BROWN BEAR MANAGEMENT IN SOUTHEASTERN ALASKA

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Abstract: Brown bears *(Ursus arctos)* inhabit the mainland of southeast Alaska and the islands north of Frederick Sound. Greatest numbers occur in Alaska Game Management Unit 4, the ABC (Admiralty, Baranof, and Chichagof) islands, where about 70 percent of the southeastern harvest is taken. Average sport harvests increased from 51 bears per year (1949-56) to 60 per year (1962-72) to 141 in 1975. Other pertinent harvest statistics have remained fairly consistent since 1949: average skin size (length plus width), 4.1m; average skull size (length plus width), 54.6 cm. Based on dental annuli, ages of males have averaged 8.1 years since 1968. The highest mean annual age was 9.4 years in 1976. The goal of management is to maintain a high-quality hunting experience, which an annual harvest rate of 60-80 animals per year will do much to provide. Harvest statistics gathered over the past 30 years will provide guidelines to insure that management plans are biologically sound. Current regulations that should limit the harvest to desired levels are a $25 tag fee for resident hunters and a limit on the number of guides who can operate in Unit 4. If these fail, time-space zoning, further restrictions on guides, or ultimately permit-only hunting will be necessary. Transfer of nearly 151,760 ha to private land through the Alaska Native Claims Settlement Act and continuing large-scale clearcut logging further cloud the management issue, but with prudent management policies, high-quality and reasonably high-quantity brown bear sport hunting should be possible for many years to come.

Alaska Game Management Unit (GMU) 4 consists of Admiralty, Baranof, and Chichagof islands, known as the ABC islands, as well as smaller adjacent islands. The majority of southeastern Alaska's brown bears are found on these islands, and our greatest body of data pertains to this part of southeastern Alaska.

This work was financed in part through Federal Aid to Wildlife Restoration, Alaska Project W-17-R. The Boone and Crockett Club provided for the author's transportation to the Fourth International Bear Conference in Kalispell. Sincere thanks are due D. E. McKnight, R. E. Pegau, and L. M. Bergdoll of the Alaska Department of Fish and Game for their assistance in preparing this paper.

THE AREA

The ABC islands are the northernmost islands of the Alexander Archipelago (Fig. 1). Admiralty and Baranof islands each have an area of about 2,575 km^2 and Chichagof has about 3,540 km^2. They are separated from the remainder of the archipelago by Frederick Sound. All are characterized by rugged topography, with some peaks rising to 900-1,200 m only 1-2 km from salt water. The shoreline, some 3,700 km in extent, is very irregular and has many long, narrow fjord-like bays. These bays are characterized by steep, forested hillsides and are fed by numerous anadromous fish streams draining heavily timbered U-shaped canyons. Most of the bays are bordered by narrow strips of grass-sedge vegetation that spread out to form large deltas at the heads of the bays. Extensive, dense stands of a Sitka spruce (*Picea sitchensis*)-western hemlock (*Tsuga heterophylla*) consociation, which is the dominant vegetative type, reach to an elevation of about 600 m. Muskegs and subalpine and alpine vegetation occur above that elevation.

Brown bears have apparently occupied the ABC islands since recession of the last Ice Age some 10,000 years ago (Klein 1965). They are the only large carnivore on the islands. Wolves *(Canis lupus)*, wolverines (*Gulo gulo*), and black bears (*Ursus americanus*) — but no brown bears — are present on the Alaskan islands of the Alexander Archipelago south of Frederick Sound. All four of these species coexist on the adjacent mainland (Klein 1965).

Brown bears appear well adapted to the habitats available on the ABC islands and at the appropriate times of year make use of most habitat types. Bears emerge from their winter dens, which are located at or above timberline, in April and May and descend to the beaches, where newly emerging grasses, sedges, and forbs provide the bulk of their diet. Some scavenging of animal remains, i.e., winter-killed deer (*Odocoileus hemionus sitkensis*) and marine mammal carcasses, occurs. Bears remain near the beaches until early summer when berries begin to ripen and anadromous fish begin to appear in the streams. They feed on fish and berries until the fish runs begin to diminish in September and October. At that time, they move to higher elevations where they remain for a short period, feeding on berries and other vegetation until the onset of winter makes that food supply unavailable. They enter their winter dens usually in October and November.

