic uniqueness of Unit 4 bears that may have implications for brown bear management and future bear research in Unit 4 and other areas of Southeast Alaska. The new genetic information has also given rise to a new hypothesis about the origin of Unit 4 brown bears.

Two theories have been proposed for the origin of brown bears in Unit 4. Klein (1965) suggested brown bears and other Southeast Alaska fauna colonized the region's islands approximately 10,000 years ago after the most recent ice age.

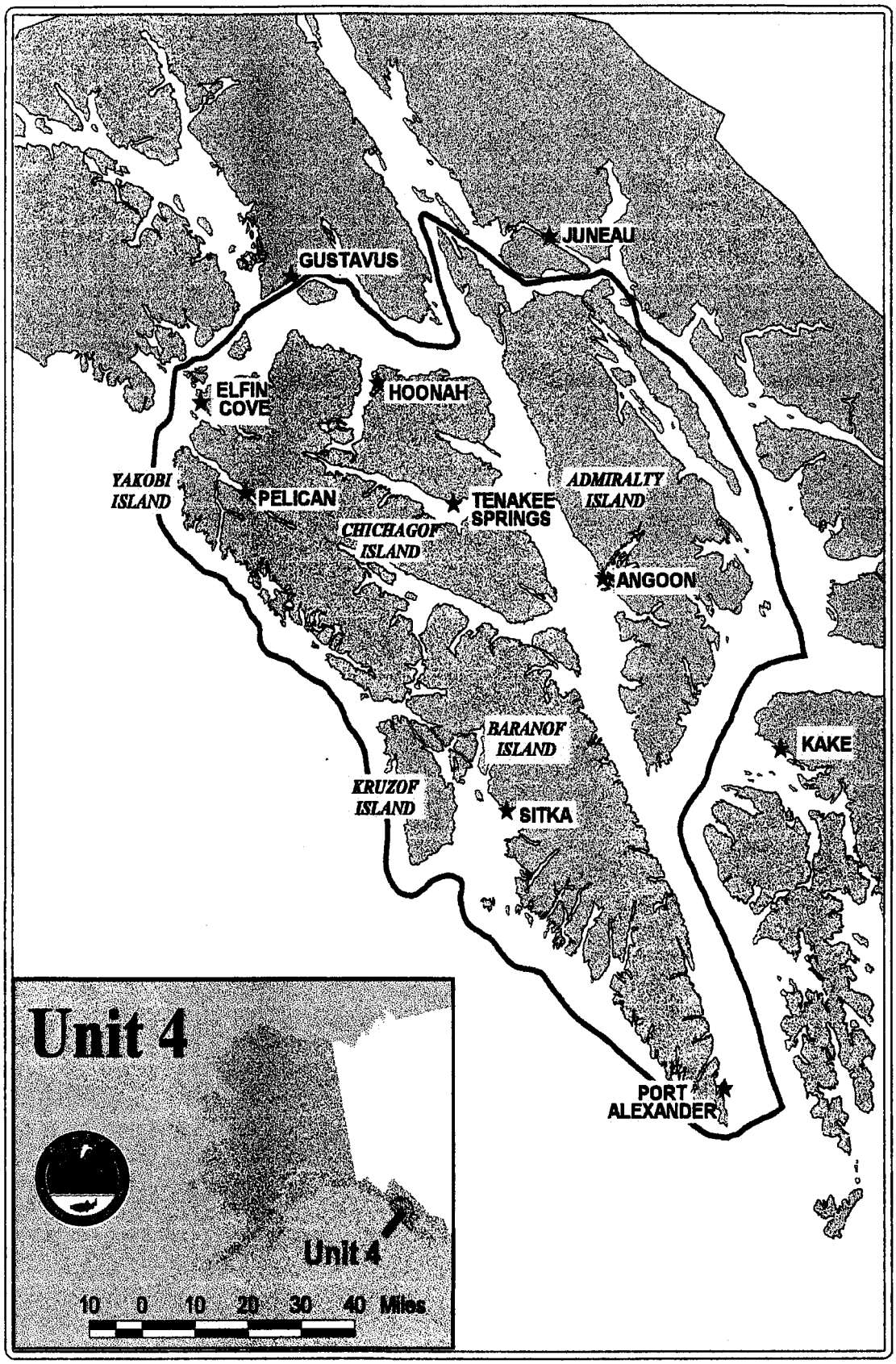

JUNEAU
GUSTAVUS
ELFIN COVE
HOONAH
YAKOBI ISLAND
PELICAN
TENAKEE SPRINGS
ADMIRALTY ISLAND
CHICHAGOF ISLAND
ANGOON
BARANOF ISLAND
KAKE
KRUZOF ISLAND
SITKA
PORT ALEXANDER
Unit 4
Unit 4
10 0 10 20 30 40 Miles

Figure 1

During that period (the Wisconsin glaciation) virtually all of the region was covered with ice. Klein's conclusion also presupposed that Unit 4 brown bears are closely related to mainland brown bears.

Heaton et al. (1996) pointed out that Klein's conclusions did not satisfactorily explain why brown bears are not found on other islands in the Alexander Archipelago. Using recent paleontological and genetic evidence, they propose a different origin for Unit 4 bears. They have suggested that brown bears were widespread in the region both before and after the Wisconsin glaciation and that brown bears on Admiralty, Baranof, and Chichagof (the ABC) islands are remnants of a pre-glacial population that survived on the islands through the ice age in unglaciated refugia. Heaton et al. cite new discoveries of brown bear fossils in caves on Prince of Wales Island to support their theory that brown bears were historically more widespread in Southeast Alaska. They cite new DNA evidence that suggests that brown bears on the ABC islands are very different genetically from those on the mainland and argue that, because of this genetic difference, ABC bears are not descendants from post-ice age mainland colonizers. Instead, they must have existed on the islands for a long time, isolated from other more recently arrived new world brown bears and evolving differently from them.

The genetic evidence cited by Heaton et al. is from mitochondrial DNA (mtDNA) studies by Talbot and Shields (1996a and 1996b). Brown bears from Admiralty, Baranof, and Chichagof islands were found to be unique from all other brown bears in the world and more closely related genetically to polar bears than to other brown bears. Mitochondrial DNA, which carries information about bears' maternity, tells us about historical events in a species' development, but not, except in very rare circumstances, about current gene flow. In the case of bears from the ABC islands, their very homogeneous mtDNA sequences suggests that on the female side they are genetically distinct from other North American brown bears, and that they are a relic of an invasion of U. arctos from Asia into Alaska prior to the glaciation, near the time polar bears branched off from a coastal form of brown bear.

The genetic separation of ABC brown bears from the other mtDNA lineages of brown bears goes back approximately 550,000 – 700,000 years. Being more closely related to polar bears does not mean ABC bears are more polar bear than brown bear. It means that other brown bears have changed more genetically from a common ancestor than ABC bears or polar bears have. Because both ABC bears and polar bears have been separated from the mainland brown bear gene pool for so long, they have more genes in common with each other than with interior and Asian bears. ABC bears' genetic antiquity, mtDNA homogeneity, and close relationship to polar bears makes them unique and "profoundly different" from other brown bears in the world (Shields, 1998 pers. comm.)

The genetic uniqueness found by Talbot and Shields was tempered somewhat and put in greater perspective by results of a subsequent study of bears' nuclear DNA. The study of nuclear microsatellites (Paetkau, Shields, and Strobeck 1998) complements the mtDNA study. Microsatellite DNA, unlike mtDNA, contains information on paternity and can be used to examine gene flow between populations. The study found that within the population of ABC bears, those of Baranof and Chichagof islands are so genetically close that the researchers combined them into a single genetic group.

Data from Paetkau et al. (1998) also indicate that although ABC brown bears have an ancient maternal history, they have not been isolated genetically in recent times. The microsatellite data tell us that male bears have been the agents of gene flow between Baranof/Chichagof islands and Kluane National Park in Yukon Territory to the north. To a lesser extent, some gene flow has also occurred between Admiralty bears and those on the mainland coast directly to the east. In contrast, there is little evidence of recent genetic interchange between Baranof/Chichagof bears and Admiralty bears across Chatham Strait.

The data show that genetic interchange between ABC and mainland bears has occurred within the past 25,000 years, but the data are limited in their ability to describe when or how it occurs (Shields, 1998 pers. comm.). For instance, is the gene flow only from mainland bears migrating to the ABC islands, only from island bears migrating to the mainland, or does it move in both directions? How frequently do bears make the crossing between the islands and the mainland? Since radio-telemetry studies began in the early to mid-1980s no radio collared bear has crossed to the mainland.

Paetkau et al. note that coastal bears in Southeast Alaska are not in genetic "equilibrium"; they are not freely breeding with one another. There are distinct genetic differences between bears in the north and those in the south portions of the region.

ADF&G biologists believe it is important that genetic studies of brown bears continue. A larger sample is needed from mainland brown bears in Southeast Alaska to further define the genetics of coastal bears in relation to bears of Unit 4. For instance, bears in Glacier Bay National Park have not been compared to bears from other mainland locations. Information on the genetics of Glacier Bay bears may be useful in explaining gene flow between Kluane National Park and the ABC islands.

All Unit 4 bear populations are thought to be stable and near carrying capacity, and the viability of populations is not currently in question. In view of the apparent genetic uniqueness of Unit 4 bears, long-term bear and habitat management must insure the continued viability of each major island population.

UNIT 4 BROWN BEAR BIOLOGY AND RESEARCH HISTORY

INTRODUCTION

Aside from C.H. Merriam's classification studies on Southeast Alaska brown bear taxonomy, since discredited, brown bear research prior to statehood was minimal. Dufresne and Williams conducted track count surveys in stream drainages on Admiralty Island in 1932 to estimate brown bear numbers. Similar U.S. Forest Service surveys were done on Chichagof Island in 1938 and Baranof Island in 1939.

Since statehood brown bear research in Southeast Alaska and Unit 4 has been conducted in response to development issues. There are two reasons for this: 1) impending development projects or perceived effects of development focus attention on the risks to bears; 2) funding becomes more available for development issues either because developers themselves provide the research funds or because agencies are able to make a stronger case for increased funding from overall agency budgets or legislatures when wildlife populations may be affected.

This section summarizes what we have learned about brown bear biology through ADF&G research in Unit 4 and what we believe are its key management implications.

HOOD BAY STUDY

During the summers of 1972 through 1975, Bob Wood of the ADF&G trapped, visually marked, and observed 35 brown bears at Hood Bay on Admiralty Island (Fig. 2). The purpose of the study was to get a population estimate and determine the extent of bear movements prior to anticipated logging of the area. Subsequently, the large long-term timber sale contract for Admiralty Island was cancelled. Using tagged:untagged ratios, Wood estimated the study area populations for 1993, 1994, and 1995 were 104, 70, and 72 bears respectively. Although conducted without the benefits of radio-telemetry, another conclusion of the study was that southern Admiralty Island bears have restricted home ranges. Maximum movement recorded was 7 miles and average movement between recorded points was 3.1 miles (Wood 1976).

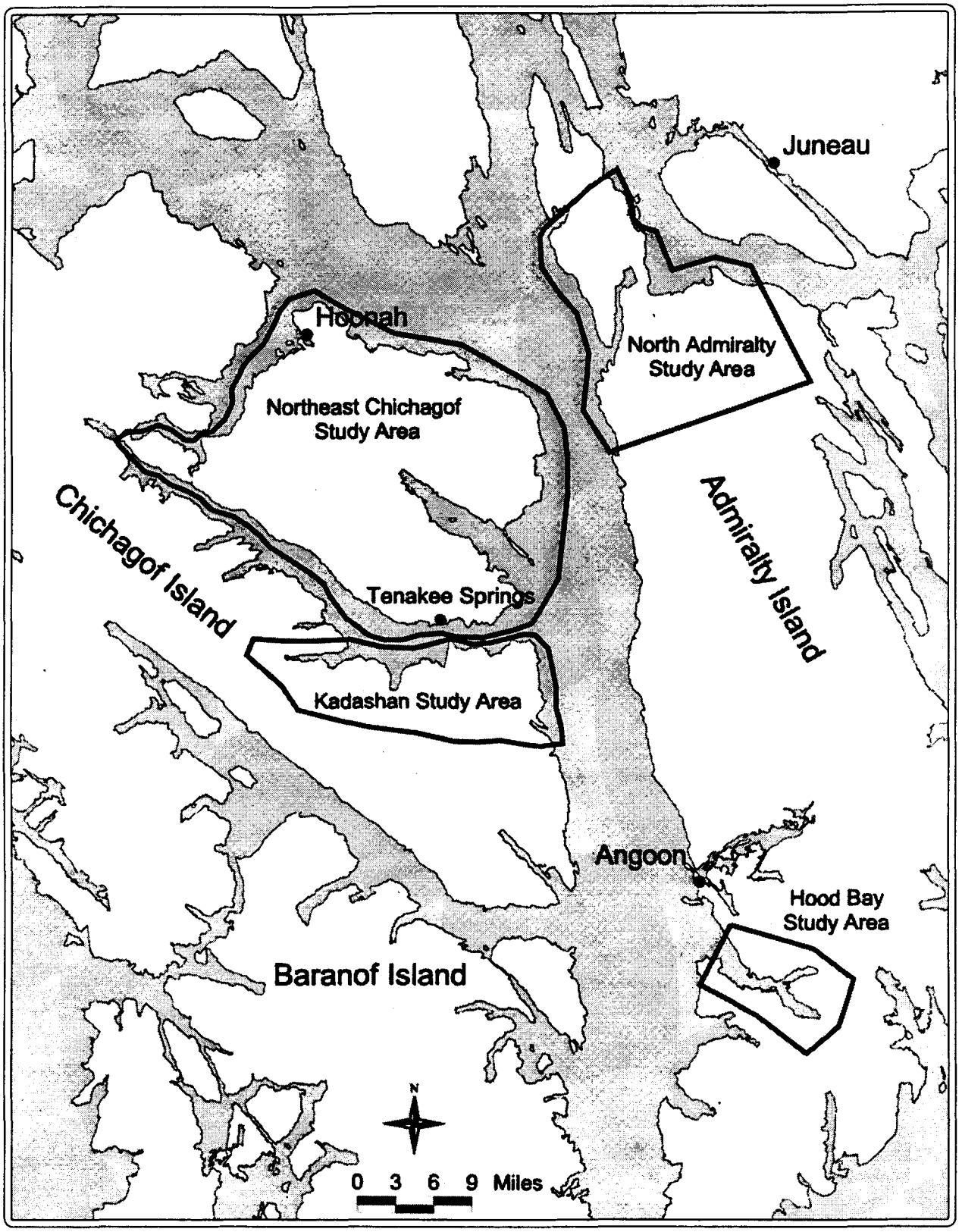


Figure 2 Locations of ADF&G brown bear research areas in Unit 4

Northern Admiralty Island & Kadashan studies

In 1981, John Schoen and LaVern Beier of the ADF&G began capturing, marking, and radio-tagging brown bears as part of a long-term study of bears in the Hawk Inlet area of northern Admiralty Island (Fig. 2). The initial impetus for their research was development of the Greens Creek mine on northern Admiralty. Their objectives were to determine home range sizes, seasonal movement patterns, the types of habitats used by brown bears, and the effects of mining development on brown bears. They also wanted to find and describe denning sites. By following and relocating bears, particularly sows and their cubs, over the years, they planned to determine reproductive rates and relate them to habitat types and hunting harvest levels.

In 1983, Schoen and Beier expanded the radio-telemetry project to bears on southeastern Chichagof Island including the watersheds of Trap Bay, Basket Bay, Corner Bay, Crab Bay, and the Kadashan River. Twenty-seven bears were captured and subsequently tracked to examine the effects of logging on bear habitat selection as well as seasonal habitat use, mortality, reproduction, denning sites, and other population information. Except for Kadashan, most of the area had experienced extensive clearcut logging and roading. A logging camp with an open dump was located at Corner Bay. The field work portion of southeastern Chichagof research project was ended in 1989 and radiocollars were retrieved.

The following is a summary of the major findings of these two research projects.

Demographics – Previous brown bear research in Alaska and elsewhere has found that, in general, brown bears mate from May through July. The cubs, weighing less than a pound, are born the following January and February in a winter den. Litters range from one to five cubs with two being most common. Elsewhere, cubs generally remain with their mother for two years. In Unit 4, however, cubs normally remain with their mother until they are three or even four years old (Beier, et. al. 1996)

Brown bears have the lowest reproductive rates of all land mammals in North America, and Southeast Alaska brown bears begin breeding older and have longer breeding intervals than those found for some other brown bear populations. In Southeast Alaska, Schoen and Beier (1990) found that no sows younger than age 7 produced a litter and the average age for a sow with her first litter was 8.1 years. For brown bears elsewhere the most common breeding age is 5 (e.g., Knight and Eberhardt 1985, Reynolds et al. 1987, Schoen and Beier 1990). On Admiralty and Chichagof islands, the average interval between successful litters

was 3.9 years, longer than for brown bears elsewhere (Eberhardt 1990). Several adult females failed to produce young for five to six year periods. In any given year, 82% of the marked Admiralty Island sows did not produce cubs.

Not only are bear reproductive rates low, but Schoen and Beier found high cub mortality on Admiralty Island. Eleven out of 46 cubs died in the first year of life on Admiralty. There is an important difference between how many cubs are born into a population and how many are successfully weaned and become adults. In a high-density, highly competitive area like Admiralty Island, it is likely many more cubs are produced than are successfully recruited into the adult population.

Despite the difficulties of determining the fate of each bear over several years, Schoen and Beier (1990) found that a minimum of 28% of the 95 brown bears captured on their Admiralty and Chichagof islands study areas died during 9 years of their studies. Of those deaths, 82% of their non-capture-related mortalities were the result of some human factor. This indicates that Southeast Alaska brown bear populations are strongly affected by humans, even in roadless areas such as Admiralty Island.

Home Range Size — Brown bears in southeast Alaska have small home ranges compared with other brown/grizzly bear populations. They have overlapping home ranges averaging about 25,000 acres (40 sq miles) for male brown bears on Admiralty Island. Female home ranges were much smaller, averaging about 9,000 acres (14 sq miles) on Admiralty Island and 6,000 acres (9 sq miles) on Chichagof Island. Bear survival depends for the most part on an adequate supply of food. The availability of food is dependent on a mix of habitats that bears use during the year. Most life requirements such as adequate old-growth forest patches, salmon streams, berry patches, alpine and denning habitat will be contained within a bear's annual home range.

