BROWN BEAR-HUMAN CONFLICTS IN THE KODIAK ARCHIPELAGO, ALASKA

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Abstract: Circumstances of 88 incidents in which 93 brown bears (*Ursus arctos*) were killed in defence of life or property from 1974-1986 in the Kodiak Archipelago, Alaska, were examined. Sex, age, and reproductive status of mortalities were analyzed. The leading sources of mortality were conflicts with deer (*Odocoileus hemionus sitkensis*) hunters (51%) and conflicts with residents of remote villages (23%). Deer hunters were also the leading source (53%) of defense of life or property incidents. An increasing trend in defence of life or property mortality indicates interactions between humans and brown bears are becoming more frequent. More females than males were killed and maternal females were killed more often than single females. The present level of mortality is probably not detrimental, but continued loss of mature females whose home ranges intersect villages and popular hunting areas could depress bear numbers in localized areas. A growing resident human population, increasing activity by outdoor recreationists, and development of private lands are predicted to result in increased bear-human conflicts. An accelerated program to educate the public to avoid conflicts with bears is recommended.

Bear-People Conflicts - Proc. of a Symposium on Management Strategies (1989). Northwest Territories Dept. of Renew. Res.

The Kodiak Archipelago in southwestern Alaska is renowned for supporting high brown bear densities (Troyer and Hensel 1964) and for producing trophy bears (Nesbitt and Wright 1981). The area has recently gained a reputation for high quality salmon (*Oncorhynchus* spp.) and steelhead trout (*Salmon gairdneri*) sport fishing, and for Sitka black-tailed deer hunting. An influx of outdoor recreationists travelling to Kodiak, along with increased pressure from a growing local populace, has resulted in a significant increase in human activity and a corresponding rise in bear-human conflicts. Immediate concerns are increasing conflicts with deer hunters and inhabitants of rural villages on Kodiak Island. Future development and occupation of private lands in coastal areas are expected to produce chronic bear problems. The agencies with primary responsibility for managing bear populations and habitat, the Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (FWS), are faced with the task of improving bear management and habitat protection while operating budgets are decreasing. This paper examines current and predicted bear-human conflicts in the Kodiak Archipelago and discusses strategies for minimizing those conflicts. We have focused on defence of life or property (DLP) mortality of brown bears as the most reliable indicator of trends in bear-human conflicts.

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BACKGROUND

Brown bears were considered undesirable competitors by ranchers and commercial salmon fishermen, and wanton killing of brown bears was common in the early 1900's. Hunters and conservationists became concerned about the welfare of the Kodiak brown bear in the 1930's, and their efforts resulted in the establishment of the 7,680 km^2 Kodiak National Wildlife Refuge in 1941. Conflicts with livestock on northeastern Kodiak Island resulted in a controversial brown bear control program conducted by the ADF&G from 1964-1968 (Rearden 1964, Eide 1965).

The Alaska Native Claims Settlement Act of 1971 and the Alaska National Interest Lands Conservation Act of 1980 resulted in the transfer of 1,250 km^2 of public land to Alaska natives. Additional land has been sold by state and local governments for homesteads and recreational cabins. Consequently about 25% of the land in the Kodiak Archipelago is now privately owned. Because most of this land is important bear habitat, there is potential for adverse impacts on brown bears. Other recent land developments with potentially adverse effects on brown bears include commercial timber

harvest on Afognak Island and the Terror Lake hydroelectric project on northern Kodiak Island.

The most significant trend in the Kodiak Archipelago in the past decade was the rapid increase in human use. The population of 13,952 residents increased 43% from 1980 to 1986 and it is expected to exceed 21,000 people by the year 2000 (Kodiak Island Borough, unpubl. data). Recreational use by local residents and by off-island visitors is increasing by about 10% annually. Over 7,000 people visited the Kodiak National Wildlife Refuge in 1984 and that number is projected to more than double by 1995 (U.S. Fish and Wildl. Serv., unpubl. data).

Interest in brown bears is growing among both the hunting and non-consumptive recreationists. There is a high demand for hunting the Kodiak brown bear by both resident Alaskans and non-residents. Brown bear hunting in most areas is regulated by a system with assigned hunting areas and limited permits. Visits to remote brown bear habitat by photographers and tourists appear to be increasing steadily.