With primary food sources consisting of anadromous salmonids and vegetation associated with early stages of postglacial succession, and a lack of competition from other mammalian species, brown bears probably became relatively abundant fairly soon after they colonized the ABC islands.

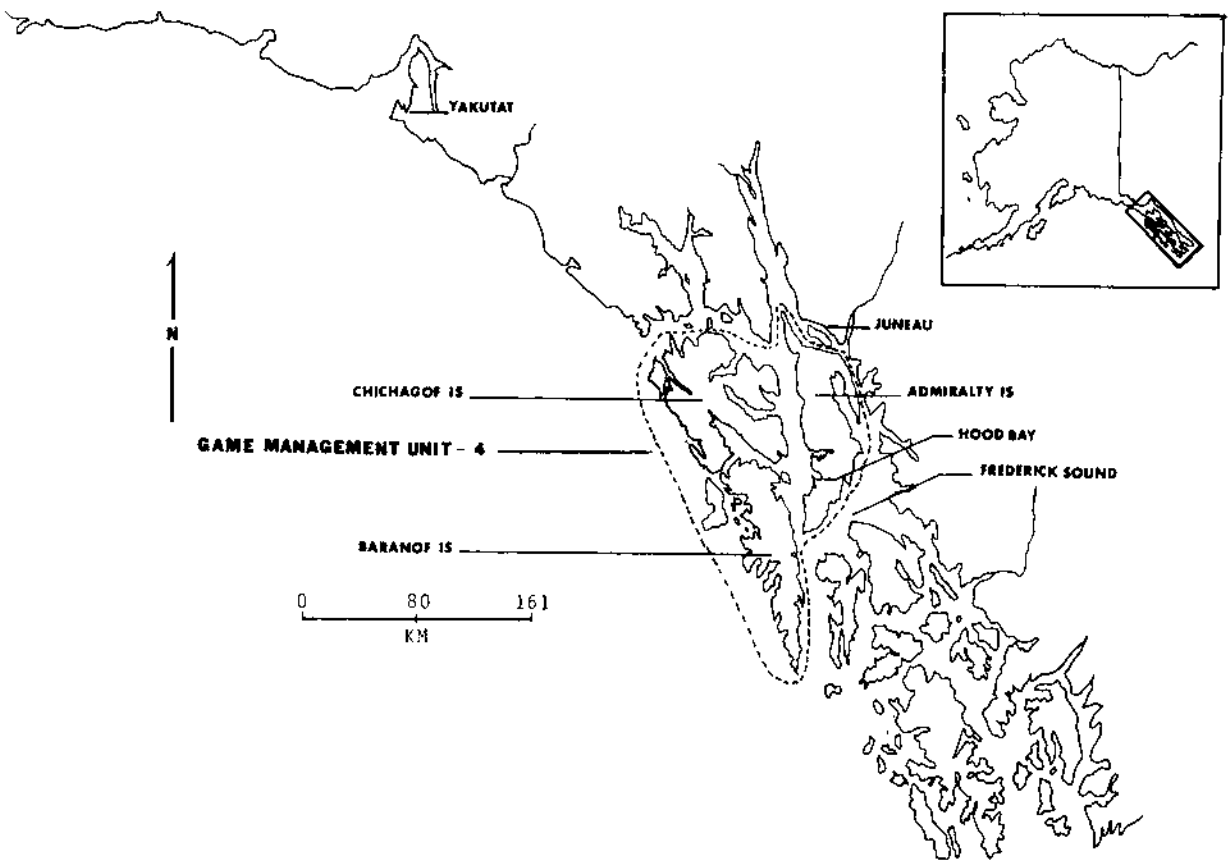

Fig. 1. Southeast Alaska.