Seasonal habitat use — Habitat use by brown/grizzly bears varies considerably depending upon the types of ecosystems they inhabit in North America. The following summary of their habitat use is based on 4,059 relocations of 95 brown bears that were radiocollared on northern Admiralty Island and Chichagof Island during the period 1981 through 1989. Habitat use by radio-collared brown bears varied seasonally and is considered a response to seasonal differences in food quality and availability.

Most brown bears were found to den in sites above 1,000 feet elevation and emerge from dens in April or May. Many bears then move to low-elevation slopes. Bears prefer plants on these sites which are the first to green up in the spring. During early summer (mid-June through mid-July), most bears move to forested slopes and alpine/subalpine meadows where they forage on new plant growth.

Bears concentrate at low elevations along coastal salmon streams from mid-July through early September. During this late summer season, 54% of all radio relocations of bears occurred in riparian (streamside) forest habitat of predominantly Sitka spruce trees with a devil's club (*Oplopanax horridus*) understory. During this season, 66% of all bear relocations occurred no farther than 525 feet from anadromous fish streams. Bears used this habitat for fishing along river banks, for foraging on succulent vegetation and berries, and for security and thermal cover.

Although more than 85% of bears are associated with salmon streams in late summer, some bears (primarily females) do not move to the coast to fish. These bears (termed "interior bears") remain in interior regions of the island throughout the year, foraging primarily on plants and berries in subalpine and avalanche slope areas. By mid-September, bears which feed on fish return to forests, avalanche slopes, and subalpine meadows above 1,000 feet elevation to feed on currants and devil's club berries before they den.

Denning – Winter denning begins in October and November. Based on locations of 121 den sites of radiocollared bears from Admiralty and Chichagof islands, the average den was quite high and steep at 2,100 feet elevation on a 35 degree slope. About half (52%) of these dens were in old-growth forest. Although denning in caves was common on Admiralty Island, many bears excavate dens under large-diameter old-growth trees or into the bases of large snags (standing dead trees).

FOOD HABITS STUDY

During the late 1980s, graduate student/ADF&G biologist Tom McCarthy studied the seasonal food habits of Admiralty brown bears. Although classified in the order Carnivora (meat eater), brown bears are omnivorous, that is they are both carnivores and herbivores (plant eaters), eating a variety of foods. McCarthy (1989) found that during spring, brown bears feed mostly on sedges (*Carex* species), the new growth of other plants, roots, and deer. Sedges and salmon are the major foods consumed during summer, although bears also use skunk cabbage (*Lysichitum americanum*), devil's club berries (*Oplopanax horridus*), and other plants, berries, and roots. During fall, bears eat salmon, devil's club berries, skunk cabbage, sedge, beach lovage roots (*Ligusticum* species), and currants (*Ribes* species). Where bears were found corresponded closely to the seasonal

John Hyde

abundance and quality of the food items listed above. Because bears have relatively inefficient digestive systems typical of meat eaters and are active for only part of the year, they must exploit the most productive feeding sites available to survive. Brown bear feeding patterns and habitat use often bring them into conflict with humans who use these same lands.

Northeast Chichagof Island study

A marked increase in the brown bear hunter harvest and defense of life and property (DLP) kills on northeastern Chichagof Island coupled with increased human access to that portion of the island from the recently expanded system of logging roads prompted research to be focused on that part of Unit 4 in 1989 (Fig. 2). Again, radio-telemetry was used to study home range size, habitat selection, population characteristics, patterns of human access and brown bear mortality, and the ecology of bears associated with the Hoonah dump. Kimberly Titus and LaVern Beier of the ADF&G began this study with cooperative funding and assistance from the U.S. Forest Service for the first few years.

Demographics - Titus and Beier (1992) captured over 50 brown bears on northeast Chichagof Island older than age 4. Of those, a third (33%) of both males and females were older than age 10. Half the males captured (48%) and 40% of the females were age 6 or younger. One fifth of males (20%) and 27% of females were between 7 and 10. This age structure is similar to that reported for the northcentral Alaska range (Reynolds 1990). From a conservation and management standpoint, it is important to note that brown bears are long-lived and that a significant portion of the adult population is composed of bears older than 10 years old.

Survival - Annual survival rate estimates for the whole Northeast Chichagof population based on the fates of 61 radiocollared adult female and 30 adult male brown bears were 96% and 84% respectively during 1990–1994 (Titus and Beier 1994). The overall annual survival rate for females was high and similar to that of 92% found for a naturally regulated, unhunted population in Katmai National Park (Sellers et al. 1993). It appears to be higher than the 87% female survival rate for a hunted brown bear population on the Alaska Peninsula (Sellers 1994).

The lower male annual survival rate is attributed to hunters' selective harvest of male bears, larger male home ranges, greater movement of juvenile males, and male bears' attraction to the Hoonah dump during this period, all of which exposed them to greater contact with humans. Sellers et al. (1993) found a male survival rate of 96% in an unhunted population suggesting that male bear mortality is similar to females in a naturally regulated population. Male mortality may have been underestimated because some bears were lost track of and

some collars switched to mortality mode in places where they could not be retrieved. Researchers concluded that the patterns of human-caused mortality have resulted in fewer males than females in the bear population on Northeast Chichagof Island (Titus and Beier 1994).

Of 93 brown bears radiocollared and followed on Chichagof during 1989–1994, 11 have been killed, including 5 taken legally by hunters, 1 killed illegally, 2 killed in defense of life or property, and 3 whose cause of death could not be determined. Each of those 3 cases may have been human-caused because one bear was found near a beach and 2 were found less than 200 yards from an open road. Beier et al. concluded that at least 8 of the 11 deaths were human-induced. Results support the overall trend of increasing nonhunting human-caused brown bear mortality on the northeast portion of Chichagof Island in recent years (Fig. 3). During this period additional nonhunting mortality of unmarked bears was also reported in and around the community of Hoonah and its nearby road system. (Beier et al. 1996).

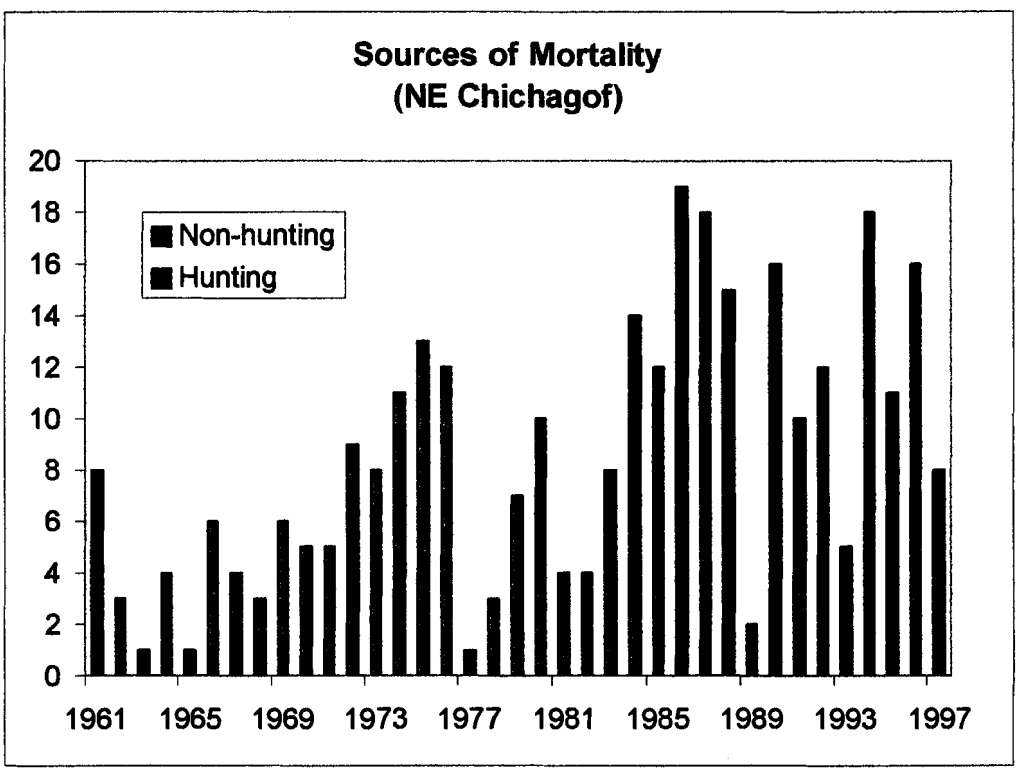


Figure 3 Nonhunting mortality on Northeast Chichagof Island

Habitat use and development effects - On Northeast Chichagof, overall and seasonal uses of habitats were similar to those found on Admiralty. The exceptions were: late summer riparian use on Chichagof was significantly less than that found on Admiralty (31% and 54% respectively); and, Chichagof bears

used avalanche slopes in the fall more than Admiralty bears (43% and 25% respectively). Perhaps riparian habitats were less available on Chichagof or a larger percentage of "interior" bears were in the Chichagof sample. As in the Kadashan study, brown bears avoided clearcuts, using them only 3% of the time in both study areas. No bears were found in second-growth stands (Titus and Beier 1994).

ADF&G research also found that the density of bears on Northeast Chichagof (0.8 bears/sq mi) was 21-28% lower than was found on northern Admiralty (1.1 bears/sq mi) (Miller et al. 1997). Both study areas have approximately the same mix of habitats, abundant salmon streams and other food resources. The habitat differences that do occur were not great enough to explain the difference in density. There are great differences, however, in the extent of human development in the areas. The Northeast Chichagof study area has established communities, recent roadbuilding, and extensive logging, conditions which are generally absent on northern Admiralty. As a result, Titus and Beier (1993) concluded that increased access, logging, and habitat change are responsible for the lower bear density on Northeast Chichagof. This conclusion was supported by a panel of brown bear experts convened during revision of the Tongass Land Management Plan to assess risks to brown bears.

Dispersal – An analysis of the extent of some bears' movements in Unit 4 was done by Beier et al. (1996). They documented the distance between the original place bears were captured and where they died to calculate estimated mean travel distances for northern Admiralty, Kadashan, and Northeast Chichagof bears. On average, males moved farther than females; 9.4 miles compared to 5.4 miles. This can be partly explained by the fact that males have larger home ranges than females. In adult bears (those 7 years old or more), the difference in movement distances between males and females is greater, 5.7 miles vs. 1.9 miles. Subadult bears (6 years or younger at first capture) of both sexes traveled farthest; the average for males was 11.1 miles and for females 10.6 miles. Dispersal from their maternal home ranges probably accounts for the higher means of the younger bears.

Because of time and funding constraints researchers did not regularly try to find radiocollared bears outside the study areas during research projects. Study animals who died outside of the study area, however, provide solid evidence that bears travel widely, at least on Admiralty Island. Researchers have documented the deaths of five marked bears outside the southern boundary of the Admiralty Island study area. Other marked bears have been seen alive south of the study area. The greatest documented distance traveled by a bear on Admiralty was 53 miles by a male from Greens Creek to Hood Bay. Others were found on the Glass Peninsula. Average distance moved by Admiralty bears was 9 miles, and juvenile males on Admiralty traveled farther on average than any other sex or age class.

Bears from the Admiralty study area had larger mean distances between original capture locations and place of death than those on Northeast Chichagof. This probably reflects the geography of the areas. Dispersal from the Admiralty study area is easier because the southern boundary is not a barrier to bear movements. Northeast Chichagof is nearly an island, however, with only a single, narrow land connection to the remainder of Chichagof. No marked Northeast Chichagof bear has been recovered dead outside the study area. One marked bear traveled from the Northeast Chichagof study area to the south side of Tenakee Inlet. It was not found again.

Although brown bears are strong swimmers, water barriers such as those surrounding Northeast Chichagof are apparently significant obstacles to movements. Bears must continue to have access across the land bridge at the Port Frederick–Tenakee Inlet portage that connects Northeast Chichagof bears to those on the remainder of Chichagof Island. Because current population interchange appears minimal, management of Northeast Chichagof bears should recognize this isolation (Beier et al. 1996).

Current status of Unit 4 bear research

Since the ending of the active field research portion of the Admiralty and Northeast Chichagof studies in 1995, ADF&G has maintained radio-collars on over 70 bears and transitioned into a program that monitors reproduction, mortality, and other population dynamics on both the Admiralty and Northeast Chichagof study sites.

Information from Unit 4 research was used by biologists of several agencies to develop a habitat capability model for brown bears in Southeast Alaska. This model was used by the Interagency Viable Populations Committee to recommend an overall strategy for maintaining brown bears in the region. ADF&G has used information from the research to develop guidelines for managing hunter harvest and to develop recommendations on other ways to maintain healthy populations of brown bears. Those guidelines and recommendations appear elsewhere in this document.

The future of continuing research and monitoring on Unit 4 brown bears that meets high standards is uncertain. Despite the recommendation by a panel of bear experts that brown bears continue to be monitored and further research be done as part of the new forest plan implementation, funding in recent years has come solely from ADF&G.

SUMMARY

ADF&G considers the following research findings to be key to Unit 4 brown bear and brown bear habitat management.

- Based on capture-mark-resight methods, brown bears occur in very high densities on Admiralty (1.1 bears/sq mi) and Chichagof islands (0.8 bears/sq mi). The density estimate for the northeast portion of Chichagof Island was significantly lower than that for northern Admiralty Island.

- Unit 4 brown bears show strong seasonal patterns of habitat use. Most bears den above 1,000 feet elevation and move to low-elevation slopes in late April and May. In early summer (mid-June through mid-July), bears move up in elevation to forested slopes and alpine/subalpine meadows where they forage on new plant growth. As chum and pink salmon begin to move into streams in mid- to late July, most bears concentrate at low elevations in lowland forests and riparian habitats. The maintenance of these riparian areas and forested buffers along these salmon-spawning streams is considered a critical component of maintaining viable and well-distributed brown bear populations. By early September most brown bears move to upland old-growth forest stands and avalanche slopes to feed on ripening berries. Bears spend little time in clearcuts and do not appear to use second growth forest.

- Reproductive rates for brown bears on Admiralty and Chichagof islands are similar. Overall mean litter size for cubs of the year was about 1.9. Mean interval between successful litters for adult female bears was 3.9 and 4.1 years based on two analyses. The earliest age of first production of cubs was 6 and

LaVerne Beier

mean age of first litter was 8.1 years. In any given year, 40-50% of adult female bears were without cubs. The late age of first reproduction and the long interval between successful litters suggests a lower reproductive rate than some other brown bear populations, despite the high bear density. The demographic data collected on Admiralty and Northeast Chichagof stress the importance of careful management because the consequences of a management error can be high (Miller 1990*a*). This is because few cubs are produced in any given year, at least 8 years are required for females to become important contributors to the next generation, females only produce cubs once every four years, and loss of too many adults will slow the ability of the population to provide for adequate recruitment.

- Human-caused mortality is the dominant cause of mortality in adult brown bears. Based on our sample of radiocollared bears, a higher portion of mortality was attributed to defense of life or property and illegal kills on Chichagof Island than on Admiralty Island. Road access and development activities were highly correlated with bear mortalities on the Northeast Chichagof road system.

- Annual survival rate estimates based on 61 radiocollared adult female and 30 adult male brown bears were 96% and 84% from Chichagof Island during 1990–1994. The differing survival rates between sexes and the higher male mortality rate is not unlike other brown bear populations where much of the mortality is human-caused, either through hunting or development-related activities. Across Unit 4, patterns of bear mortality combined with our knowledge of reproductive rates and population recruitment suggest that a 4% annual human-caused mortality rate is a conservative management approach that, if not exceeded, will sustain high bear densities.

- Estimates of brown bear dispersal and movements suggest that juvenile males disperse greater distances than other sex and age classes. Brown bears marked on the northern Admiralty Island study area have dispersed to Glass Peninsula and Hood Bay, indicating that the island contains one large brown bear population. Bears on Northeast Chichagof, on the other hand, appear to face significant barriers to movement and interchange with other bears on Chichagof. Only one bear is known to have left Northeast Chichagof in eight years of research there. Management of the Northeast Chichagof bears should recognize this isolation.

BROWN BEARS AND LAND MANAGEMENT

INTRODUCTION

Brown bears are animals of wild lands. History shows they do not do well in proximity to humans or extensive human development. Consequently, management of lands in brown bear country has a great effect on the welfare of brown bear populations. In Unit 4 most brown bear habitat is managed by the USDA Forest Service. Native corporations own and manage large private tracts on Admiralty and Chichagof islands. The chief land management issues affecting bears in Unit 4 are loss and alteration of habitat from logging and the disturbance that accompanies human settlement, development projects, and their associated roads. Habitat loss and disturbance activities are distinct problems. Because they typically accompany each other during resource development, solutions to them are often intertwined.

HABITAT ISSUES

Loss and alteration of habitat is not an issue everywhere in Unit 4. The major islands in Unit 4 are subject to varying amounts of timber harvest and other habitat alteration. Most of Admiralty Island is Wilderness, but a large mine development operates on the north end of the island and significant clearcut logging on private land has occurred in three watersheds. About half of Kruzof Island and a quarter of Baranof Island are still in land management prescriptions which allow logging. More than half of Chichagof Island is subject to logging (USDA Forest Service 1997*b*).

The area of most current concern in Unit 4 in regard to brown bear habitat loss is eastern Chichagof Island, particularly Northeast Chichagof Island. Logging on both private and public lands has resulted in clearcuts and roads in every watershed (Fig. 4). The major roads are closely associated with major fish streams and many stream buffers are quite narrow. The new Tongass National Forest management plan identified and mapped large 40,000 acre reserves across the forest that were designed to be non-roaded, non-development tracts for wildlife. Bears were an important reason for adopting the reserve strategy. On Northeast Chichagof, however, no large unroaded, uncut area remains and the mapped large reserves contain extensive areas of second growth and road systems. Concern about long-term effects of this level of logging on bears is elevated because the northeast Chichagof peninsula may function as a separate island with regard to bear populations. ADF&G biologists believe little migration of bears occurs on or off the peninsula. In eight years of research only one marked bear left Northeast Chichagof.