Conflicts between humans and brown bears occur regularly and in varied circumstances in the Kodiak Archipelago. Conflicts with wildlife, including bears, can legally be resolved by killing an offending animal under a regulation passed by the State of Alaska in 1960. The regulation provides for the "taking of game in defense of life or property" by individuals, and defines legitimate circumstances for DLP killings (Miller and Chihuly 1987). Hides and skulls must be salvaged and surrendered to ADF&G, with a written report detailing the circumstances of the killing.

STUDY AREA

The Kodiak Archipelago consists of 16 major islands located east of the Alaska Peninsula in the Gulf of Alaska (Figure 1). The 2 largest islands, Kodiak (9,300 km^2) and Afognak (1,800 km^2), compose 87% of the land area and support most human activities (Buck et al. 1975).

Rugged topography, unpredictable weather, and dense vegetation characterize the archipelago. Major physiographic features include rugged mountains, rolling hills, broad valleys, and an irregular coastline with prominent headlands, cliffs, and deep, narrow bays. Weather patterns are strongly influenced by the Japanese current, and fog, drizzle, and high winds occur frequently. Temperatures are mild and annual precipitation exceeds 180 cm. Remote areas are accessible only by floatplane or boat. This poor accessibility tends to concentrate human activities and settlements in small areas.

Vegetation is typified by a moderate to dense shrub cover interspersed with lush, herbaceous meadows. Willows (*Salix* spp.), the dominant shrub in wet lowland areas, give way to alder (*Alnus crispa*) on drier sites. Large bog and heath communities occur in southwestern Kodiak Island. Extensive Sitka spruce (*Picea sitchensis*) forest occurs on Afognak and northern Kodiak Islands. Five species of Pacific salmon are found in the archipelago, with pink salmon (*O. gorbuscha*) and sockeye salmon (*O. nerka*) the most abundant. Large mammals include Sitka black-tailed deer, Roosevelt elk (*Cervus elaphus roosevelti*), mountain goat (*Oreamnos americanus*), feral reindeer (*Rangifer tarandus*), and brown bear. The brown bear population is estimated to exceed 2,700 bears, with the highest densities occurring on Kodiak Island (Barnes, V.G., Jr., R. B. Smith, and L. G. Van Daele, unpubl. rep., Alas. Dept. Fish and Game and U.S. Fish and Wildl. Serv., 1988).

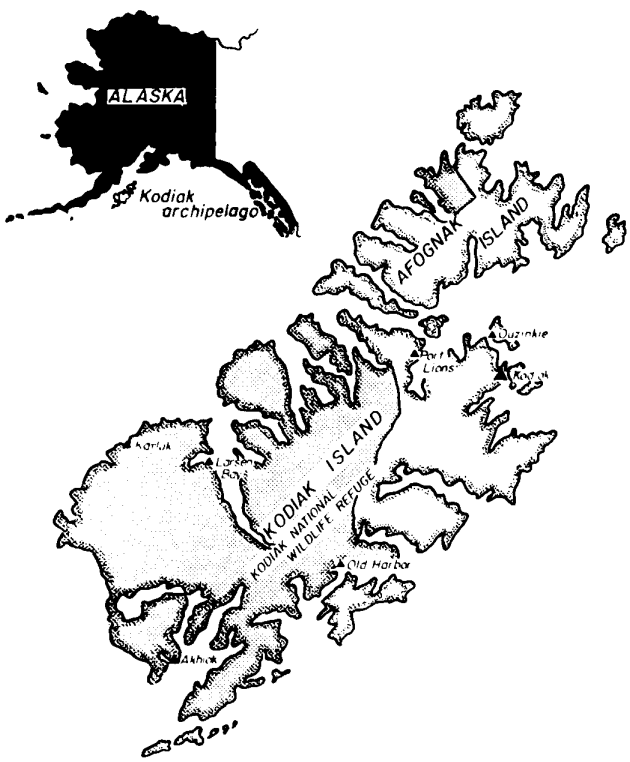

Figure 1. Kodiak Archipelago showing villages and the Kodiak National Wildlife Refuge (shaded) (1 cm = 11.5 km).