POPULATION LEVELS

Much has been written on the abundance of bears on the ABC islands since Holzworth's (1930) account of his photographic expeditions there in the late 1920's. The first attempt to enumerate bears was made by Dufresne and Williams (1932) in a cooperative study between the U.S. Forest Service and the Alaska Game Commission. That study covered Admiralty Island only and was based on track counts made while bears were concentrated along fish streams during the sumsummer. They estimated that 900 bears inhabited Admiralty Island. Estimates based on track counts also indicated 940 bears for Chichagof Island in 1938 (Holbrook 1938) and 445 bears for Baranof-Kruzof islands in 1939 (Holbrook 1939) — a total of 2,285 bears for the ABC islands.

Klein (1958) tested the track count technique on Admiralty Island and found it unreliable except for local situations. Expanding his Admiralty Island data, he estimated the population on the ABC islands as 1,800 bears in 1958.

A U.S. Forest Service study from 1960 through 1966 (Perensovich 1966), using aerial censuses and track counts, made no population estimates but concluded that there were no data to suggest declines in population during the period of that study. Perensovich's study was aimed primarily at measuring the impact of logging on bears. A similar study was continued by the Alaska Department of Fish and Game until 1968 (Lentfer et al. 1969). At that time, it was concluded that although the aerial census technique was not satisfactory for population estimation, the data col-

lected did indicate no appreciable changes in population densities.

More recently, a population study conducted at Hood Bay on Admiralty Island from 1971 to 1975 (Wood 1976) estimated a population of 72-105 bears from ratios obtained through observations of tagged to untagged bears. Previous estimates for Hood Bay were 49 by Dufresne and Williams (1932) and 20 by Klein (1958). Although past studies varied considerably in technique, technology, and objectives, all indicated that bears were abundant and none suggested population declines.

In addition to data on bear population densities and status, studies have provided information on the reproductive biology of brown bears in GMU 4. Klein (1958), from 555 bear observations, found that cubs-of-the-year composed 9.7 percent of the population and yearlings and older cubs represented 11.9 percent. Litter sizes were 2.2 for cubs-of-the-year and 1.9 for yearlings and older cubs. Perensovich (1966), in a sample of 190 bears, found litter size in cubs-of-the-year to be 2.1 and in older cubs to be 1.6.

Johnson (1974, 1976, 1977) reported litter size of cubs-of-the-year to be 1.75 and of yearling and older cubs, 2.0. Cubs of all ages represented 22.6 percent of the 31 individual bears seen in 1973, 31 percent of the 32 individual bears seen in 1974, and 24 percent of the 21 individual bears seen in 1975. No cubs-of-the-year were seen in 1974. All observations were made in May and June in Hood Bay on Admiralty Island. These data indicate that cub production and survival in southeastern Alaska have been quite consistent, at least since 1958. They are similar to data from other coastal parts of Alaska (Klein 1958, Lentfer et al. 1969, Glenn et al. 1976).

Sightings and recoveries from tagged bears (Wood 1976 and unpublished records of the Alaska Department of Fish and Game) indicate that there is only limited interchange of bears between adjacent bays on Admiralty Island. Among 10 recoveries of 44 bears tagged in Hood Bay, 1 was taken from Pybus Bay, 7.3 km distance, and 1 from Chiak Bay, 4.8 km distant; the remainder were taken in Hood Bay.

HUNTING/MANAGEMENT

For many years, both hunters and nonhunters have been highly interested in the bears on the ABC islands. As the timber industry developed in southeastern Alaska, action to afford habitat protection for bears also developed. The principal early proponent for protection of bears was the New York Zoological Society, with J. M. Holzworth its spokesman (Senate hearings, 1932). Admiralty and Chichagof islands received the most attention. The philosophies of the two factions are summarized and fairly well represented in a management plan for Admiralty Island published jointly by the Alaska Game Commission and the U.S. Forest Service (Heintzleman and Terhune 1934). Portions of that plan, which were adopted and incorporated in Alaska game regulations, do not differ greatly from present philosophies of the Alaska Department of Fish and Game, e.g., the plan suggested holding the annual kill from Admiralty Island at 35 animals, which is similar to our current recommendation. Developmental interests, however, generally have not complied with another objective of the plan: "Other resources will be so managed as not to cause a diminution of the number of these animals." Although no cutting of timber was recommended in areas of heavy bear concentrations, some fairly extensive clearcutting has occurred on the southern portion of the island. A long-term logging contract, first signed in 1966 but since canceled, was also not in accord with the intent of the plan.