Foremost among habitat issues concerning bears is the effect of development on anadromous fish streams and the riparian forest habitats associated with them. For half a year while hibernating in their dens, bears must live off the fat reserves they are able to build during the other half year. The major reason the ABC islands can support such dense populations of bears is the presence of salmon streams which provide a readily accessible, efficient way for bears to build their fat reserves. Bears use forests along streams for travel, for loafing between fishing sessions, and for hiding and escape cover from other bears and humans. Riparian forests also contain currants, devil's club berries, and salmonberries which bears eat. ADF&G research found 66% of all bear use during fishing season was within 525 feet of fish streams. Protecting the productivity of fish streams and the nearby habitat which bears use while fishing is one of the chief habitat issues that influences bear survival in Unit 4.

Fish stream productivity can be adversely affected by sedimentation entering the stream directly or running down tributaries. The sediment can come as runoff from logged areas, road construction, poor road maintenance, unstabilized stream banks, and slope failures. For travel corridors, loafing areas, and hiding and escape cover, bears need riparian forest preserved in buffers. It's important to note that bear use buffers may need to be wider than those needed to protect stream productivity.

Bears also use old growth upland forest habitats, particularly in the fall. Some use higher elevation old growth for denning. The current preferred logging method in Southeast Alaska is clearcutting. ADF&G research has found that brown bears use clearcuts rarely, only about 3% of the time (Titus and Beier 1994, Schoen and Beier 1990). ADF&G biologists believe bears make limited use of clearcuts in Southeast Alaska because other sites (alpine/subalpine, wetlands, riparian old growth, and avalanche slopes) provide more nutritious foraging and better cover habitat than clearcuts. For example, the devil's club berries, currants, and salmonberries, which bears prefer, are more abundant in riparian and avalanche slope habitats than in clearcuts.

Second-growth forests which replace clearcuts after 30 years, were not used by bears at any time of year during ADF&G research projects (Titus and Beier 1994, Schoen and Beier 1990). Because younger second-growth conifer stands in Alaska produce minimal understory vegetation, second growth provides poor foraging habitat for herbivores and omnivores like bears. The standard timber rotation cycle in Southeast Alaska is 90 to 125 years. Eventually second-growth forests will dominate about 75% of lands subject to clearcutting. The wholesale replacement of old growth upland forest habitats with clearcuts and eventually second growth in some drainages reduces the carrying capacity of the habitat as a whole. The net effect of clearcut logging of old growth in Unit 4 will be a

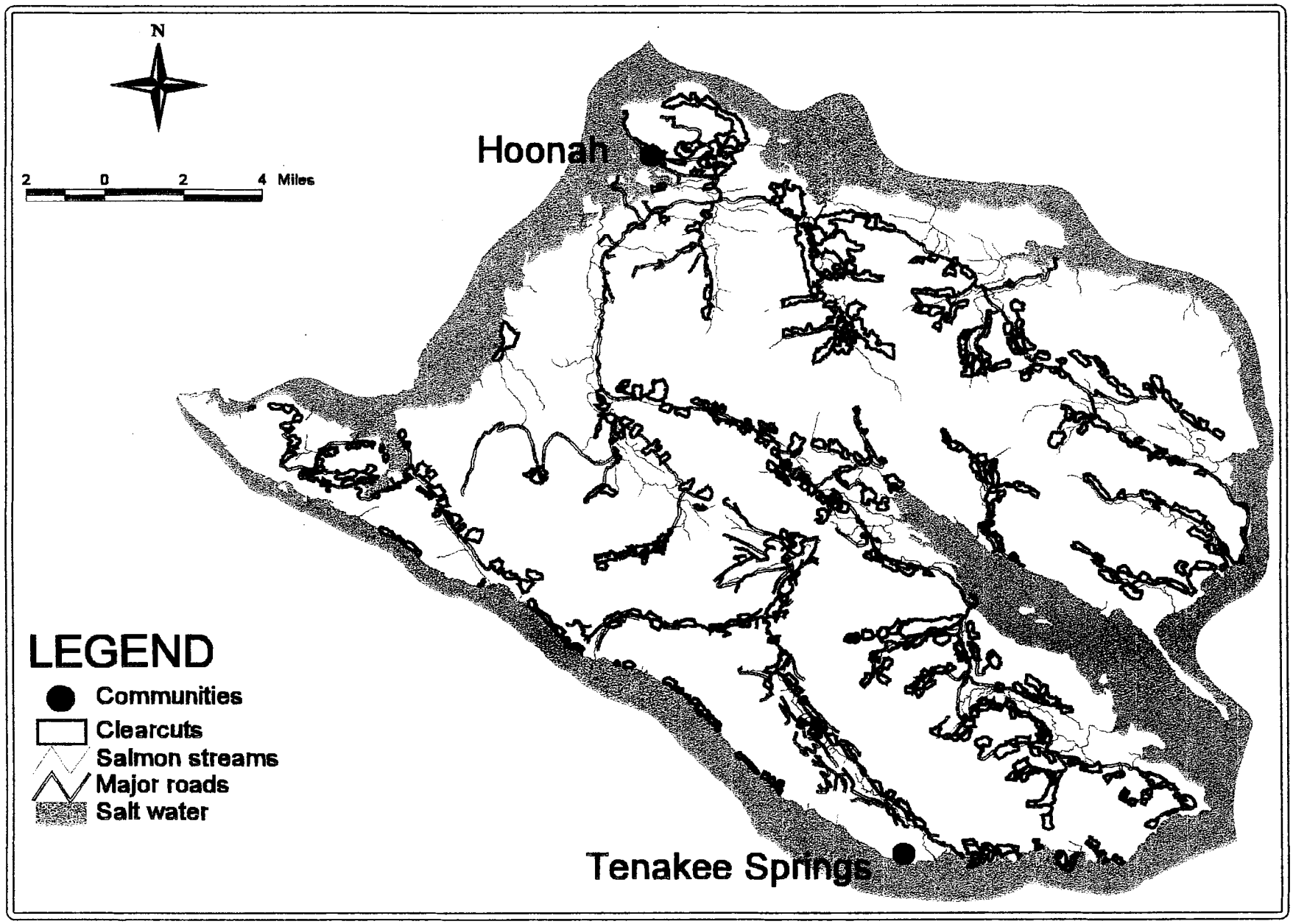


Figure 4 Logging, roads, and major streams on Northeast Chichagof Island

long-term reduction in brown bear carrying capacity. As carrying capacity declines, risks to long-term survival of populations increase. A smaller carrying capacity also means fewer bears will be available for hunting and viewing.

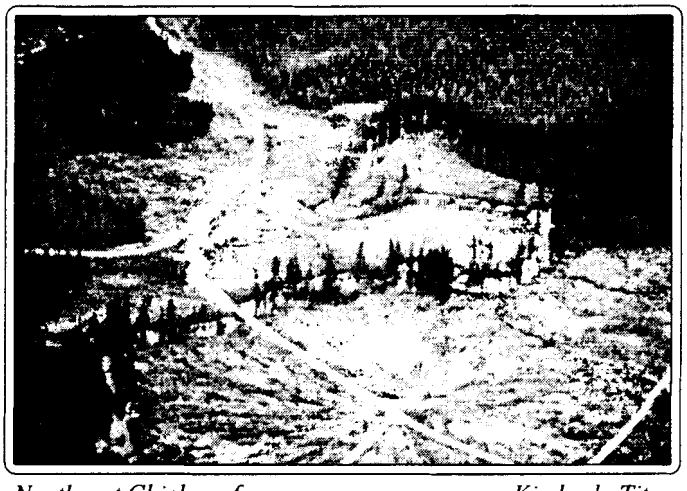
Roads and development

Brown bears, which range over extensive areas (from 3,500 to 50,000 acres) should be considered creatures of landscapes rather than of specific habitat types. Aside from habitat degradation, resource development like logging, mining, hydroelectric development, and tourism, must also be evaluated in terms of bear-human interactions. Resource development in the generally wild, undeveloped areas that characterize brown bear habitat significantly improves human access to those areas and so increases disturbance as well as direct human-induced mortality of bears. Roads are usually detrimental to bears because they increase the opportunity for human-induced mortality of bears through legal hunting, defense of life or property kills, and illegal killing (Knight 1980, Peek et al. 1987, Rogers and Allen 1987, McLellan and Shackleton 1988, Brody and Pelton 1989, Schoen 1990). Although it is possible to manage the legal hunting of bears, it is difficult to control illegal kills, wounding loss, and defense of life or property kills. Once an area is roaded for one development activity, it often results in additional developments which increase human-bear interactions, and ultimately reduces the area's capability for supporting viable bear populations.

The dense rain forest of Southeast Alaska provides more security cover for bears than more open habitats in the Rocky Mountains or northern Alaska. Road building activities in the Greens Creek drainage of Admiralty Island displaced fewer bears than expected, presumably because of the security cover provided by the dense forest. In Southeast Alaska, bears may remain closer to development activities than they do elsewhere because of the dense forest cover. As those bears become habituated to humans and/or associate humans with food (garbage), human-bear interactions will increase and result in higher bear mortality. Human garbage has been implicated as one of the major contributors to bear attacks on humans and ultimately the reason that many garbage-habituated "problem" bears must be destroyed (see below).

Arterial and collector roads accessible to vehicles have greater impacts on bears than local roads and roads closed to vehicular traffic. Roads closed administratively with gates or excavated pits would still have some level of off-road vehicle traffic. Although less detrimental to bears than roads accessible to vehicles, roads closed temporarily (with gates) pose greater impacts than permanently closed roads (through bridge removal). All roads, regardless of closure, still have the potential for supporting more people traveling on foot which can also place pressure on bears.

The combination of roading and logging may be particularly detrimental. A radio telemetry study comparing roaded and unroaded watersheds on Chichagof Island found that brown bear locations were much farther away from the salmon stream in the highly roaded and clearcut watershed than the uncut and pristine watershed. This may mean bears are not making optimal use of the salmon food resource in heavily roaded and cut drainages. The highly roaded and clearcut watershed lacked cover and forested stream zones. Brown bears continue to make use of streams in heavily logged watersheds. They seldom use the clearcut habitat, but make frequent use of roads and the patches of remaining forest. Brown bears were much closer to secondary and blocked roads than primary roads in the roaded watershed indicating that they do not avoid these locations. This results in more frequent bear-human encounters and increases mortality rates (Schoen, et al. 1994).



Northeast Chichagof *Kimberly Titus*

Brown bear mortality on Northeast Chichagof Island supports the view that increased human activity reduces brown bear numbers and habitat capability. Titus and Beier (1992) documented that the number of bears killed in autumn was directly related to the total length of roads built on northeastern Chichagof Island during the period 1978 to 1989. An additional number of bears were likely killed illegally during that period as well.

Larger communities likely have greater impacts on brown bears than smaller communities. Brown bears are rarely observed in or near major cities or towns in southeast Alaska, but they are much more frequently encountered near small villages. Even though suitable habitat exists near the larger communities, it is not used because the bears are either killed or displaced by human activity. Similarly, permanent camp sites used to support development would have more effects than temporary camps. Clearly, the effects of human activity and development on bears need to be incorporated into any analysis of the effects of land management activities on brown bears.

One effect of development activities in remote areas is an increase in hunter harvest along with defense of life and property (DLP) kills. Depending on the size and permanence of camps the increase in hunter harvest can be substantial and prolonged and change harvest patterns over a large area. Brown bear managers in British Columbia routinely close bear hunting while an area is being logged to guard against overharvest. Because of ADF&G concerns about the effects of its development on bears on north Admiralty, Greens Creek Mining Co. prohibits hunting by employees while they are at camp or on duty status. ADF&G believes this voluntary company policy along with a strict garbage control policy has helped reduce the potential detrimental effects of the mine on bears. We recommend it be adopted by all camp managers.

Alpine and subalpine bear habitats may be increasingly affected by mining and tourism activities. Recent proposals have included mineral drilling exploration and heli-hiking tours in Unit 4 alpine areas. The alpine is a critical seasonal habitat for bears. Although isolated, infrequent human activity is of little concern, the cumulative effects of regular and increasing activity can be detrimental. Scheduling activities during seasons when the majority of bears are elsewhere provides some mitigation, but some bears remain at high elevations most of the year (Schoen and Beier 1990). The welfare of these "interior" bears depends on their foraging success in alpine and subalpine habitats.

The action usually proposed in timber sale documents to mitigate bear losses from logging and roading is to change hunting regulations to ensure bears are not overharvested. The ADF&G has recommended such changes where appropriate and the Board of Game and Federal Subsistence Board have adopted them. With continued logging expected on northeast Chichagof and elsewhere, hunters must expect more restrictive regulations in the future. At some point hunting restrictions may not be sufficient mitigation for losses caused by logging and development. Even in the absence of legal hunting, many bears will undoubtedly be killed in future control actions around rural communities and camps (particularly around garbage dumps), by deer hunters in defense of life, and by an undocumented level of poaching.

ADF&G believes strongly that careful road and access planning is essential to limiting brown bear mortality in Unit 4. Forest planners and managers need to recognize and remain mindful of the habitat and development factors in bear survival. The public must make known what tradeoffs in bear carrying capacity and hunting it will accept in return for continued forest development.

SOLID WASTE AND BEARS

The combination of increased road access and bears becoming habituated to garbage dumps and people is a major concern of bear managers in coastal forests of British Columbia and Southeast Alaska. Garbage dumps without incinerators and/or bear-proof fencing, attract bears from long distances. These bears become habituated to humans and human foods and are more prone to interact with humans, thus decreasing their probability of survival.

The current ADF&G Division of Wildlife Conservation (DWC) policy on solid waste management is based on the assumption that non-hunting human-related mortality such as illegal and defense of life and property (DLP) kills contributes to excessive mortality. Bears are often attracted to human settlements because of improper food storage and/or garbage disposal. These animals are then destroyed with no measures taken to correct the human activities creating the problem. The public frequently expects DWC to either kill or relocate problem animals. In chronic problem areas, DLP mortality could become a population "sink", countering reproduction in surrounding areas and possibly contributing to lower population densities in a wider area.

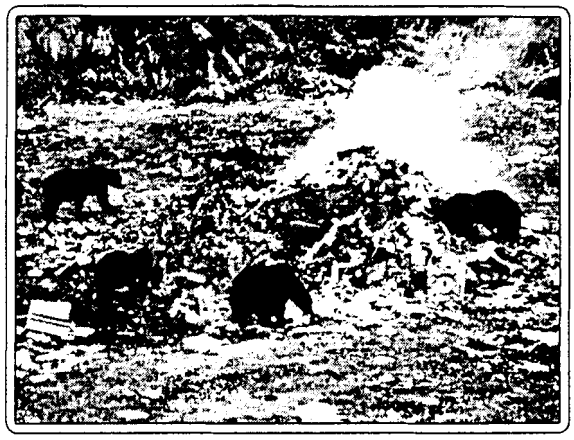
As a result of observations made in 1984 during brown bear research, ADF&G highlighted problems at the Corner Bay and Kennel Creek logging camps on Chichagof Island in a letter to the Alaska Department of Environmental Conservation (ADEC). In January 1985, ADF&G and ADEC met with the US Forest Service about improving solid waste treatment at logging camps and other USFS permitted sites. The Forest Service agreed at that time to require all solid waste sites under Forest Service permits, including those at logging and other resource development camps, to meet all state and federal rules and regulations.

Subsequently, ADF&G recommended installation of solid waste incinerators at Corner Bay camp and other camps throughout the Tongass National Forest. In September 1987, ADF&G, ADEC, the Alaska Department of Public Safety, and the USFS issued a "Joint Policy Statement and Action Plan for Southeast Alaska" (see Appendix) in which they agreed to work together to meet the following objectives: reduce habituation of all Southeast Alaska bears to garbage, reduce potential bear/human confrontations, and decrease overall problems caused by improper handling of solid waste. In March 1990, ADF&G/DWC issued a "Policy on Solid Waste Management and Bears in Alaska" (see appendix) with the objectives of reducing bear/human interactions and confrontations, providing consistent policy guidance to ADF&G staff, and providing guidelines to other agencies and the public.

ADF&G has worked with ADEC, the U.S. Environmental Protection Agency, and local communities to minimize attracting bears into areas where their presence conflicts with human safety. We have advocated community efforts to deny bears access to garbage (baling, incineration, daily garbage burial, bear proof garbage containers, and mandatory garbage pick-up), and preventing bear-human contact (fencing of and controlled periods of public access to dumps). Communities need to also encourage individuals to store food and garbage in such a manner that it is inaccessible to bears. ADF&G needs to increase funding to better educate the public about bear behavior so bears will not be destroyed in non-threatening situations.

It has been ADF&G policy that bears will generally not be transported and released elsewhere. Home ranges of brown bears are large and their ability to return are well documented. Transplanted bears frequently cause problems in the new area or along their return route. The ultimate responsibility for resolution of most bear problems rests with the public; but illegal kills and the non-justified destruction of bears will result in appropriate citations.

Most small communities and settlements in Unit 4 do not have public landfills that attract bears. Two communities, Hoonah and Angoon, have had open raw-garbage landfills that have attracted large numbers of brown bears, resulting in a number of bears being killed. The Hoonah landfill once had as many as 13 different bears regularly feeding on garbage. In fall 1996, Hoonah took steps to improve its landfill operation. Garbage is now confined to a small area and burned and buried daily in the landfill. Bears are still attracted to the site but far fewer than in the past. A new fall hunting season to allow harvest of displaced dump bears in the immediate Hoonah area had no bears reported killed in fall 1997.



Hoonah landfill 1992 *Kimberly Titus*

As long as its daily operation is maintained conscientiously, Hoonah's improved treatment of garbage should lead to increased human safety and fewer bears killed, at least in the short term. Angoon's open landfill still attracts a large number of bears, including sows with cubs, and remains a safety concern for both humans and bears. Over the long-term, we believe the best solution for dealing with community waste in bear country is incineration or barging the waste to landfills or incinerators elsewhere.

TLMP CHANGES AFFECTING BROWN BEARS

In 1997, the Tongass Land Management Plan (TLMP), directing management of the national forest, was revised. Some changes were adopted which improved habitat management for brown bears (see USDA Forest Service 1997*a*:4-113 and 4-114). Although some changes fell short of recommendations made by ADF&G biologists they represent a positive step in better land management for bears.

Two panels of bear experts convened in 1996 and 1997 to rate the relative risk to brown bear viability posed by different TLMP revision alternatives agreed on the importance of fish streams to brown bears. Summaries of the panel discussions indicate that a primary habitat concern centered around protecting fish habitat and providing wider stream buffers along anadromous fish streams for bears (Iverson 1996, Meade 1997) . They recommended minimum 500-foot no harvest-no road riparian buffers be retained on all anadromous streams in brown bear areas unless evaluations indicated they were not needed. Current TLMP standards and guidelines for brown bears include buffers of "approximately" 500 feet in important brown bear foraging sites committing the Forest Service to putting the buffers only where an evaluation finds they are needed.