METHODS

We analyzed brown bear sealing records and written reports of people who killed brown bears in defence of life or property in the Kodiak Archipelago (Game Management Unit 8) from 1974-1986. This analysis was based on 88 separate incidents involving 93 individual bears. For DLP incidents in which hides and/or skulls were salvaged, standardized sealing forms in ADF&G files provided data on sex, cementum age, location of kill, and notes on circumstances of the kill. Anyone who kills a bear in defense of life or property is required to submit a written statement within 15 days detailing the incident. Statements examined ranged from 1 paragraph to several pages. Additional information was acquired from questionnaires filled out by individuals involved in DLP kills since 1985.

Over the past decade, ADF&G has given high priority to documenting DLP kills and enforcing the requirements for reporting and salvaging hides and skulls. Compliance with the reporting requirement is believed to be high in the Kodiak Archipelago relative to other areas of Alaska, but unreported kills are sometimes found. Where data were missing from a DLP statement, cross-referencing with sealing records usually filled the gaps. Occasional subjective judgements were required to interpret the reports, but we had personal knowledge of nearly all the incidents, having interviewed many of the individuals involved, and sealed the hides and skulls of bears killed.

We examined circumstances of the DLP incidents and assigned them to 1 of 8 categories. For analyzing seasonal occurrence and distribution of kills, the 8 categories were reduced to 3, including incidents involving hunters, bush and village residents, and other sources combined. We further examined the circumstances of 47 DLP kills of brown bears by deer hunters and classified them into incidents which occurred in the field and in camps. The sex and age composition of the kills and reproductive status of females killed were analyzed. Data from radio-collared bears, obtained in a study on the impacts of the Terror Lake hydroelectric project constructed on northern Kodiak Island from 1982-1985 (Smith and Van Daele 1988), provided additional insight into bear-human conflicts.

RESULTS

Hunters were most often involved in DLP incidents (61%) followed in order by residents of 5 remote villages, isolated bush residents, government fish and game managers, and commercial fishermen (Table 1). Deer hunters accounted for 87% of the bears killed by hunters.

Table 1. Sources of brown bear mortality in defence of life or property incidents, 1974-1986, Kodiak Archipelago, Alaska.

Source of incidents/ mortality	Incidents N	Incidents %	Bears killed N	Bears killed %
Deer hunters	47	53	47	51
Bear hunters	5	6	5	5
Elk hunters	2	2	2	2
Village residents	18	20	21	23
Bush residents	5	6	7	8
Government fish & game	4	5	4	4
Commercial fishermen	3	3	3	3
Other	4	5	4	4
Total	88	100	93	100

Table 2. Seasonal occurrence of defence of life or property brown bear mortality, 1974-1986, Kodiak Archipelago, Alaska.

Month	Source of mortality: Hunter	Source of mortality: Village/ bush resident	Source of mortality: Other	Total mortalities N	Total mortalities %
January-May	4	1	1	6	6
June	0	2	3	5	5
July	0	1	2	3	3
August	3	2	3	8	9
September	3	3	0	6	6
October	27	13	1	41	44
November	15	4	1	20	22
December	2	2	0	4	4

Most DLP mortalities occurred in the fall with October (44%) and November (22%) accounting for the highest number of kills (Table 2). The highest seasonal incidence of bear kills occurred in October both for hunters (50%) and for village/bush residents (46%).

The DLP mortalities were distributed throughout the Kodiak Archipelago (Table 3). Northwestern Kodiak Island and the Afognak Island area sustained 60% of the kill by hunters. Northwestern and southeastern Kodiak Island, which include the villages of Port Lions and Old Harbor respectively, had the highest kill by village/bush residents.

Table 3. Spatial distribution of defence of life or property brown bear mortality, 1974-1986, Kodiak Archipelago, Alaska.