Brown bear hunting on the ABC islands can be divided into three rather distinct periods — before 1925, 1925-59, and 1960 to the present. Regulations governing bear hunting during these periods are summarized in Table 1. Before 1925, there were few regulations governing the taking of bears in Alaska. Although harvest records are scanty, the ABC islands were well known for their bear-hunting potential. A. Hasselborg, a homesteader who lived on Admiralty Island for many years, reportedly killed more than 300 bears and sold over 200 of them to museums (Holzworth 1930). Until 1925, brown bears could be taken as furbearers. The only known record of the possible magnitude of use of bears for fur is a report in the U.S. Senate hearings of 1932 that the Native people of the village of Angoon on Admiralty Island annually sold 25-50 bear skins. The hearings also noted that fox farmers frequently killed bears for fox food.

In 1925, a fairly comprehensive set of regulations was adopted and applied with little alteration until Alaska achieved statehood in 1959. These regulations ended commercial hunting, established an annual bag limit of 3 bears, and provided a closed season during the summer months. Guides were required for nonresident hunters. Harvest records for the early years after 1925 are poor at best. Reconstruction of information presented at the Senate hearings in 1932 suggests that the ABC islands sustained an annual kill of about 30

Table 1. Historic brown bear hunting regulations, ABC islands, Alaska.

Year	Bag limit	Season	Guide required for nonresidents	Remarks
Before 1925	No limit	Year-round	No	
1925	3	Year-round	Yes	Sale of hides illegal after 1925
1926-29	3	1 Sep-20 June	Yes	
1930-32	No limit	Year-round		Alaska residents only
	2	1 Sep-20 June	Yes	Nonresidents
1933-34	2	1 Sep-20 June	Yes	
1935-44	1 (Admiralty only) 2 (remainder of area)	1 Sep-20 June	Yes	Thayer Lake and Pack Creek closed areas established in 1935 or 1936
1945-55	2 (Admiralty exception removed)	1 Sep-20 June	Yes	Mandatory guide reporting system initiated
1956	2	1 Sep-30 June	Yes	
1957	2	1 Sep-30 June	No	Game Management Unit system established
1958	1	1 Sep-30 June	No	Mandatory guide reporting system eliminated
1959	1	1 Sep-30 June	No	Cubs and sows with cubs protected hereafter
1960-63	1	1 Sep-30 June	Yes	
1964-66	1	1 Sep-30 June	No	
1967	1	1 Sep-20 June	Yes	
1968-present	1 bear every 4 regulatory years	1 Sep-10 June	Yes	Minor changes in season openings and closures

bears during the period 1927-31. Nonresident hunters took about 80 percent of that harvest.

A memorandum from the U.S Forest Service to the U.S. Fish and Wildlife Service (Heintzleman 1948) indicated that 256 bears were taken on Admiralty Island in the period 1933-40. Resident hunters took 56 percent and nonresidents, 44 percent of the average annual kill of 32 bears. No mention was made of how the data were gathered; however, during that time, persons purchasing an Alaska hunting license were required to report their previous year's bag.