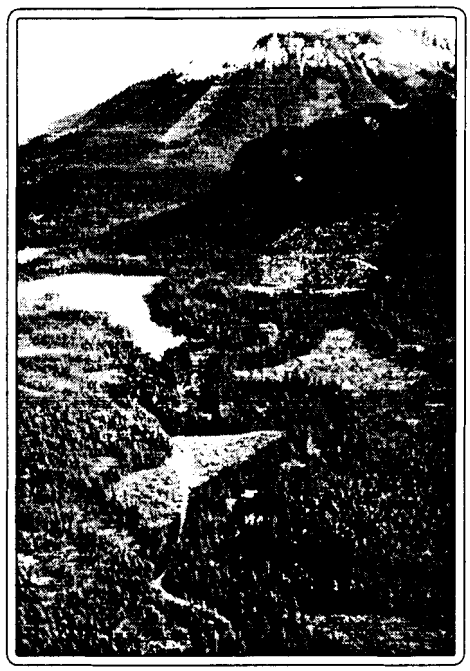
Roads and access management were also identified as a primary concern by the two panels. The risks posed by roads include increased human access to bears and damage to salmon streams. Panelists agreed with an ADF&G conclusion that increased access, logging, and habitat change are responsible for the lower bear density on northeast Chichagof than on Admiralty. They recommended retaining unroaded watersheds in a roadless condition, constructing necessary roads more than 500 feet from fish streams with perpendicular stream crossings only, and closing roads in high priority watersheds (Iverson 1996). In the TLMP Revision the Forest Service committed to developing road access and travel management plans, and to manage road use in brown bear concentration areas to minimize bear/human encounters.

The TLMP Revision also instituted a system of old growth habitat reserves which was originally recommended by an interagency team of biologists in 1992 and strongly supported by a peer review of that team and by the brown bear risk assessment panels. The reserves are intended to provide habitat refuges for brown bears and other old growth dependent species that guarantee the species will continue to have well-distributed, viable populations throughout their ranges in the National Forest. ADF&G's management mandate is to maintain not just viable bear populations but populations that are healthy and large enough to be used by the public. Although ADF&G strongly supports the concept of habitat reserves, we have serious concerns, particularly on eastern Chichagof Island, that the current reserve system may not be adequate for the long-term conservation of healthy and useable brown bear populations.

The TLMP Revision commits the Forest Service to annual monitoring of brown bear populations but ADF&G believes the estimated cost and the methods proposed for the monitoring are inadequate.

The Forest Service also:

- recommitted to working with the ADF&G, communities, and other agencies to insure proper solid waste disposal in brown bear areas.
- committed to "working with ADF&G to develop and implement a brown bear management plan which considers access management and seasons and bag limits to manage brown bear mortality rates within sustainable levels".



Kimberly Titus

GUIDELINES FOR MITIGATING AFFECTS OF RESOURCE EXTRACTION INDUSTRIES ON BROWN BEAR POPULATIONS

ADF&G has proposed guidelines for reducing the effects of development on brown bears. The following guidelines emphasize managing human activities to reduce bear-human interactions. Fewer interactions should decrease the chances of injuries to humans as well as lessen the detrimental effects on bears. The guidelines were developed as a result of bear research associated with the Greens Creek Mine on Admiralty Island and logging at Tenakee Inlet on Chichagof Island.

Camp sites:
New construction for camp sites (permanent and seasonal) should never be located closer than 1 mile from sites of seasonal brown bear concentrations (anadromous salmon streams, estuarine sedge meadows, etc.).

Firearms:
In large industrial camps (logging and mining camps, etc.), camp policy should discourage the carrying of personal firearms by all employees except foremen and security personnel.

Hunting, fishing, and backcountry recreation:
Hunting by industrial camp personnel should be prohibited by camp policy at or near the camp site while employees are on duty status. Fishing along anadromous salmon streams should also be discouraged in areas of seasonal bear concentrations. Hiking, berrypicking, photography, and other outdoor activities should be minimized outside the camp compound and particularly in areas of seasonal bear concentrations.

Feeding bears and littering:
Attracting and habituating bears to human foods is one of the most significant causes of bear-human conflicts. It is illegal to feed bears. This should be a strictly enforced camp policy (see solid waste guidelines below). Camp policies should also clearly prohibit leaving foods or other bear attractants in the field or work area. These policies need rigorous enforcement.

Road construction and access:
Road construction in brown bear habitat should be minimized. Construction of roads should be avoided less than one mile from important seasonal concentration areas (anadromous salmon streams, berry fields, estuarine sedge flats, etc.). Where road construction in bear habitat is unavoidable, public and recreational access should be prohibited and strictly enforced. When roads are no longer necessary, they should be permanently removed or made impassable to motorized vehicles.

Habitat impacts:
Construction of industrial facilities and recreational or homesite developments should be avoided in areas of seasonal bear concentrations. Short-term intensive human use of seasonal bear concentration sites should be scheduled to avoid peak periods of bear use. Logging of riparian old-growth forest adjacent to anadromous salmon streams should be avoided within 500 feet of the streamside.

Harassment of bears:
Bears should not be harassed or chased by motorized land vehicles or aircraft. Bears should be approached no closer than 500 feet and 1,000 feet by fixed-wing aircraft and helicopters, respectively.

Bear-human conflicts:
ADF&G has developed a policy for dealing with bear-human conflicts. This policy emphasizes the prevention of conflicts through public information, reducing attractants (food, garbage), and nonlethal deterrence. In cases where immediate danger to an individual or his property exists, offending bears may be killed by any individual under provisions of the Defense of Life and Property (DLP) regulation (5 AAC 92.410). This regulation should be employed only as

a last resort. If a bear is killed under DLP provisions, and the taking was brought about by improper garbage or a similar attractive nuisance, the offender will be warned or cited. It is not legal to kill a bear to protect a hunter-killed game animal.

Education:
All industrial camps and other facilities (lodges, fish camps, fish hatcheries, tour groups, research and exploration camps, etc.) should routinely provide bear safety education to their employees. This can be accomplished by inviting wildlife managers from state or federal agencies to periodically speak to camp staff or by using educational material from those agencies. Bear safety programs should emphasize camp sanitation, basic bear biology and behavior, how to avoid contact with bears in the field, and what to do in case of a bear encounter.

FOOD AND SOLID WASTE GUIDELINES

Human activities and industrial camps located in brown bear habitat should comply with the current ADF&G "Policy on Solid Waste Management and Bears in Alaska", including the following guidelines.

1. Solid waste disposal sites for communities and permanent field camps should be located in habitats receiving the least use by bears. Traditional movement routes and seasonal concentration areas (such as salmon spawning streams or productive berry areas) should be avoided.

2. The preferred alternative for disposal of organic products that may attract bears is incineration in a facility that meets Alaska Department of Environmental Conservation (ADEC) standards for combustion residue (less than 5% unburned combustibles). In large urban communities or at regional disposal sites, daily landfill and burying is an acceptable alternative to reduce or eliminate attraction to bears, provided that these facilities are secured by a bear-proof fence. Existing open-pit sites that use surface burning for disposal should be phased out and replaced by a system of daily incineration meeting the above standards or by daily landfill.

3. Large (more than 15 people), permanent (longer than one season) field camps should dispose of organic products by daily incineration in a fuel-fired incinerator that meets the above standards. Or, organic products could be hauled daily to an ADEC-approved regional disposal site. Temporary storage of organic products prior to incineration or backhaul should be in a bear-proof enclosure (building or fence). Ideally these camps should be surrounded by a bear-proof

fence. If entire camps cannot be fenced, then dining halls, kitchens, sleeping areas, and incinerators should be fenced, with no organic wastes allowed to be left in vehicles.

4. Small permanent facilities (e.g., lodges, weather stations) or large nonpermanent camps should daily segregate and store organic wastes and items such as cans and jars that are contaminated with organic waste in a bear-proof container for weekly backhaul to an approved disposal site. Alternatives are (1) organic waste and other combustibles could be incinerated in a locally fabricated incinerator meeting ADEC standards for residue, or (2) garbage grinders with disposal to a sewer system could be used to remove organic wastes, while contaminated combustible and noncombustible wastes could be incinerated or temporarily stored as above.

5. Food and organic wastes, if stored outside in bear habitat, should be stored in sealed bear-proof containers. Although it is not necessary to remove fish or game carcasses from the field, these should not be left at a central site nor should they be left in or near a campsite or other place with high potential for bear-human conflicts.

6. Small parties using Alaska's backcountry should burn all combustibles and pack out all noncombustibles. Organic material should not be discarded along trails. Caution and common sense are required to reduce or eliminate bear attractants.

7. In all new parks, roadside facilities, and temporary construction worksites located in bear habitat, bear-proof garbage cans and regular garbage pickup should be required. This requirement should be phased into all existing facilities as soon as possible.

8. Baiting and feeding bears and other wild game by photographers, tourists, hunters, or others is prohibited except for trapping furbearers or hunting black bears consistent with regulations on black bear baiting.

9. Bears currently accustomed to eating garbage should be handled on a case-by-case basis according to the ADF&G's guidelines for managing bear-human conflicts.

GARBAGE
KILLS BEARS

BROWN BEAR VIEWING

INTRODUCTION

Seeing a brown bear in the wild is one of the most memorable wildlife experiences many people have. For the majority of people in modern times it is also one of the rarest experiences. Because of the high density and number of bears in Unit 4, viewing and photographing of brown bears has a long history in Southeast Alaska.

In the late 1920's and early 1930's, the celebrated bear hunter and guide Allen Hasselborg regularly guided groups of photographers and writers on trips to Admiralty Island primarily to photograph brown bears. Among those that Hasselborg guided was conservationist Arthur Newton Pack for whom Pack Creek was named. When a movement to exterminate Admiralty Island bears gained steam after Forest Service employee Jack Thayer was mauled by a bear in 1929, the publicity generated by those writers and photographers helped conservationist George Bird Grinnell, journalist Stewart E. White, Boone and Crockett club co-founder William T. Hornaday, and others start a counter campaign to make Admiralty, Baranof, and Chichagof islands brown bear sanctuaries. A compromise was reached when Pack Creek and Thayer Mountain on Admiralty were closed to hunting in 1934 (see Howe 1996:134-161).

During 1932–57 and 1960–64, nonresident photographers pursuing brown or grizzly bears in Alaska were required to be accompanied by a licensed guide in some circumstances. Beginning in the 1920's and lasting until 1955, Campbell Church's large guiding company brought photographers and tourists as well as hunters to find brown bears. As Southeast Alaska bears became more well known to the public, later established bear hunting guides like Ralph Young and Karl Lane began guiding wildlife watchers too.

Seeing bears was once an opportunity available only to big game hunters, scientist/adventurers, and wealthy tourists. Now the speed, efficiency, and affordability of modern transportation has put Southeast Alaska and other remote areas well within the reach of large numbers of people who want to see bears. As a result, bear viewing in Unit 4 has grown rapidly in the past ten years and the number of both guided and unguided people setting out each year to view and photograph bears is expected to increase.

Brown bears are of course also seen when people are engaged in other activities such as hiking, beach combing, fishing, or hunting for other species. Although these opportunisitic, mostly unintentional sightings account for a great deal of the bears seen, in this paper we discuss the intentional viewing of bears.

Where bear-viewing occurs

Much intentional and opportunistic bear viewing in Unit 4, for reasons both of convenience and safety, is done from boats. Brown bears are most often viewed in spring on shorelines and grassy tidal flats where they feed on newly-green plants. In summer and fall bears can be found on these flats and along streams during salmon runs. Because of the brown bear's reliance on salmon for food in Southeast Alaska, bears frequent salmon streams in concentrations that allow fairly predictable sightings of bears when the fish are spawning. Such places have also begun to attract humans eager to see and photograph bears. Tide flats and other beach areas also provide opportunities to see bears. However the large extent of many tide flats and estuary systems and the large tidal fluctuations often mean that people wanting to view bears in these settings need to go ashore.

Pack Creek *Jim Faro*

Although bears are ubiquitous in Unit 4, some bays, estuaries, streams, and shorelines attract more bears, are more accessible to humans, or for other reasons are considered more dependable viewing sites than others. A survey of commercial tour operators in 1989 by the ADF&G Division of Habitat and Restoration (Shea, 1993) identified areas targeted by tour operators at that time for viewing brown bears.

Garbage dumps also provide brown-bear viewing opportunities, though not of the high quality associated with viewing bears in their natural environment. Angoon and Hoonah, in particular, have had a number of brown bears habituated to feeding at the garbage dump which attract local and visiting viewers and photographers.

Effects of viewing

Viewing is nearly always considered a benign, "nonconsumptive" use of bears because, after being watched or photographed, bears remain to be viewed by others. Viewing can have detrimental effects on bears and other wildlife, however. Wild bears unaccustomed to people will generally avoid them if they are aware of human presence. Sometimes that means bears will abandon important feeding or resting habitats. If the humans' presence is long-term and persistent, it can jeopardize a bear's well-being or even survival. Some bears never adapt to

human activity or observation and may leave the area permanently. For this reason, one cardinal rule of ethical, considerate viewing of bears as well as other wildlife is to remain far enough away so that your presence does not affect the animal's behavior. How far that is depends upon the viewing situation and such things as the level of the bear's habituation to humans, cover, wind and lighting conditions, etc. If a closer view of the animal is desired, binoculars, telephoto camera lenses, or spotting scopes should be used.

Bears which do become accustomed to human presence can also suffer detrimental effects from viewing, particularly if careless, ignorant, or misguided viewers teach bears to associate humans with food. These bears, called "food-conditioned", often rapidly become a danger to humans and themselves. In their quest for food, food-conditioned bears typically learn to ignore their natural fear of humans. They may be attracted to human associated food sources such as campsites, beached boats, backpacks, smoke houses, community gardens, compost heaps, and even people's homes. In the process bears will often act aggressively toward people and it can become difficult if not impossible to drive them off. It is easy at some point in such situations for both bears and humans to feel threatened. Typically two to five bears annually in Unit 4 pay for such intrusions with their lives. Another cardinal rule of bear viewing is to never allow bears access to food or allow them to associate humans with food.

Viewing, then, is not without its effects on bears. What we may see as insignificant actions can have profound effects on the bears, especially if our individual actions are multiplied many times by other visitors over the course of a viewing season. Informed, considerate, and ethical viewing practices and management are essential for both bear and human safety.

Unmanaged viewing areas

Bear viewing in nearly all of Unit 4 is currently subject to minimal management. Much of the unit remains in the wild and primitive state necessary for brown bears to thrive. ADF&G policy has been to subject viewing to as little regulation as necessary for the protection of bears and people. Only Pack Creek has had the intensity of use or poses the risks to safety deemed necessary before enacting stricter regulation. The USFS, which issues permits for commercial outfitter/guides using national forest lands for viewing, has found no reason to limit the numbers of permits in any area of Unit 4 except Pack Creek.

In most areas viewing appears to be far below capacity. Nevertheless, anecdotal evidence from some viewing guides and the public suggests that bears have become more elusive in some areas where heavy boat traffic occurs at some times of the season. Defining viewing capacity is not easy because it will vary

among users and areas. Insuring that guides and independent viewers are aware of ethical and considerate viewing practices may be the most efficient and effective short-term method of maintaining good viewing opportunities while minimizing viewing's effects on bears.

Over the long term our ability to continue to provide high-quality viewing of wild bears and to minimize the effects of viewing on bears may be determined by how well we can answer questions like the following: How much of the future demand for bear viewing can be satisfied by unmanaged viewing areas? Can we reach concensus about how to determine the capacity of bear viewing sites? Can we and should we attempt to guide use in unmanaged areas to lessen the impacts of future increases in viewers?

Pack Creek Cooperative Management Area

Pack Creek, on the west side of Seymour Canal, is a productive chum and pink salmon stream that has an extensive tide flat. The fish runs attract up to 30 different bears, predominantly, sows, sows with cubs, and subadult bears each summer. People recognized early on that Pack Creek was an exceptional gathering place for bears and sought to give it special status. The Territorial Game Commission closed the Pack Creek drainage to bear hunting in 1934.

Fifty years later, responding to the public perception that a larger closed area would give greater protection to the Pack Creek bears, the state Board of Game expanded the Pack Creek closure to approximately 95 square miles in 1984. With that addition of Swan Cove, Swan Island, and Windfall Harbor the area was named the Upper Seymour Canal Closed Area in state game regulations.

In 1988, with documented visits up over sevenfold from 1981, ADF&G began cooperating with U.S. Forest Service Admiralty Island National Monument staff to handle increased visitation and its effect on bear behavior and well-being. We were particularly concerned that at least one bear was beginning to associate humans with food and had been acting aggressively at times toward visitors. It was clear that, left unmanaged, increasing human use would eventually lead to a dangerous situation for bears and people. Our agencies developed rules for visitors to Pack Creek, established a system limiting commercial guide use, and put a permit system in place. ADF&G and USFS personnel also began supervising visitors at the observation area on the tidelands during the July 1 through September 1 period of peak salmon runs. No similar management program occurs at Swan Cove or Windfall Harbor.