Area	Source of Bear Mortality: Hunter N	Hunter %	Village/Bush Resident N	Village/Bush Resident %	Other N	Other %	Total N	Total %
Afognak and adjacent islands	16	(30)	1	(4)	2	(18)	19	(20)
NW Kodiak Island	16	(30)	10	(36)	2	(18)	28	(30)
NE Kodiak Island	8	(15)	1	(4)	0		9	(10)
SW Kodiak Island	11	(20)	6	(21)	4	(36)	21	(23)
SE Kodiak Island	3	(6)	10	(36)	3	(27)	16	(17)

Table 4. Circumstances of brown bear kills in defence of life or property by deer hunters, 1974-1986, Kodiak Archipelago, Alaska.

Circumstances of kills	Bear: Male	Bear: Female	Bear: Unknown	Total N	Total %
In field					
Without meat	8	11	2	21	45
With meat	1	5	0	6	13
Camp Area	5	9	1	15	32
Unknown	1	3	1	5	11

For bear mortalities involving deer hunters, bears were more often killed while hunters were in the field than while they were at camp (Table 4). The presence of deer meat was a probable factor in 6 (22%) of 27 incidents in which hunters killed bears in the field. Establishing the precise circumstances of these kills was difficult because some statements were known or suspected to have been made misleading in order to avoid possible prosecution for an unjustified killing.

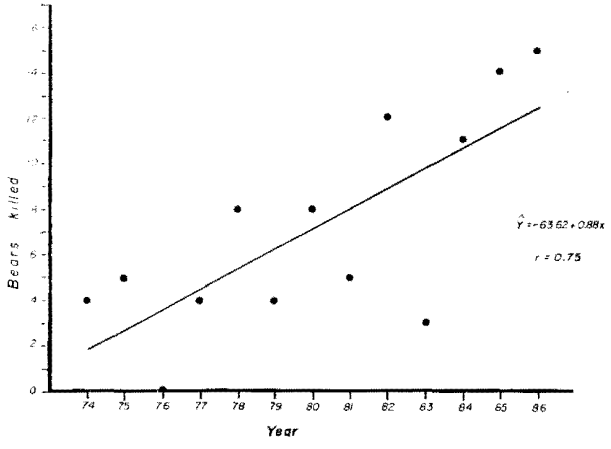

Figure 2. Defence of life or property mortality of brown bears in the Kodiak Archipelago, Alaska, 1974-1986.

An increasing rate of DLP kills of brown bears was evident since 1978 (Figure 2), with 60% of the mortality recorded in the past 5 years. Mean annual mortality for the periods 1974-1981 and 1982-1986 was 5.4 and 11.0 bears, respectively.

In the adult and subadult categories, females accounted for 43 (57%) of 76 DLP bears of known sex (Table 5). Adult females were killed more often (77%) than subadult females. Maternal females were killed more commonly than were single adult females. Among males, the number of adults and subadults killed was nearly equal.

Excluding dependent juveniles, the mean age of males killed was 7.3 years (N=33; range = 2.5 - 23.5 yrs) and the mean age of females killed was 11.6 years (N=40; range = 2.5 - 23.5 yrs). The mean age of all adult and subadult bears, including 2 of unknown sex, was 9.5 years (N=75; range = 2.5 - 23.5 yrs).

DISCUSSION

Conflicts with Hunters

The increasing incidence of bears killed in defence of life or property primarily reflects a large increase in deer hunting effort and harvest since the early 1970's. Brown bear and elk hunters were involved in only 8% of the DLP incidents (Table 1). Deer were introduced in 1924 and have recently reached a population high. Between 1972 and 1984 the estimated number of hunters increased from 590 to 3,950 and the estimated harvest increased from 690 to 8,900 deer (Alas. Dept. Fish and Game, Kodiak, Unpubl. data). Nearly 70% of the deer harvest occurs in October and November when bear foods such as salmon, berries, and herbaceous vegetation are waning. Because most of the deer harvest occurs in a narrow band of coastline along protected bays and freshwater lakes, a relatively concentrated food source is created each fall for bears. That bears are learning to associate deer hunting with easily available food is supported by the fact that 25 (53%) of 47 DLP kills by deer hunters occurred in the past 3 years (1984-1986), and 42 (78%) of 54 DLP kills by all hunters occurred in October and November.