From 1945 through 1956, the U.S. Fish and Wildlife Service required registered guides to submit detailed reports for all guided hunts involving nonresident bear hunters. Although accurate kill data were kept for guided hunts, no records of the harvest from unguided hunts have been located. Data obtained from the mandatory guide reporting system, which are often fragmentary, included sex, date of kill, location of kill, hide size (nose to tail length plus width between tips of forepaws of skins laid out flat), and skull size (greatest length plus greatest width.) Males composed about 64 percent of the reported kill. Admiralty, Baranof, and Chichagof islands contributed 67, 15, and 18 percent, respectively, of the kill. Skin size of all bears averaged 4.7 m, and skulls measured 59.9 cm. The annual kill was about 51 bears for the period 1949-56 (Table 2). For the first 4 years of the mandatory guides reporting period (1945-48), the reported kill averaged only 9 bears per year, presumably because the guiding industry was still hampered by wartime restrictions.

From 1956 through 1960, apparently no harvest records were kept. With statehood in 1959, the Alaska Department of Fish and Game was created. Current regulations, which have been relatively unchanged since then, provide for a closed season during the summer when pelts are of little trophy value; prohibit the taking of cubs or sows accompanied by cubs (cubs being bears 1 or 2 years of age); prohibit the use of helicopters or rotorcraft in any manner; limit the take to 1 bear every 4 regulatory years; require registered guides for all nonresident hunters; require that all bears be presented to representatives of the Department of Fish and Game for sealing; prohibit hunting the same day hunters are airborne; and prohibit barter or sale of bear skins. The sealing program originally required that only skins be presented. That provision was amended in 1967 to require that skulls as well as skins be sealed and was further amended in 1968 to require that a tooth be collected for aging. These requirements have yielded a large volume of data upon which to base management decisions.

Data derived from the sealing program (Table 3) included sex, date and location of kill, skin size, age

Table 2. Historic brown bear harvest data, ABC islands, Alaska.

Year	Admiralty	Baranof	Chichagof	Total
1933	40 (52)[a]			
1934	25 (48)			
1935	26 (61)			
1936	30 (44)			
1937	31 (46)			
1938	33 (64)			
1939	29 (18)			
1940	32 (36)			
1941-44		— No data —		
1945[b]	3	1	0	4
1946	9	1	5	15
1947	6	0	0	6
1948	6	3	3	12
1949	41	9	6	56
1950	56	11	1	68
1951	36	13	18	67
1952	36	5	8	49
1953	38	9	5	52
1954	31	4	13	48
1955	20	3	19	42
1956	18	4	2	24
1957-60		— No data —		
1961	22	4	13	39
1962	25	3	16	44
1963	15	7	4	26
1964	33	5	17	55
1965	34	14	18	66
1966	47	12	17	76
1967	36	11	22	69
1968	29	3	16	48
1969	30	8	27	65
1970	40	11	21	72
1971	29	12	28	79
1972	29	13	35	77
1973	45	8	46	99
1974	44	4	38	86
1975	51	14	40	105
1976	71	21	49	141

[a] Percent resident kill in parentheses.
[b] Nonresident kill only, 1945-56.

based on cementum annuli, and total sport kill. They show that the harvest averaged 70 percent males, 71 percent of which were taken in spring and 53 percent by nonresident hunters. The average bear had a skin size of 4.1 m, a 54.6-cm skull, and was 8 years of age (males only). Total kill averaged 60 per year, 1961-72, but increased to 99 in 1973, 105 in 1975, and 141 in 1976. Admiralty, Baranof, and Chichagof islands contributed 51, 15, and 34 percent respectively, of that kill. There has been an upward trend in the percentage of the kill from Chichagof Island and a corresponding downward trend from Admiralty and Baranof islands. However, pertinent harvest statistics except total kill have remained remarkably consistent. In fact, the mean age of males increased to 9.4 years in 1976. On a statewide basis, the ABC islands account for approximately 11 percent of the annual harvest of brown and grizzly bears.