In 1990 the area at the outlet of Pack Creek was designated the Stan Price State Wildlife Sanctuary by the Alaska legislature (Fig. 5). The sanctuary was named for Stan Price who moved to a cabin at Pack Creek in 1954 and lived there until

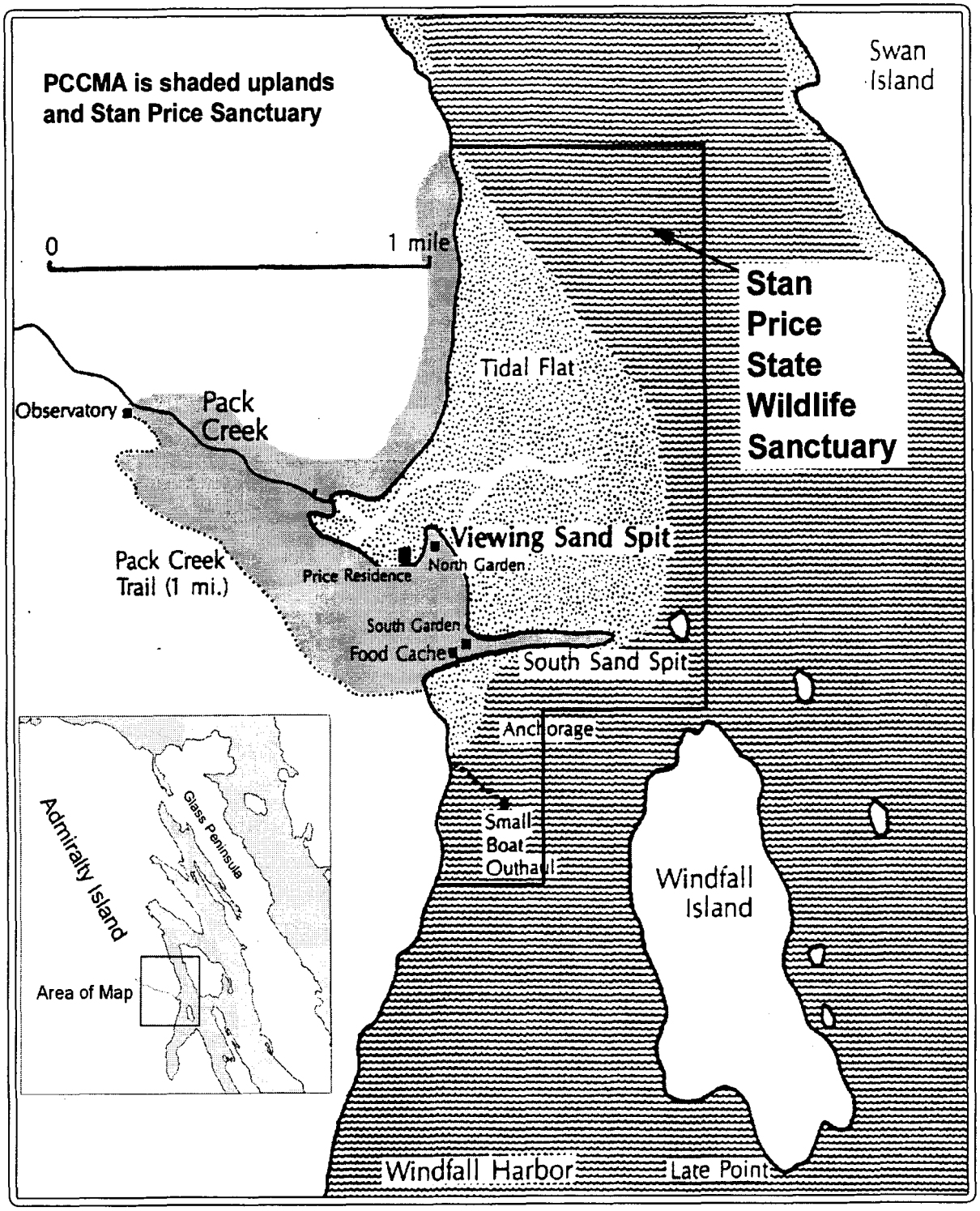


Figure 5 Pack Creek brown bear viewing area

his death in 1990. His long presence was instrumental in habituating Pack Creek bears to humans and later in attracting visitors. The sanctuary and a portion of the Admiralty Island National Monument are now called the Pack Creek Cooperative Management Area (PCCMA) and are managed jointly by the U.S. Forest Service and ADF&G. In 1993 joint management was formalized by a written agreement which was expanded to include cost-sharing in 1997 and continues to evolve.

As visitation and the potential for bear/human conflict grew, management and regulations grew more intensive through the 1990s. In 1991 a limit of 24 visitors per day was imposed during the peak season from July 10 to August 25. Twelve of the 24 permits are issued to the general public and 12 are reserved for outfitter/guides. In 1993 an advanced reservation permit system was required for unguided visitors. In 1994 the Forest Service began charging a $10 permit fee to reduce the number of "no shows" and to cover administrative costs.

In response to a withdrawal of funding by the Alaska legislature and Forest Service budget cuts, agency managers began jointly charging a visitor access fee for the PCCMA in 1997. The initial fee was set at a maximum of $36 during the peak season. The peak-season fee will increase in 1999 to $50. It is hoped these dedicated user fees will pay 50% or more of the management costs of Pack Creek which currently total about $85,000 per year. The balance of ADF&G operating dollars currently comes from the state General Fund.

Since the advent of the permit system in 1988, visitation at Pack Creek has grown from 668 people that year to 1,381 people in 1997. Judging by the increase in visitor numbers and by positive visitor responses to their experience, Pack Creek has been a successful program. It provides a high-quality viewing and educational experience and makes available to the casual visitor a very good chance of watching brown bears in natural habitat. In 1996 the population of bears using the Pack Creek area during the summer was estimated at approximately 30 with ten to fifteen bears seen at one time on the tideflats. ADF&G and Admiralty Monument staff also have an opportunity to answer questions and explain brown bear behavior, biology, and management. It is a valuable way for our agencies to interact with the public.

Viewing issues

Pack Creek management raises issues pertaining to brown bear management throughout Unit 4 that need to be resolved. A brief discussion of those issues follows:

Intensive management in wilderness areas – At Pack Creek, visitors are restricted to two specific viewing locations, a food cache, and travel corridors between these locations. Intensive management of a viewing area normally

involves a greater facilities infrastructure than unmanaged viewing and greater control over visitors' movements and actions, primarily because of the increased number of visitors. In contrast, National Forest Wilderness Areas are required to be managed with as little alteration of the natural state as possible. Some believe that also means minimizing controls on humans that use wilderness areas even if that results in some disruption of bears' normal activity. Reconciling these two contrasting philosophies is one of the issues that repeatedly arises in Pack Creek management. How far should the well-being of bears or human visitors be compromised in the name of providing visitors with a wilderness experience?

Habituating bears to humans – Bears which are subject to frequent and intense viewing can become habituated to human presence. This is most likely to occur at intensively managed viewing areas. Bears at Pack Creek and at the other intensively managed ADF&G viewing area, McNeil River in southcentral Alaska, are habituated bears. Bears' willingness to tolerate each other's presence varies depending on site-specific situations. Their tolerance is perhaps the greatest at salmon streams which may be why high intensity viewing programs at salmon streams are so successful. With their tolerance for each other at a peak, it may be relatively easy for them to extend that tolerance to humans.

Experience at both Pack Creek and McNeil River leads us to suspect that when bears become habituated to humans because human behavior is tightly controlled and predictable, they regard us no longer as threatening but neutral objects in the environment; therefore, they are less apt to respond aggressively to human actions. They are also more willing to approach humans closely which enhances people's experience in a controlled viewing situation. For these reasons, habituation of bears to human presence is one goal of management at intensive viewing areas.

It is important to recognize that bears which are habituated in one site-specific circumstance may not be habituated at other times and in other places. It is a common assumption for example that habituated bears will be more vulnerable to hunting. While that may be the case, it has not been substantiated by research or observation.

A distinction should be made between bears which are merely habituated to human presence and those which associate people with food (food-conditioned). Food-conditioned bears are nearly always a danger to humans and themselves. One of the main goals of intensively managed viewing areas is to prevent habituated bears from associating humans with food. Habituated bears, because they have more contact with people, may have more opportunities to learn to associate food with humans.

Bear behavior can be so different after habituation that some have asked the question, "Are habituated bears still truly wild bears?" Because it changes bear behavior we might also ask, how desirable is it to habituate wild bears to human presence? However one may feel about this, it is a likely outcome of establishing intensively managed viewing areas.

Pack Creek *John Hyde*

How many intensively managed bear viewing sites do we need and who should bear the costs? – As the number of tourists and wildlife viewers in Southeast Alaska grows, so will the demand for high quality brown bear viewing. A critical decision to be made for Unit 4 is should we try to meet a portion of that demand by developing more high use, intensive viewing sites?

No other areas in Unit 4 have been formally identified as having all the desired attributes of an intensive viewing area including: naturally occurring use by enough bears to provide a reasonable assurance that visitors will see bears; adequate fields of view; and safe viewing sites for relatively large groups of people. No other areas have bears already habituated to humans. Because of Stan Price's role in habituating bears over many years, Pack Creek may be a one-of-a-kind place in Unit 4.

Development of new areas requires a long-term, large scale commitment of funds. Neither ADF&G nor federal agencies are in position to make such funding and staffing commitments. A possible solution is to make user fees high enough to cover the costs of viewing areas. This may exclude lower income segments of the public from managed viewing areas.

A suggested alternative to intensively managed areas is to construct facilities which enhance bear viewing without instituting a program to manage human behavior. Where this approach has been tried elsewhere in Southeast Alaska the results have not been encouraging. At Anan Creek (managed by the USFS), a trail and bear-viewing platform have been built, primarily for black bears, and at Hyder, the USFS built a small platform at Fish Creek for viewing both brown and black bears. Like Pack Creek, neither site initially had a program which manages and controls the behavior of visitors. As the Forest Service has found

at both Anan and Hyder, however, "if you build it, they will come". Over the past several years visitation has tripled at both sites prompting development of formal management plans, on-site staffing, and closure of some areas to human access.

Designating sites as bear viewing areas seems to inevitably lead to intensive management for those places. Experience has led ADF&G to conclude that maximizing the safety of both bears and human visitors and providing a high-quality viewing and educational experience at high use areas requires controlling human access and behavior, providing on-site staff, and a permit system.

Licensing bear viewing guides – During 1932–57 and 1960–64, licensed guides were required, under certain conditions, for nonresidents who wished to photograph brown bears. Competition for increasing numbers of tourists visiting bear country may lead viewing guides to take greater risks to provide clients with close views or photos of bears. Viewing is unmanaged and unregulated in all of Unit 4 except at Pack Creek. The prospect of large numbers of inexperienced, poorly supervised, and in many cases, unarmed people seeking out brown bears is a growing concern to ADF&G. Before proposals for such things as heli-hiking tours in summer bear alpine habitat are approved and as the number of wilderness tourists throughout Unit 4 increases, serious consideration should be given to how experienced and well-trained tourist guides need to be.

Bear-viewing and hunting closures

ADF&G has a goal of managing bear populations to provide a variety of uses, including hunting and viewing. Populations which can sustain hunting harvests can also provide viewing opportunities. There is a public perception that habituated bears are likely to be more vulnerable to hunters than non-habituated bears. Although the truth of that perception has not been proven, ADF&G has supported conservative management of habituated bear populations around popular viewing areas.

The ADF&G, Division of Wildlife Conservation maintains a neutral stance on wildlife allocation issues. Allocating the resource among users is the responsibility of the Board of Game. The division only considers taking a position on an allocation issue if the decision could affect the well-being of the wildlife population involved. Only twice has the division taken a position on allocation issues concerning bears. Both cases had to do with whether or not to close areas to hunting in order to protect bears habituated to people at bear viewing sites managed or co-managed by ADF&G, Pack Creek and McNeil River.

Of the three areas in Unit 4 specifically closed to brown bear hunting, only one has been closed to accommodate habituated bears. An area surrounding the

Pack Creek drainage is currently closed to bear hunting to include the normal movement areas but not the entire home ranges of habituated bears.

In 1932 the United States Congress considered closing bear hunting on all or portions of Admiralty, Baranof, and Chichagof islands (US Senate 1932). Admiralty Island was seriously considered for designation as a bear refuge. Creating a bear refuge was thought by many Juneau residents to be a threat to development interests, notably mining and pulp production. As a compromise between development interests and preservation of the bears the Territorial Game Commission closed Pack Creek and Thayer Mountain on Admiralty Island to bear hunting in 1934. The Pack Creek closed area consisted of the Pack Creek drainage and comprised about 20 square miles. The Thayer Mt. area was 60 square miles (Heintzleman and Terhune 1934).

In 1984, brown bear hunting guide Karl Lane of Juneau and retired guide Ralph Young of Petersburg proposed expanding the closed area to include Swan Cove, Swan Island, and Windfall Harbor to provide greater protection for the bears using Pack Creek. Guide Bill Peterson of Sitka testified in favor of the closure at the Board of Game meeting. At the same time the Board expanded the Pack Creek area it greatly reduced the size of the Thayer Mountain closed area, reopening most of it to hunting and renaming the remaining 5 square mile closed area the Salt Lake Closed Area (see below). The expanded Pack Creek closure was renamed the Seymour Canal Closed Area and is now about 95 square miles.

In 1991 and again in 1996, several proposals were made to the Board of Game to either reduce or expand the Seymour Canal Closed Area. ADF&G actively supported retaining the existing boundaries. After hearing extensive public input and discussion, the board decided both times to retain the boundaries established in 1984. This issue is a highly emotional one for some members of the public and there are firmly established opinions on all sides of the issue. Consequently, we expect future proposals will be made to the board to alter Seymour Canal Closed Area boundaries.

Viewing was also part of the reason the Board of Game established the two other areas closed to bear hunting in Unit 4.

Salt Lake/Mitchell Bay Closed Area

The Salt Lake closure (5 square miles at the head of Mitchell Bay near Angoon) was originally part of the Thayer Mountain Closed Area which existed from 1934 until 1984. When the Pack Creek area was expanded, the Board of Game reduced the size of the Thayer Mountain Closed Area and renamed it the Salt Lake Closed Area (Fig. 6). The Mitchell Bay shoreline (within 660 feet of mean high tide) was closed in 1991 for development of a bear-viewing area. The

shoreline of Mitchell Bay is a special cooperative land management zone created by ANILCA. The majority of the land is owned by Kooztnoowoo Inc., the Angoon village corporation, however the U.S. Forest Service manages surface resources and regulates public access as part of Admiralty Island National Monument and Wilderness on the condition that Kootznoowoo, Inc. be assured "quiet enjoyment" of the area. The closure proposal was an outgrowth of Kootznoowoo Inc.'s interest in pursuing commercial nonconsumptive recreation as part of its long range development strategy for the area. Bear hunting was not a traditional use of the area by local residents and concern was growing that bears wounded by hunters could pose a threat to local residents using the areas for harvesting fish and other wildlife.

Port Althorp Closed Area

This area on northern Chichagof Island was closed by the Board of Game in 1984 at the request of some residents of Elfin Cove (Fig. 6). It has only recently been "discovered" as a bear viewing area by commercial guides and individuals. Bears in the area are not yet habituated to human presence. ADF&G has received reports of some Elfin Cove residents feeding bears to make them "more viewable". However, feeding bears will ultimately make them less viewable because a food-conditioned bear inevitably becomes a danger to people. Bears which are a danger to people are usually killed.

ADF&G BEAR-VIEWING GUIDELINES

ADF&G has developed guidelines for bear viewing in Unit 4 and elsewhere in Southeast Alaska that we consider important for the safety of both humans and bears. The department has disseminated many of these guidelines in variety of ways and in a variety of public and interagency forums over the years. We recognize that not all of these guidelines are appropriate for all situations, but believe that they still represent the best general approach to safe bear viewing.

I. Casual viewing of solitary bears or family groups of bears in remote locations

- Always remain far enough away from the bear so that your presence, if noticed, does not affect the animal's behavior. Use binoculars, spotting scopes, or other telescopic lenses to improve your view.
- Viewers should be armed with some type of suitable defense system (pepper spray or large caliber firearm).
- Always select a viewing position that does not make you vulnerable to a surprise approach by a bear.
- Never directly approach a bear, allow it to move to you.
- Avoid situations where your presence could startle a bear.
- Avoid viewing from obvious bear trails.
- Never allow bears access to human foods.
- There is safety in numbers, stay with your group.
- If seen by a bear, avoid moving. Even minor movements will encourage wary bears to leave.
- Never try getting close to a bear in motorized vehicle or boat.
- Never run from an approaching bear; if you move away do it in a slow, deliberate manner.

II. At bear concentration areas that are regularly used as viewing areas or that are used occasionally by large numbers of people

A. Sites selected to be managed for public bear viewing must have the following attributes:

- naturally occurring use by enough bears to provide a reasonable assurance that visitors will see bears;
- a field-of-view that promotes seeing bears at a safe distance;
- one or more viewing sites that do not place the public in prime bear use areas;
- secure land ownership and commitment by the land owner to keep the area in a status compatible with occupancy by bears;
- agency commitment to adequate funding of the program.

B. Program management must be equally directed at providing public/bear safety and developing bears' habituation to humans.

- Human use of the area must be secondary to the use by bears.
- Control of human activities needs to be increased as the number of persons using the area and/or the regularity of viewing increases.
- The size of the viewing site(s) should be the minimum necessary to accommodate the group size; group size should be limited both by the space limitations of the viewing site and acceptance as indicated by bear behavior.
- Viewing activities should be limited to designated viewing sites.
- Viewing sites must not be in areas regularly used by bears.
- Human foods should never be left accessible to bears; all organic waste should be removed when the group leaves.
- Viewing sites should be accessed by a single trail.
- Where possible the approach and departure of visitors to the viewing sites should be visually screened from the bears, and viewers at the sites should be unobtrusive.
- The number of trips to and from the viewing site should be minimized, and groups should plan on only one round trip to and from the viewing site.
- The number of groups viewing bears should be minimized; a larger group size is generally preferable to an increased number of groups.
- If possible, travel to and from viewing sites should occur at the same time each day.
- Except for access trails and viewing sites, all other areas of bear sanctuaries should be free from human use.
- Portions of each day should be visitor free to allow non-habituated bears a period of use without stress from humans.
- Persons knowledgeable in bear behavior should accompany each group; a prime responsibility of this person will be controlling human activity.
- Development of viewing sites should accommodate visitor comfort and safety, especially to encourage human activities to remain within the prescribed area.
- Records should be kept of bear use of the area; success of viewing programs should be judged by undiminished numbers and hours of use by bears; human use goals should be secondary.

BROWN BEAR HUNTING

INTRODUCTION

Prior to 1908, hunting of brown bears in Alaska was permitted year round with no bag limit restrictions. Until 1925 market hunting for bear hides was permitted and was thought by many to have greatly reduced bear numbers (see Howe 1996:37). In the early years of this century, a seesaw battle over bear management was fought between those who favored more protection for brown bears and those who saw brown bears as an obstacle to development and thus favored their elimination. Eventually, those favoring brown bear preservation prevailed and management of hunting became more restrictive. However, with a few notable exceptions, hunting has been permitted in most areas of Southeast Alaska. Hunting regulations have been designed to insure a sustained yield from the bear population.

Trophy hunting for Alaska coastal brown bears dates back to the arrival and settlement by Europeans. The brown bear is one of the largest game animals in North America, growing as large as 8 feet long and weighing up to 1,000 pounds. The skull and hide, if in prime condition, are highly valued as trophies. Because the meat is not considered palatable by most hunters, brown bear hunting in Southeast Alaska is primarily sport hunting for trophies. Measured by the increase in harvest in recent years, the popularity of sport hunting for brown bears has been growing.

Guided hunts have been an important aspect of brown bear hunting for many years and brown bear hunting is the mainstay of the hunter-guiding industry in Southeast Alaska. Nonresidents brown bear hunters have been required to use a guide since 1960, except during the period 1964-1966. During 1932-57 and 1960-64, hunting guides were also required, under certain conditions, for nonresidents who wished to photograph brown bears. Since 1967, nonresidents have been required to have a guide for hunting brown bears unless accompanied by an Alaskan relative over 19 years of age within the second degree of kindred. Nearly half the brown bears harvested in Southeast Alaska since 1960 have been taken by nonresident hunters.

Native subsistence hunting of brown bears was widespread, regular, and highly ritualized in the past. Brown bear meat was eaten regularly by some Natives and its fat and grease was highly valued. Hides were used for ceremonial robes, clothes, rugs, and bedding. Mandibles and teeth were used for adornment, bones and sinews were used for tools and cord. Bones, ears, and tongues were used by Native shamans as devices for ceremonies and medicine. Recent data collected by the ADF&G Division of Subsistence suggest that many of the

traditional practices associated with brown bear hunting have been abandoned, and harvest levels and use of brown bears have declined among Southeast Alaska Natives (Thornton, 1992).

Several factors have been cited for the decline in Native use. Among them are low desirability of the meat; more available alternate resources that are more economically viable; the erosion of the cultural complex surrounding bear hunting; and harvest regulations that are at odds with traditional practices. Examples of the latter include the outlawing in 1908 of hunting with dogs, a traditional method of hunting by Natives. Also, current salvage and sealing requirements are incompatible with the prescribed traditional treatments of the slain bear in Native culture. Finally, getting a hunting permit and buying a brown bear hunting tag are, in effect, a public declaration of intent to hunt. In Native traditions, if a hunter made his intention known, the bear would find out about it and avoid the hunter. In that case, hunting would be futile. (Thornton, 1992)

Although Southeast Alaska Natives probably still do take a few brown bears for food and other purposes, the level of harvest is not nearly as large as the current take by non-Natives (Thornton, 1992). The Board of Game has determined that brown bear populations in Unit 4 are customarily and traditionally taken or used for subsistence (see Alaska Statutes 5 AAC 99.025). However, the Board of Game has not established a separate regulation for subsistence hunting of brown bears.

Hunting management history

Before 1908, there was no bag limit or closed season on brown bears in Southeast Alaska. That year the "Game Law of 1908" established a season from October 1 to July 1; however, "Natives, miners, and explorers" were exempted from the season restriction if they needed food. From 1919 to 1925, a bag limit of three bears was in effect with the same season. Market hunting for bears was permitted until 1925 when the newly created Alaska Game Commission outlawed it. The bag limit remained three bears and the season was changed to September 1 through June 20. Beginning in 1925 until 1957, guides were required for nonresident hunters. During 1930-33, nonresident hunters were limited to two bears but residents could take any number and had no closed season for Game Management Units 1, 4, and most of 5A (Yakutat Forelands). Beginning in 1933, the bag limit on Admiralty was one bear per year; elsewhere the bag limit was two bears for all hunters and the September 1-June 20 season was reinstituted. In 1928, Glacier Bay National Monument was the first area in the region closed to bear hunting. In 1933 additional areas bordering Glacier Bay were closed. In 1934, the Pack Creek drainage and the Thayer Mt. Reserve on Admiralty were the first areas closed in Unit 4.

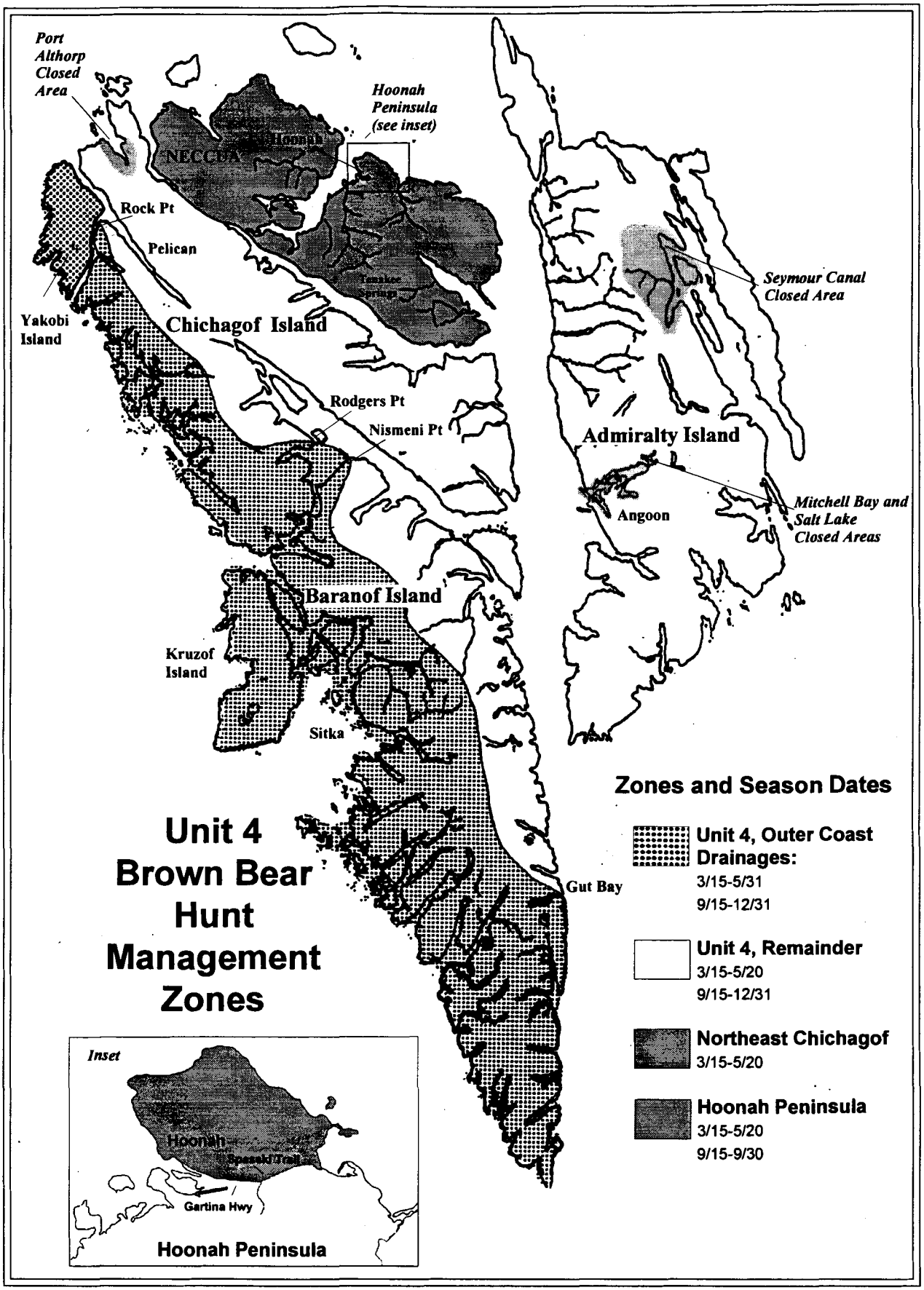


Figure 6 Unit 4 brown bear hunt management zones and closed areas

The bag limit was reduced to one bear per year regionwide in 1956 and the season was extended to the end of June. In 1957 the federal guide law was abolished. With statehood in 1959/1960, ADF&G took over brown bear management and required hunting licenses for all hunters age 16 and over, sealing of all hides and skulls, and reinstated the requirement that nonresidents of the state use guides.

In 1968, the bag limit was reduced to one bear every four regulatory years throughout Southeast Alaska. During the 1970's and 1980's, minor changes were made in season lengths in response to increased hunter pressure on bear populations. The trend then and in the years since has been to shorten the spring season to better protect bears when they are most vulnerable on the beaches, and to start the season later in the fall after bears have moved away from salmon streams.

In 1983, Port Althorp on Chichagof Island was closed to brown bear hunting at the request of the residents of Elfin Cove. The next year, the closed area around Pack Creek was expanded to include all drainages flowing into Swan Cove and Windfall Harbor, as well as Swan and Windfall islands in Seymour Canal. In compensation to hunters, most of the Thayer Mt. closed area was reopened to hunters except for lands within a quarter mile of the shoreline of Salt Lake at the head of Mitchell Bay. In 1991, all land within 660 feet of the shoreline of Mitchell Bay was added to the closed areas on Admiralty at the request of Angoon residents.

Concern about bear overharvest during the 1980s was the reason for creation of the Northeast Chichagof Controlled Use Area (NECCUA) north of Tenakee Inlet and east of Port Frederick in 1989. The fall season was closed and use of motorized land vehicles for brown bear hunting prohibited. NECCUA was expanded in 1994 to include lands west of Port Frederick with extensive road systems.

Since 1989/90, Unit 4 brown bear hunts have been registration hunts. In the 1991/92 season, Unit 1 brown bear hunts became registration hunts as well. Before registration, although ADF&G knew from sealing data how many hunters killed bears each year, we had no way of knowing how many people hunted brown bears. As harvests increased, the need to monitor hunter effort increased and registration for brown bear hunters is now required.

CURRENT REGULATIONS

Current regulations divide Unit 4 into three large regulatory zones (Fig. 6). In 1978, concerned that bear populations were declining on Admiralty and the more accessible portions of Baranof and Chichagof, the Board of Game shortened the spring hunting season for "inside drainages" of Unit 4. Most of the annual harvest in Unit 4 comes from the inside drainages. "Inside drainages" include all of Admiralty Island, northeastern Baranof Island, and southeast and northcentral Chichagof Island. The spring season in this zone lasts from March 15 to May 20 and the fall season from September 15 to December 31. Subsequent research demonstrated bear populations were stable and the season has remained unchanged.

"Outside drainages" are the southwest portions of Chichagof, Baranof and adjacent islands (see Alaska Hunting Regulations for detailed description). In that zone, the spring hunting season is 11 days longer than the rest of Unit 4, ending May 31. The outside drainages generally have more difficult access and are hunted less. Population stability has not been a concern, and the Board of Game has kept that season longer than the rest of Unit 4 to provide an extended hunting opportunity that does not significantly increase the harvest.

The Northeast Chichagof Controlled Use Area (NECCUA) includes all of Chichagof Island north and east of a line connecting Tenakee and Idaho inlets. Use of motorized vehicles is prohibited in this area and there is no fall hunting season. This area is extensively roaded and includes the nearly isolated northeast Chichagof peninsula. A growing harvest of bears on the road system was the reason for imposing more restrictive regulations in NECCUA beginning in 1989.

A fourth, small regulatory zone was created in 1997 within NECCUA in the immediate Hoonah area. It provides for a special fall hunting season north of the Spasski Trail and the Gartina Highway to allow harvest of bears displaced when operation of Hoonah's landfill was changed.

HARVEST PATTERNS

Bear harvest data have been collected since 1961 by requiring that each kill be examined and sealed by the Department. Information collected has evolved to include data on sex, age, skull size, kill location, kill date, days hunted, guide services, hunter residency, and transportation used by successful hunters. These long term data are important in managing the unit's bear resource but no one harvest category is sufficient for making management decisions. Changes in hunting regulations are considered when several categories show similar trends and are supported by subjective field observations. Given the apparent low

reproductive potential of Unit 4 brown bears, management decisions are more conservative than for populations in other areas of the state.

The bear sealing program has led to a database which contains information on 3,481 Unit 4 bears. Sealing data analysis shows a pattern of increased kill that peaked in the mid-1970's, declined, and then increased again to the current harvest level of about 120 bears annually (Fig. 7). These data include 3,283 (94%) hunting kills and 198 bears (6%) that died from other causes.

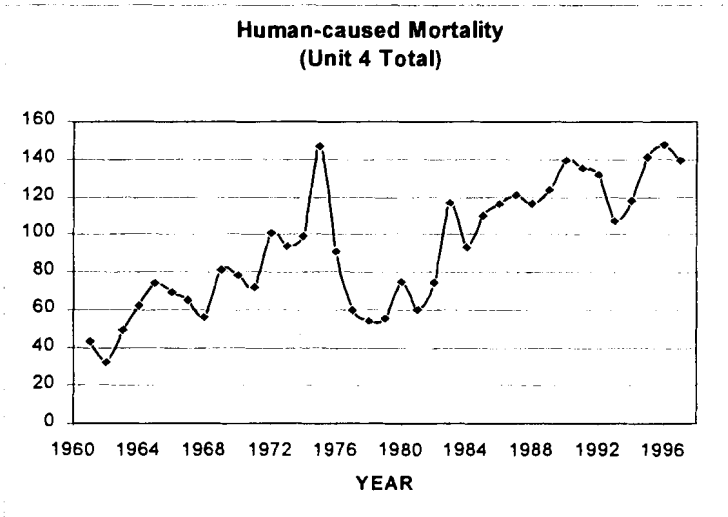


Figure 7 Annual Unit 4 human-caused brown bear

Spring seasons account for 2/3 of the annual kill and fall seasons the remaining 1/3. More males than females are killed in the spring (76%) while fall harvests are nearly half females (43%) (Fig. 8). Because of the magnitude of the harvest, the actual number of females taken in the spring is usually greater than in the fall. This seasonal pattern is consistent throughout the years and for all islands.

Since 1989 bear hunting has been administered by a registration permit system that provides information on actual hunting effort. Interest in bear hunting is high with up to 900 permits issued annually; half the permittees report hunting. The majority of the kill is by nonresidents, and Southeast residents normally take less than 20 percent of the bears. There is no significant difference in sizes, age classes, or sex ratios of bears taken by guided versus nonguided hunters. In recent years Admiralty and Chichagof islands each have produced about 40 percent of the hunter kill and Baranof Island 20 percent (Fig. 9). The Chichagof Island kill has increased more rapidly than other islands in response to human population growth and logging related development. Chichagof's average annual harvest now exceeds Admiralty's.

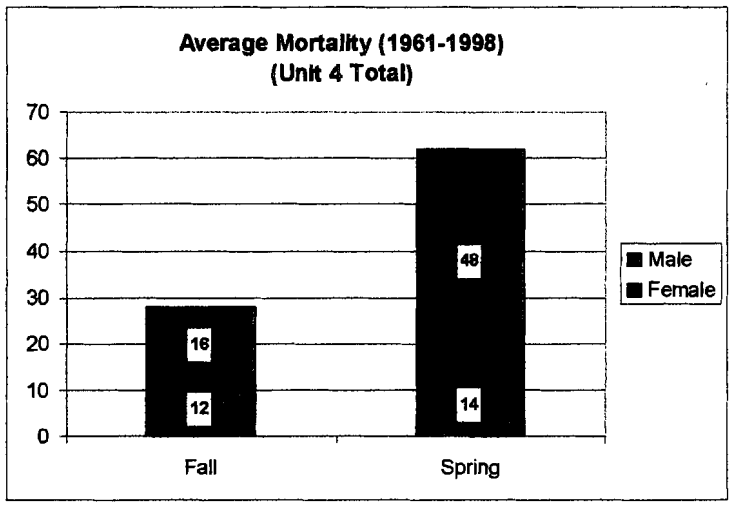


Figure 8 Average Unit 4 human-caused mortality by sex and hunting season

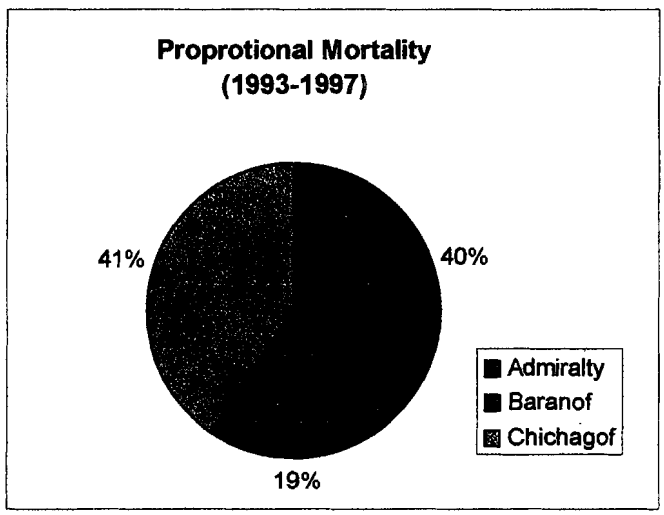


Figure 9 Percent of total Unit 4 human-caused mortality by island 1993 - 1997

Magnitude of the harvest is quite variable from year to year on each island and for the unit as a whole (Figs. 7, 10-13). The greatest factor affecting harvest in any given year appears to be weather. If timing of den emergence and seasonal availability of new plant growth in the spring makes bears accessible to hunters during the spring season, or the timing and strength of salmon runs make them accessible to hunters in the fall, then harvest is usually greater than years when bears are not as accessible. Good or bad weather during the hunting seasons can also affect the harvest by influencing how easy it is for hunters to travel and how long they stay afield.