Data provided by the guide reporting system used by the U.S. Fish and Wildlife Service before statehood and data derived from the current sealing program are not always comparable. Hide sizes reported by guides were typically green, unsalted skins; measurements taken under the sealing program are typically of salted skins. A bear skin normally shrinks about 50-60 cm after salting. Therefore, the 4.7-m average green skin taken during 1945-58 compares favorably with the 4.1-m average salted skin since 1961. Also, under present conditions, bears taken by nonresident guided hunters average slightly larger than those taken by resident hunters. If the sizes of resident hunters' bears could be averaged in with the data for 1949-56, even greater similarity might be shown. The average skull size of 59.9 cm under the guide reporting system is also probably high; guides, especially in the presence of the successful hunter, frequently intensify their efforts to make the trophy appear larger. Under the sealing program, skull measurements are normally taken with calipers.

HUNTING TRADITIONS

Brown bear hunting in southeast Alaska, particularly during the spring season, has traditionally been an aesthetically pleasing experience. The optimum springtime hunting period of 20 May — 10 June, which coincides with high bear availability and pelt primeness, is a pleasant time of year. Over 70 percent of the spring harvest and 50 percent of the yearly harvest is taken during this period. Male blue grouse (*Dendragapus obscurus*) are displaying, filling the bays with their pulsating "hoots." Fishing can be good, clam digging is excellent, a variety of crabs can be gathered, and in the evenings deer are often seen in large numbers on the beaches. Marine mammals such as seals (*Phoca vitulina*), sea lions (*Eumetopias jubata*), whales, and porpoises can be observed. Migrating waterfowl and other birds are plentiful. It is not uncommon to see upwards of 50 different bears on a 10-day hunt. All of these experiences can combine to make a memorable hunt. Obviously, hunting success rates are high. Guides and resident hunters traditionally seek solitude from other hunting parties. Transportation is mostly by boat, with hunting forays made by skiff from a large boat. The larger boats provide roving base camps, which guard against hunter crowding through their mobility and enable the guides to survey a great deal of country. Aircraft are infrequently employed.

Table 3. Brown bear sport harvest, Game Management Unit 4, 1961-75.

Calendar year	Total kill	Percent kill in spring	Percent males	Percent nonresident kill	Mean hide size, male[a] (m)	Mean skull size, male[a] (cm)	Mean cementum lines[b]	
							Male	Female
1961	39	72	80	59	4.6			
1962	44	73	66	66	4.5			
1963	26	67	74	56	4.4			
1964	55	72	67	44	4.3			
1965	76	65	63	67	4.2			
1966	76	65	63	67	4.0			
1967	69	66	69	48	4.0	57.7		
1968	48	72	76	36	3.9	56.3	8.0 (10)	
1969	65	67	77	52	4.2	57.7	7.1 (32)	
1970	72	85	73	55	4.2	55.9	7.8 (40)	
1971	79	78	64	52	4.3	57.7	8.3 (44)	8.1 (15)
1972	77	66	75	53	4.4	57.2	8.8 (55)	6.4 (17)
1973	99	72	68	40	4.2	54.9	7.7 (63)	8.5 (32)
1974	86	74	73	51	4.2	56.4	7.6 (57)	7.7 (21)
1975	105	72	69	57	4.3	56.4	8.1 (66)	6.4 (29)
1976	141	79	64	60	4.3	56.9	9.4 (90)	8.6 (50)
Mean		71	70	53	4.2	56.6	8.1	7.6

[a] Length plus width.
[b] Tooth sample size in parentheses.

An annual exploitation rate of 60-80 bears produced the harvest data parameters outlined above (and in Tables 2 and 3). Biologically, that rate of exploitation appears to have had little impact on the population, as witnessed by the consistency of the data over the years, and also ensures minimal hunter interaction in the field and little or no competition for hunting space or for bears. With harvest levels greater than 60-80 per year, as in the past 4 years, aesthetic hunting conditions are eroded through hunter interaction and competition for space and bears.

MANAGEMENT GOALS

The management goal of the Alaska Department of Fish and Game in GMU 4 is to provide bear hunters with high-quality hunting experiences. A management plan to meet that goal has been drafted and will soon be presented for public review. The plan was based upon hunting tradition and harvest characteristics over the past 30 years. It outlines two basic options available to achieve the management goal: (1) limit the kill to the pre-1972 harvest rate of 60-80 bears per year through a permit hunt; or (2) design a time and space zoning procedure to minimize hunter interaction. It might be possible under the second option to exceed the annual kill of 60-80 bears. Under either option, adherence to the harvest parameters cited above ensures biologically sound management practices.

Until full implementation of the management plan, we are faced with the problem of increasing harvests and decreased quality of hunting experience. If overharvest becomes critical, we can reduce hunting through emergency season closures. Beginning in 1977, a tag costing $25 will be required of all resident brown bear hunters, the first time a resident tag for general hunting has been issued in Alaska. Although initiated to provide needed revenue, the tag is expected to reduce the number of bear kills incidental to other hunting activities of resident hunters. Also, in February 1977, the Alaska Guide Licensing and Control Board set a limit on the number of guides (19) who can contract for hunts in GMU 4. Should that limitation fail to reduce the nonresident kill, the Guide Board also has the authority to assign restricted or exclusive guiding areas to individual guides. The latter measure is less acceptable because it eliminates the opportunity to move about and hunt different areas, which was an appealing aspect of the earlier type of hunting.

MANAGEMENT PROBLEMS

In addition to increased hunting pressure, bear management in southeastern Alaska faces other problems. Transfer of nearly 151,760 ha of land to Native groups under the 1972 Alaska Native Claims Settlement Act (PL 94-2004, 85 Stat. 688) is now under way. The Native lands will be subject to the usual problems associated with the management of a public resource on private property. Because of conflicts, litigation, and trade-offs, it will be many years before these transfers are fully implemented. Some Native groups made

selections that would enable them to continue their subsistence way of life, which should favor bear management. Other groups are primarily interested in exploiting the timber resource, which will undoubtedly adversely affect bear management. Also, a special land classification for Admiralty Island is again being discussed.

Development of an extensive logging industry has perhaps had the greatest impact on bear management in southeast Alaska. All lands under administrative jurisdiction of the U.S. Forest Service on Baranof Island and most of Chichagof Island are included in a 1956 50-year timber sale to the Alaska Lumber and Pulp Company, a Sitka-based, Japanese-owned firm. That sale committed most of the merchantable timber (28,173,696 m^3) to logging. At present, approximately 18,211 ha have been logged. Admiralty Island was included in a similar sale; but litigation by environmental groups, notably the Sierra Club, brought about a mutual cancellation of that contract by the U.S. Forest Service and the company involved. Admiralty Island is now subject to independent timber sales.

Logging in southeast Alaska is generally done by clearcutting; unfortunately, the effects of clearcut logging on bear populations and bear hunting are poorly understood. Perensovich (1966) reported that the effects were slight but felt his study was too brief to be conclusive. One known impact, which is primarily a management problem but at the same time contributes significantly to the kill, is the rather large number of bears destroyed in logging and support camps. This kill may approach 10 percent of the reported legal kill. Many of these kills seem avoidable, and we are continually working on this problem. Regulations should be developed to place responsibility on the logging industry or the appropriate governmental agency to minimize bear-human confrontations at campsites. Camps and refuse sites are usually chosen at the convenience of operators.

Oil development on the Outer Continental Shelf and tankers transporting oil from the trans-Alaska pipeline will perhaps not affect bears directly, although a large-scale spill could be ruinous to spring feeding areas. The additional growth in the human population, brought about by oil-related activities, will put more hunters in the field and further compound other problems.

Perhaps the most pressing problem is implementation of a long-range management plan. If the trend toward increased harvests and decreased quality of hunting experiences is allowed to continue, precedents will be established that will be hard to reconcile. Overall, notwithstanding these problems, brown bear management in GMU 4 faces a promising future. Increased demands for the bear resource and for its habitat make it obvious that the idealistic management characteristic of the pre-1972 period will no longer be possible, but adoption of the proposed management plan should assure a continuation of high-quality hunting experiences. Because that plan is based on an exploitation rate that is not expected to alter bear numbers significantly, bear numbers should be adequate for nonconsumptive uses as well.

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