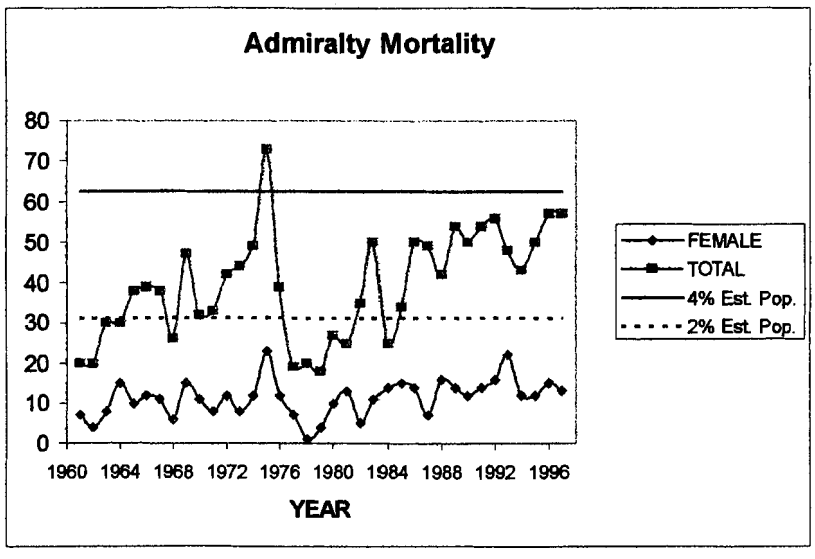


Figure 10 Annual human-caused mortality on Admiralty Island

Brown bears occur at lower densities and have lower reproductive potential than most big game species, and are slow to recover from high harvests. Population modeling based on brown bear research is typically used to determine safe harvest levels. Harvest levels to insure a non-declining brown/grizzly bear population are usually placed at five percent of the population. Because research conducted on Admiralty and Chichagof islands suggests that Unit 4 bears have a lower reproductive capability than other coastal brown bears, ADF&G

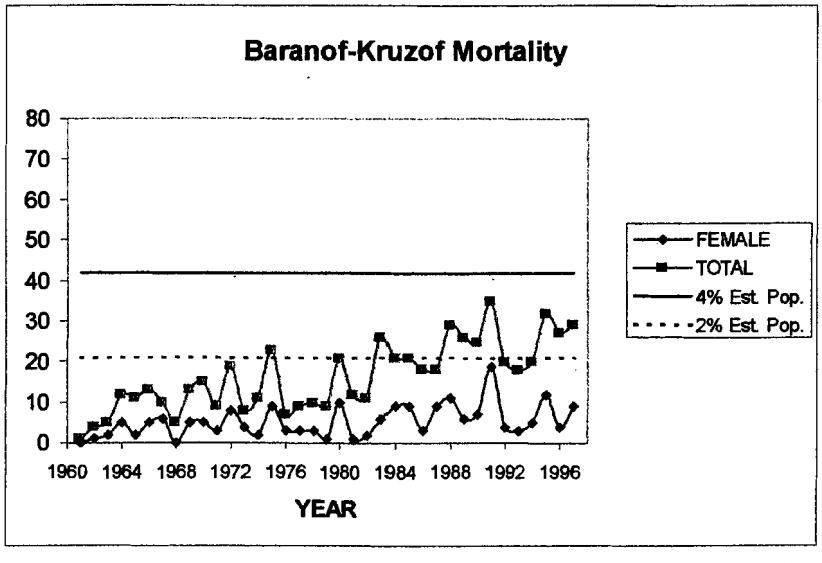


Figure 11 Annual human-caused mortality on Baranof-Kruzof islands

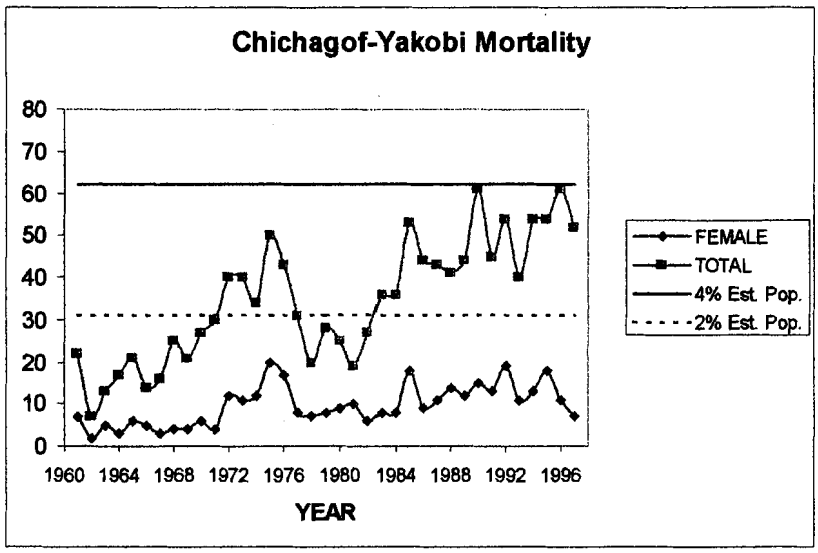


Figure 12 Annual human-caused mortality on Chichagof-Yakobi islands

has used a four percent human-caused mortality guideline as the non-declining level. Human-caused mortality includes death from reported legal and illegal hunting, defense of life and property kills, road accidents, research losses, bears found dead of obvious human causes, and any other known human-caused mortality. Known human-caused mortality for Admiralty and Baranof islands has not exceeded four percent. Chichagof Island has occasionally been at four percent (Figs. 10-13).

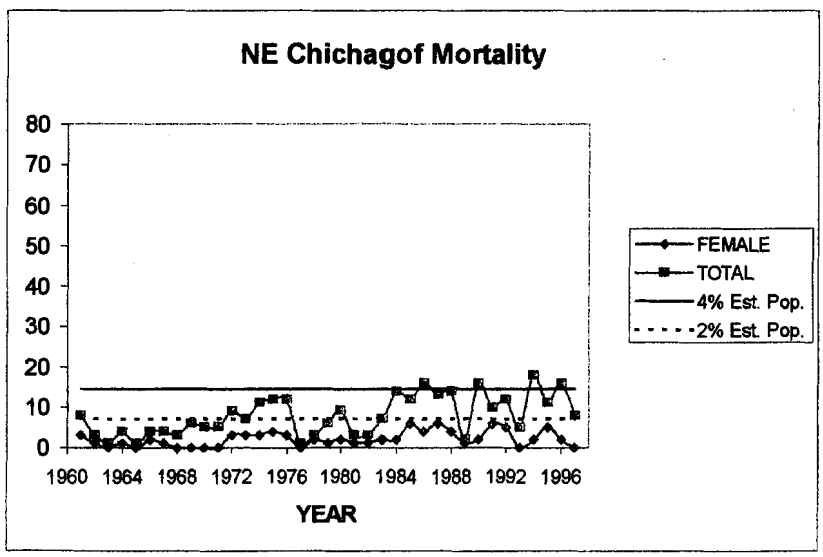


Figure 13 Annual human-caused mortality on Northeast Chichagof Island

Access and Management Areas

Access is one of the main factors determining human use of bears, particularly hunting. Many of the areas where bears occur (interior parts of roadless islands, island coasts with no sheltered anchorages) are inaccessible or extremely difficult for hunters to reach. As a result, bears living in some areas have little hunting pressure whereas others are so heavily hunted some hunters complain of overcrowding. Limited access and concentration of hunting in particular areas is likely to continue to be a problem. It means that although overall numbers of brown bears in Unit 4 appear to be able to support more harvest and other human use, some areas receive the bulk of human use pressure. This makes management of those few heavily used areas more difficult.

Southern Admiralty Island and northern Chichagof Island are the areas where the combination of high quality bear habitat and excellent human access has raised public concerns about hunter overcrowding, proliferation of hunting guides, and the risk of overharvest. These areas are not only important hunting areas but are becoming increasingly important for wildlife viewing.

Each of the major islands of Unit 4 is large enough to contain sufficient bears to maintain a viable population without being dependent on immigration of bears from nearby areas. Although each large island of Unit 4 has its own discrete bear population, research has identified no discrete subpopulations of brown bears on those islands (with one possible exception discussed later). In other words, bears on one part of Admiralty,for example, can and do disperse to other parts of Admiralty. This movement of bears, especially young males, may be necessary to maintaining high bear populations as it insures a diverse genetic flow within the population. That suggests that high mortality on one part of an island could eventually be offset by immigration of bears from other parts of the island. For that reason, ADF&G has generally applied mortality guidelines to each island population as a whole and not tried to break out portions of islands for separate management.

The northeast portion of Chichagof Island is nearly a separate island with only a single narrow land connection to the rest of Chichagof. It has an extensive road network associated with logging and has been the site of extensive research by ADF&G (Figs. 2 and 4). Although there is no definitive evidence that the northeast Chichagof population is discrete, research strongly suggests that dispersal of bears between northeast Chichagof and other parts of the island is an infrequent event, occuring at most only a few times a decade. The combination of a somewhat isolated bear population, increasing mortality, and an extensive road network that allows access to virtually every portion of that population resulted in the creation of the Northeast Chichagof Controlled Use Area (NECCUA) by the Board of Game in 1989.

CURRENT MANAGEMENT GUIDELINES

In 1980, ADF&G's management guideline for annual hunter harvest in Unit 4 was 60-80 bears. In 1987, after research on northern Admiralty Island indicated a higher density of bears than previously assumed, we acknowledged that the guideline could be raised while maintaining non-declining bear populations (ADF&G 1987).

Although there is currently no formal, written plan for management of brown bear hunting in Unit 4, in recent years ADF&G has based its management on assumptions from research results and has used the following specific human-caused mortality guidelines to judge the effects of management on three populations of Unit 4 brown bears.

The guidelines are applied to the average human-caused mortality over the three most recent years rather to any one year total. Annual human-caused mortality levels can fluctuate greatly as a result of a variety of factors. We think that comparing mortality to a three-year average gives a better perspective on bear mortality trends. Thus a single year in which human-caused mortality exceeds the guidelines for an island does not necessarily prompt remedial action, but is a caution flag for bear managers.

ADF&G Three-Year Mean Annual Human-Caused Mortality Guidelines

Population Area	Maximum Mortality Guideline	Estimated Population
Admiralty Island		1,560
Total Mortality (4% of pop.)	62 bears	
Female Mortality(2% of pop.)	31	
Baranof and Adjacent Islands		1,045
Total Mortality (4% of pop.)	42 bears	
Female Mortality(2% of pop.)	21	
Chichagof and Adjacent Islands		1,550
Total Mortality (4% of pop.)	62 bears	
Female Mortality(2% of pop.)	31	
Unit 4 total estimated population		4,155

It should be noted that the maximum human-caused mortality guidelines are linked to population estimates. As such they are subject to change if the estimates change. The current estimates are based on ADF&G mark/recapture

research conducted on northern Admiralty and Northeast Chichagof islands and extrapolated to the rest of Unit 4 based on a combination of factors including biologists' personal knowledge of habitat characteristics, the predictions of a brown bear habitat capability model, anecdotal reports of field sightings by hunters and other outdoors persons, and harvest data. Although ADF&G's research meets scientific peer-review standards, population estimation, especially in Southeast Alaska, is far from an exact science. Population estimates as a result of research are typically given as a range of numbers. Wildlife managers, however, often must set specific numbers as management guidelines. These numbers may imply we are more certain about the population size than we are. Although our estimates are based on the best available information, we acknowledge that the actual populations may be somewhat higher or lower than the estimates.

Fall and spring seasons have distinctly different hunting characteristics and we have worked to maintain both in an effort to allow the public a variety of hunting experiences. Bears are hunted in different habitats and the sex ratio of harvested bears is quite different in the two seasons (see above and Fig. 8). In most cases, maintaining both seasons in a management area provides opportunities to manage harvest parameters within the guidelines.

Typically 30 to 40 percent of the mortality guideline from any population occurs during fall seasons, and the remaining 60 to 70 percent in spring. We believe that is an acceptable ratio. The hunter harvest is not equally distributed during the seasons. Historically, harvest has been concentrated at certain dates (Figs. 14 and 15). If the three-year average for either season exceeds current harvest ratios, that season can be changed by adjusting season dates, closing select areas to hunting, or limiting hunter numbers. Such changes are made through the Board of Game.

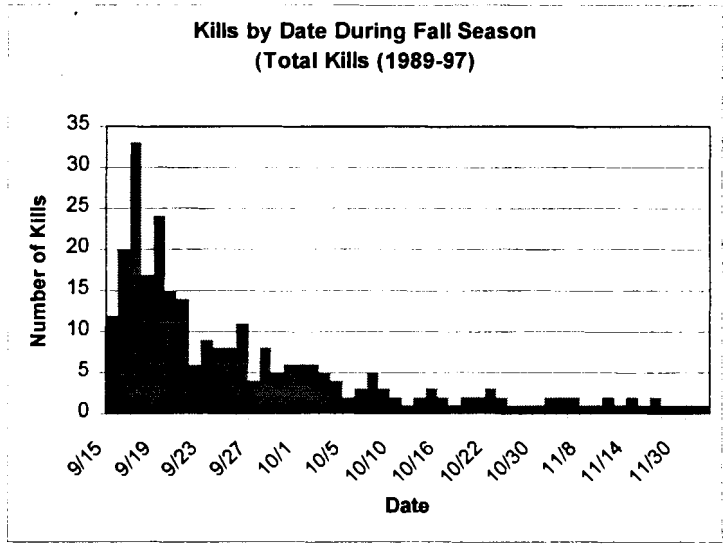


Figure 14 Chronology of harvest duirng fall hunting season

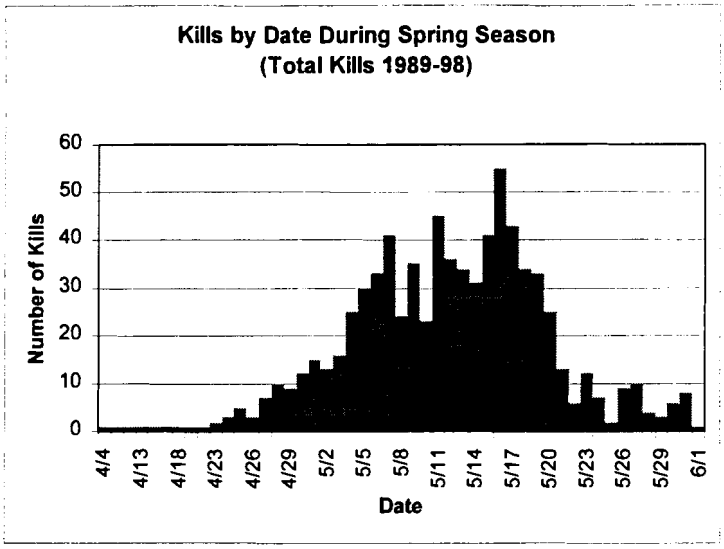


Figure 15 Chronology of harvest duirng spring hunting season

Although other factors such as defense of life and property kills, poaching, natural mortality, research losses, road kills and other development causes, all contribute to total brown bear mortality, the ADF&G and Board of Game exercise greatest control over hunting harvest levels. Adjusting hunting regulations to prevent mortality from exceeding the mean three-year guidelines in any area has typically been our first recommendation. Recommendations for regulation changes may take the form of:

- delaying openings of the fall seasons;
- closing spring seasons early;
- eliminating the fall seasons;
- closing seasons in alternate years;
- restricting use of motorized vehicles for hunting including the possibility of restricting boat use;
- closing specific areas to hunting;
- limiting hunter numbers by a drawing permit system; or,
- reducing hunting opportunity for nonresidents.

If it becomes necessary to further protect the female component of populations, the ADF&G would recommend season changes to the Board of Game to protect females during periods of higher vulnerability as well as encourage hunters to avoid female bears through information and education efforts.

Since statehood, hunting management policies have favored harvest of boars over harvest of sows. It is a common biological assumption that protecting breeding females in populations with low productivity is critical to maintaining those populations. This long-term hunting practice has skewed the sex composition of the Unit 4 bear population toward an abundance of females. It is not known how a skewed sex ratio affects brown bear social interactions or population dynamics. There appears to be a sufficient number of males to breed with the females but it is unknown what the optimum percentage of males is for greatest productivity. When there are fewer large males in a population it can be harder for hunters to tell the difference between males and females. One result can be that more females are mistaken for males and harvested.

A hunting related issue that is not entirely under the control of the state pertains to roads. ADF&G and others have found that roads enhance hunter effectiveness, contributing to excessive harvests of brown bears (see section on bears and land management issues). Consequently, where bear harvests are high and hunter efficiency is enhanced by roads, the Board of Game may prohibit use of motorized land vehicles for hunting bears as it has in NECCUA.

In addition to using regulation changes to mitigate effects of roads, it has been ADF&G policy to work with other parties to minimize road construction in Unit 4 brown bear areas. When commenting on public and private timber sales we will continue to advocate that timber harvest techniques not requiring road construction be used as much as possible in Unit 4. Where roads are necessary, we will continue to encourage the USFS and private landowners to physically close logging roads to public use immediately following completion of timber removal.

Issues in hunting management - Guide proliferation and nonresident hunting

Until 1972 ADF&G managed big game guides in the state and management of guides was integrated with wildlife management. That year regulation of guiding was transferred from ADF&G to the Alaska Department of Commerce. As a result of a 1988 Alaska Supreme Court decision, the exclusive guide area policy was eliminated and the State of Alaska lost the ability to legally limit the number of hunting guides operating in areas of the state.

A new state guide-outfitter system administered by the Big Game Commercial Services Board was adopted in 1993. In the current system the state is divided into 240 guide-outfitter areas. Unit 4 has 16 areas. Guides are limited to operating in a maximum of three areas statewide but any number can choose to guide in a particular area, for instance, southern Admiralty Island. Guides can also easily change their operation areas. The state legislature abolished the Big

Game Commercial Services Board in 1995 and transferred regulation of the guide industry to the Alaska Department of Commerce and Economic Development, Division of Occupational Licensing.

The number of licensed, registered guides permitted and operating in Unit 4 grew from 9 in 1988 to 28 in 1997/98. Seven additional guides were registered with the Dept. of Commerce to operate in 1997/98 but did not. These guide numbers do not include assistant guides. A regulation limiting each registered guide to three assistant guides was repealed in the mid 1980s. Now a registered guide can supervise any number of assistant guides. The inability to limit guiding in certain high use areas has raised concerns about overharvest, overcrowding, and diminished hunt quality and hunter satisfaction.

A 1994 survey of people who hunted bears in Unit 4 from 1991 through 1994 found that more than 80% of hunters were satisfied with their hunting experience (Faro et al. 1997). Ninety-five percent of successful hunters and 74% of unsuccessful hunters were satisfied. Two-thirds of those expressing an opinion disagreed that their encounters with other hunters or other people during the hunt detracted from the experience. The results indicate that most hunters in the early 1990s did not experience overcrowding. At that time, 21 guides were permitted to operate in Unit 4. Nevertheless the potential for increased hunter dissatisfaction exists as long as guide numbers cannot be controlled. Informal discussions with some Unit 4 guides in recent years suggests a number of them believe there are too many guides now operating there.

The U.S. Forest Service retains authority to issue permits to commercial operators, including hunting guide/outfitters, on national forest lands. In response to concerns raised by the Big Game Commercial Services Board, the Southeast Alaska Guides and Outfitters Association, and other members of the public about a rapid increase in requests for commerical guide permits for Unit 4, the Forest Service instituted a two-year moratorium in 1994 on new permits issued to hunting guide/outfitters in the unit. This had the effect of holding the number of commercial guide/outfitters in Unit 4 to 21. The Forest Service asked the Alaska Board of Game to find a regulatory solution to the guide proliferation issue by the end of 1995.

In response to that request and to other public comments about effects of the growth of nonresident bear viewing on bear behavior, the Board of Game established a Southeast Brown Bear Committee. The committee included representatives of the U.S. Forest Service, the ADF&G, other state agencies, the Southeast Alaska Guides Association, Admiralty Bear Association, and Territorial Sportsmen. The committee's final report, issued in May 1995 (Alaska Board of Game 1995), concluded that the state remained unable to legally limit numbers of guides in Unit 4 and that the U.S. Forest Service through its permitting process was the most acceptable way to control guide numbers. Recognizing that, the

committee proposed instituting drawing permits as a possible solution to concerns about overharvest, but linked that to the Forest Service maintaining the current limit on hunting guide/outfitters in Unit 4. Subsequently, the Forest Service indicated it was unable to extend its moratorium or otherwise limit the number of guide/outfitters without an extensive process involving public input, a carrying capacity analysis, and other steps. Because of a lack of quantifiable data on effects of commercial viewing of bears, the committee was unable to propose any specific controls on it.

With the inability of the Forest Service to limit the number of Unit 4 hunting guides to 21, the recommendations of the Southeast Brown Bear Committee were rendered moot. Unrestricted proliferation of hunting guides remains a concern. The Forest Service is currently conducting a carrying capacity analysis for commercial guiding of all types in Unit 4. It is not clear at this time whether that effort will result in a recommendation to limit big game hunting guides in the Unit. The inability of the State to limit the number of guides and their clients operating in Unit 4 by other means may ultimately lead to more restrictive regulatory changes for non-resident hunters. Despite our lack of regulatory authority with respect to guides, ADF&G is frequently contacted by members of the public regarding restrictions on big game guides. We will continue to work with the U.S. Forest Service, big game guides, and other members of the public to help find a solution to the guiding issue.

John Hyde

OTHER HUNTING MANAGEMENT ISSUES

The current ADF&G guidelines and management approach allow for the maximum amount of hunting opportunity and harvest in Unit 4 while limiting human-caused mortality to a level which we believe will still maintain non-declining brown bear populations. Human-caused mortality appears to be on a long-

term upward trend throughout Unit 4. As it approaches maximum guidelines, remedial actions will likely be necessary. ADF&G has no biological concerns with the current management approach but is open to public or Board of Game desires to change that approach. Following is a brief discussion of some of the guidelines and management approaches that have been advocated by organizations and members of the public in the past.

Changes to the mortality guideline – Different segments of the public have suggested raising or lowering the 4% human-caused mortality guideline. Raising the guideline to 5% would bring it closer to brown bear guidelines used elsewhere in the state. As stated earlier, research evidence suggests Unit 4 bears are less productive than those elsewhere and we would be concerned about raising the human-caused mortality guideline beyond 4%. Other members of the public believe lowering the guideline below 4% would provide a management buffer with additional assurance that brown bear populations would not decline. At this time we have no reason to believe that Unit 4 populations cannot support a 4% human-caused mortality guideline indefinitely.

Smaller management areas — It has been suggested that we manage hunter harvest and set mortality guidelines by smaller geographic units. Some members of the public believe that by managing large geographic areas we are overlooking patterns of local overharvest in portions of those areas. Human access and human-caused mortality is greater in some areas than others and ADF&G already collects hunter effort and mortality data for units as small as watersheds. However, management on a smaller scale presents difficulties.

As stated earlier, the only discrete populations ADF&G has identified in Unit 4 are those of the major islands and possibly Northeast Chichagof. Applying human-caused mortality guidelines to areas which do not have discrete populations could create a "domino effect", that may adversely impact the larger population by transferring problems to other areas. For instance, hunters avoiding restrictive regulations in one area would concentrate in other areas increasing pressure there, causing additional restrictive regulations, prompting hunters to move elsewhere, and so on. This effect is increased because limited access already concentrates hunting to a great extent in Unit 4.

Because we have evidence that dispersal of bears regulary occurs on the major islands, we believe that high mortality on one part of an island is offset by immigration of bears from other parts of the island. Managing by large geographic areas that correspond to discrete populations is the standard approach taken by ADF&G in most instances due to the costs of intensively managing by small geographic areas.

Drawing permits vs. season changes – A drawing permit system has been advocated as a way to control harvest of bears in heavily hunted areas. Drawing permits have the advantage of strictly controlling hunter effort and kill in designated hunt areas. A drawing permit system is more complicated and expensive for both hunters and managers than the current registration system. Drawing permits limit the number of hunters allowed to hunt and thus restrict hunting opportunity. Under current state subsistence law, a drawing permit hunt can be established only for non-resident hunters in Unit 4 unless customary and traditional subsistence use is provided for with a separate subsistence regulation. Once subsistence use is provided for, drawing hunts for residents can be established.

John Hyde

Informally, some guides have said a drawing permit system is preferable to cutting season length as a means of reducing crowding and improving hunt quality, but not all guides agree. One reason is that it is not clear how a drawing permit system would accommodate a guide industry in Southeast Alaska.

Simpler, less expensive regulatory means of controlling harvest, such as changes in season lengths, alternate year closures, etc., should be explored thoroughly before resorting to drawing permits. Ultimately, however, drawing permits may be the most effective way the state can manage harvest with growing guide use in Unit 4.

If a drawing permit system is instituted for Unit 4, it may be necessary to put one in place for the nearby mainland areas of Unit 1 and possibly Unit 5 (Yakutat Forelands). Some guides and unsuccessful drawing permit applicants for Unit 4 may transfer their hunting effort to the nearby mainland increasing the risk of overharvest to those brown bear populations. It is also likely that limiting brown bear hunts would prompt some guides to shift their attentions to black bear hunts on the mainland and Kuiu Island, increasing pressure on already heavily hunted populations.

Because of complex issues associated with instituting a drawing permit it is important to develop a system that is supported by most stakeholders. If the Board of Game determines that a drawing permit system is the best method of regulating bear hunting in Unit 4, the department will lead an effort to design a system that addresses the complex management issues in this unit and one that has the greatest widespread support among stakeholders.

CONCLUSION

Brown bears in Unit 4 are clearly one of the most valuable and important wildlife species in Southeast Alaska. They are a symbol of wildness and of much that is great about Alaska. We believe that the management for brown bears in Unit 4 needs renewed public attention.

As with other wildlife species, brown bear management is really the regulation of human activities to produce desired effects on brown bears. Many of those activities are outside the management authority of ADF&G and the Board of Game. ADF&G has proposed guidelines for many of those activities, but in most cases the guidelines are recommendations only and cannot be enforced by the department.

There are many unresolved issues that we believe threaten the longterm well-being of Unit 4 brown bears to varying degrees. In this paper we have highlighted the major issues and unresolved questions as we see them:

- How to minimize the effects on bears of habitat loss from logging, and determine what tradeoffs in bear carrying capacity and hunting the public will accept in return for continued forest and resource development
- How to manage roads and human access in high density bear country
- How to conduct development activities with the least detrimental affect on bears
- How to solve solid waste management problems faced by communities
- How to regulate increasing tourism and bear viewing
- How to regulate hunting and deal with the issue of proliferation of hunting guides
- How to establish and maintain a brown bear population and habitat monitoring program
- How to increase public education to promote better human-bear coexistence
- How to meet the need for continued high quality bear research

A few of these issues can be addressed at least in part through the Board of Game process. Dealing with other issues requires participation of a broad cross section of people, including: ADF&G, the Board of Game, the USDA Forest Service, other state and federal agencies, Unit 4 communities, and public organizations, groups, and individuals interested in brown bear management.

Good resource management is, among other things, trying to resolve issues before a management problem develops. A healthy Unit 4 bear population gives us an opportunity to demonstrate that we can continue to do what has eluded those elsewhere in the country: maintain healthy, useable brown bear populations coexisting with a thriving human society.

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APPENDIX

SOLID WASTE AND BEARS

A JOINT POLICY STATEMENT AND ACTION PLAN FOR SOUTHEAST ALASKA

by

ALASKA DEPARTMENTS

of

FISH AND GAME, ENVIRONMENTAL CONSERVATION and PUBLIC SAFETY

and

USDA FOREST SERVICE

September 1987

The State of Alaska and USDA Forest Service are initiating a program to reduce and eventually eliminate the "Garbage Dump Bear Problem" in Southeast Alaska.

The program objectives are (1) to reduce habituation of brown and black bears in Southeastern Alaska to garbage, (2) reduce potential bear/human confrontations, (3) create a positive experience for the increasing number of visitors to Southeast, and (4) decrease overall problems caused by improper solid waste collection, storage and disposal.

Although this policy statement is primarily for enhancement of bears, it will also reduce other wildlife and public health concerns related to solid waste.

To this end, we have initiated a combined effort between Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G), Department of Public Safety, and the Forest Service to develop plans, issue or modify existing permits, monitor and enforce these permits, and use other tools as necessary to achieve these objectives.

The prime elements for this effort will be:

A. Solid waste disposal permits issued by Alaska Department of Environmental Conservation.

B. Forest Service administration of Special-Use Permits for permitted facilities and general prohibitions concerning solid waste storage and disposal.

C. Alaska Department of Fish and Game and Department of Public Safety regulations for proper storage, transport, and disposal of food, garbage, fish and game waste products, and other associated solid waste.

D. A cooperative and educational spirit between the agencies involved and the user groups who occupy and/or use Southeast Alaska resources.

Occupants of the various lands in Southeast (NF, State, Private) will all be guided by the same regulations. As a matter of accomplishing the task, selected high priority sites will receive initial emphasis.

Bears habituate garbage because food is available for their consumption. The solution then is to remove food products from solid waste before final disposal. Tools for accomplishment can include:

1. Bearproof and waterproof containers for food and solid waste storage.

2. Segregation of solid waste into food, combustibles, and recycle products.

3. Individual or community garbage grinders with disposal to sewer system or direct outfall into marine waters for disposal of food waste.

4. Special procedures for wild game (butchering, hides, bones) and fish cleaning wastes.

5. Proper incineration of food waste. Residue would go into landfill. Combustibles could also be incinerated. Proper incineration of food waste would render the waste unattractive for bears and other wildlife.

6. Prohibition against baiting wild game for photographers, tourists, hunters, or for other reasons except for trapping furbearers or hunting black bears consistent with 5 AAC 92.

7. Bears currently habituated shall be handled on a case-by-case basis. Consideration of all viable options including destroying shall be included in revised plans for existing landfills.

Our action sequence will be:

1. Distribute this policy statement to all affected publics. (10/30/87)

2. Develop a listing of "high priority" sites for initial implementation. (Continuing)

3. Forest Supervisors publish appropriate "prohibitions" for food and refuse storage and disposal on NF lands. These will be complementary with existing Alaska regulations. (January 1988)

4. Review ADEC solid waste permits for existing landfills. An initial review of selected high priority sites will be performed on October 27. This will be a joint effort of signature agencies followed by meeting(s) with owner/operator of site(s). Recommended changes in design and/or operation shall be determined and a time table for implementation established. (Continuing)

5. Monitoring of future operations for permit compliance can be done by all signature agencies. Reports will be sent to ADEC with copies to all agencies and site owner/operator. (Continuing)

6. Develop and distribute public education materials related to bear problems associated with food transportation, storage, and disposal. (Spring 1988)

7. Formally evaluate this policy statement and action plan for effectiveness and accomplishments. (Fall 1989)

We encourage your interest and cooperation in this effort to keep bears in their wild and rightful place in Southeast Alaska resources. You are the companies, cities, and individuals who will make this program work.

Sincerely,

DON W. COLLINSWORTH
Commissioner, Alaska
Department of Fish and Game

ARTHUR ENGLISH
Commissioner, Alaska
Department of Public Safety

DENNIS D. KELSO
Commissioner, Alaska Department
of Environmental Conservation

MICHAEL A. BARTON
Regional Forester SEP 03 1987
USDA Forest Service

ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

March 1990

POLICY ON SOLID WASTE MANAGEMENT AND BEARS IN ALASKA

INTRODUCTION

Black (*Ursus americanus*) and brown/grizzly (*U. arctos*) bears are common or abundant throughout most of Alaska. Both omnivorous species quickly learn to seek out human food or garbage when provided the opportunity. Polar bears(*U. maritimus*) live in the sea ice environment of the Beaufort and Chukchi Seas and are sometimes attracted to human developments along the arctic coastline. Habituated bears are particularly dangerous and once habituated, generally must be destroyed. As state land disposals, resource development, community expansion, tourism, and outdoor recreation increase throughout Alaska, more bear-human conflicts will occur. Therefore, a consistent and enforceable departmental policy on solid waste management is necessary to minimize impacts on Alaska's bear resources as well as protect the safety of human residents. This policy addresses human settlements throughout Alaska; however, cities may have special problems that must be dealt with on a case-by-case basis.

OBJECTIVES

The objectives of this policy are to:

(1) reduce garbage/bear interactions, thereby reducing bear/human confrontations which risk human injury or death or result in killing of "nuisance" bears;

(2) provide consistent guidance for department responses to proposed human developments where solid waste and other attractants may affect bears; and

(3) provide guidelines to other agencies on the solid waste management practices which should be required prior to issuance of permits under their jurisdictions.

IMPLEMENTATION

To achieve the above objectives, interagency cooperation among the Alaska Departments of Fish & Game (DF&G), Public Safety (DPS), Environmental Conservation (DEC), Natural Resources (DNR), Transportation and Public Facilities (DOT/PF), and the United States Forest Service (FS), National Marine Fisheries Service, Bureau of Land Management (BLM), National Park Service, U.S. Fish & Wildlife Service (FWS), private industry, and private land owners (e.g., Native corporations) will be necessary in developing plans and issuing, monitoring, and enforcing permits and regulations as well as providing public education. The prime elements to accomplish this effort will be:

(1) solid waste disposal permits issued by DEC;

(2) DNR, FS, NPS, FWS, and BLM administration of special-use permits for permitted facilities and general prohibitions concerning solid waste storage and disposal;

(3) DF&G, DEC, and DPS regulations for proper storage, transport, and disposal of food, garbage, fish and game waste products, and other associated solid waste;

(4) coordinated public education efforts by federal and state agencies involved in natural resource management in Alaska;

(5) cooperation among agencies, interest groups, and the general public involved in management and use of Alaska's natural resources; and

(6) effective private industry policies that prohibit employees and contractors from feeding bears or improperly disposing of attractants and that punish employees that violate this policy with immediate dismissal and refusal for rehire.

GUIDELINES

Bears are attracted to human foodstuffs and garbage because they are easily obtained, occur in large quantities, and are often a nutritious food source. The most effective solution for handling bear problems is to eliminate the attractant from the bear's environment before a problem develops.

The following guidelines should be followed throughout Alaska where bears are or may be attracted to garbage.

1. Solid waste disposal sites for communities and permanent field camps should be located, if feasible, in habitats receiving the least use by bears. For example, traditional movement routes and seasonal concentration areas (such as salmon spawning streams or productive berry areas) should be avoided.

2. The preferred alternative for disposal of organic products that may attract bears is incineration in a facility that meets DEC standards for combustion residue (i.e., less that 5 percent unburned combustibles). In large urban communities or at regional disposal sites, daily landfill is an acceptable alternative to reduce or eliminate attraction by bears, provided that these facilities are secured by a bear-proof fence.

   Existing open-pit sites that use surface burning for disposal should be phased out and replaced by a system of daily incineration meeting the above standards or by daily landfill.

3. Large (more than 15 people), permanent (more than one season) field camps should dispose of organic products by daily incineration in a fuel-fired incinerator that meets the above standards. Alternatively, organic products could be hauled daily to a DEC-approved regional disposal site. Temporary storage of organic products prior to incineration or backhaul should be in a bear-proof enclosure (building or fence).

   These camps should be surrounded by a bear-proof fence. Alternatively, dining halls, kitchens, sleeping areas, and incinerators should be fenced, and no organic wastes allowed to be left in vehicles.

4. Small permanent facilities (e.g., lodges, weather stations) or large nonpermanent camps should daily segregate and store organic wastes, and items such as cans and jars that are contaminated with organic waste, in a bear-proof container for weekly backhaul to an approved disposal site. Alternatively, (a) organic waste and other combustibles could be incinerated in a locally-fabricated incinerator meeting DEC standards for residue, or (b) garbage grinders with disposal to a sewer system could be used to remove organic wastes, while contaminated combustible and noncombustible wastes could be incinerated or temporarily stored as above.

5. Food and organic wastes, if stored outside in bear habitat, should be stored in sealed bear-proof containers. Although it is not necessary to remove fish or game carcasses from the field, these should not be left at a central site nor should they be left in or near a campsite or other place with high potential for bear/human conflicts.

6. Small parties using Alaska's backcountry should burn all combustibles and pack out all noncombustibles. Organic material should not be discarded along trails. Caution and common sense are required to reduce or eliminate attractants to bears.

7. In all new parks, roadside facilities, and temporary construction worksites located in bear habitat, bear-proof garbage cans and regular garbage pickup should be required. This requirement should be phased into all existing facilities as soon as possible.

8. Baiting and feeding bears and other wild game by photographers, tourists, hunters, or others is prohibited except for trapping furbearers or hunting black bears consistent with regulations on black bear baiting [5 AAC 92].

9. Bears currently accustomed to eating garbage should be handled on a case-by-case basis according to DF&G's guidelines for managing bear/human conflicts.

DEFINITIONS

Combustible: wood, paper, or plastic products which can be completely burned to ash with a normal fire (e.g., campfire).

Field camp: a field facility (including cabins, trailers, or tents) used for sleeping and feeding people (e.g., mines, logging camps, oil and mineral exploration camps, fish camps, lodges, research facilities, remote hatcheries, fish weirs, etc.).

Garbage: human refuse including paper and plastic products, glass, metal, aluminum, and a wide variety of organic food material.

Habituation: the process by which animals lose their natural fear of humans. Habituated bears may be extremely dangerous, especially when they associate people with food.

Organic products: all foods or edible plant and animal parts (e.g., meat, vegetables, bread, grain, apple cores, banana peels, lettuce, fish and game carcasses, etc.).

Sealed bear-proof container: a container sealed to prevent the escape of attractant odors; bear-proof by means of physical barrier or hanging out of reach (e.g., sealed aluminum containers, pulley system in a tree 15 ft above ground level).