Deer hunters killed bears while hunting and at hunting camps (Table 4). Most of the 27 bear kills which occurred while hunting were apparently chance

Table 5. Sex and age composition and reproductive status of brown bears killed in defence of life or property, 1974-1986, Kodiak Archipelago, Alaska.

Sex/Age[a]	Source of mortality: Hunters	Village/ bush resident	Other	Total	% of total with known sex
Male					
Adult	6	9	1	16	18.6
Subadult	11	3	3	17	19.8
Juvenile	0	1	0	1	1.2
Unknown	2	1	0	3	3.5
All males	19	14	4	37	43.0
Female					
Adult, single	9	1	1	11	12.8
Adult, maternal	12	4	3	19	22.1
Adult, unknown status	3	0	0	3	3.4
Subadult	5	3	2	10	11.6
Juvenile	0	4	0	4	4.7
Unknown age/ status	1	1	0	2	2.3
All females	30	13	6	49	57.0
Unknown Sex					
Subadult	1	1	0	2	
Unknown age	4	0	1	5	
All unknown sex	5	1	1	7	
TOTAL	54	28	11	93	

[a] Adult (≥5 yr); subadult (independent, ≥2 yrs and <5 yrs); juvenile (accompanied by female).

encounters, although bears may have been attracted to deer meat in 6 of 27 (22%) of the incidents. Attraction to deer meat was a factor in nearly all the camp incidents.

Bears were reported killed in a variety of circumstances, but competition for deer meat was a common theme. Even incidents which appeared to have been chance encounters may have been indirectly related to bears being attracted to areas with heavy deer harvest. Hunters increasingly report incidents in which bears suddenly appear at the scene of a deer kill intent on claiming it.

Brown bears are a legitimate concern to hunters in the Kodiak Archipelago, although the incidence of maulings is low. Seven people have been mauled since 1976, including 5 deer hunters, a bear hunter, and a sport fisherman (Alas. Dept. Fish and Game, Kodiak, unpubl. data). In 4 of 5 cases involving deer hunters, bears were attracted to deer meat. None of the 7 mauling victims received seriously debilitating injuries. Only 1 of the bears which mauled a deer hunter was killed.

Conflicts with Residents of Remote Villages

Chronic nuisance bear problems occur in the 5 remote villages on Kodiak Island. Although the annual reported DLP kill in villages averaged only 1.6 bears from 1974-1986, the actual kill was probably greater based on unverified reports from villagers and on the occasional finding of bears shot near villages (Alas. Dept. Fish and Game, Kodiak, unpubl. data).

The location of villages in high density brown bear habitat predisposes them to high levels of bear-human conflict. Two villages have salmon streams frequented by bears, and dense brush adjacent to the villages offers excellent cover. The major attractions for bears are the village landfill sites, most of which are located near roads within 1 km of the villages. Bears are also attracted to large quantities of fish and game which are usually stored near residences. Conflicts with bears at smokehouses and fish and game caches were noted in 6 of the 18 DLP incidents. Low availability of important natural food sources may result in more bear encounters near villages in some years. Smith and Van Daele (1988) attributed an unusually high incidence of bear-human conflicts at the village of Port Lions to a poor berry crop and failure of a local salmon run in 1985. Recent expansion of housing areas, construction of roads, airstrips, and small-scale hydroelectric facilities, and proliferating use of off-road vehicles have increased the likelihood of bear-human encounters near villages.

Conflicts with Other Human Activities

People living in or visiting remote areas in good brown bear habitat in the Kodiak Archipelago, whether engaged in work or recreation, encounter nuisance bear problems in circumstances similar to those previously described for village residents. Improper storage of food, garbage, or fish and game was frequently the cause of DLP incidents involving these people. Garbage dumps at seasonally operated fish canneries have been a frequent source of nuisance bear problems. Occasional confrontations with bears are routine for people living permanently at isolated sites. Seasonal residents, mainly commercial fishermen, inevitably have conflicts with bears attracted to waste fish and marine mammals killed incidentally to fishing operations.

Recent sales and leasing of government and private lands have resulted in an increase in the numbers of recreational cabins and residences in remote areas with high bear density. The lands chosen for development are characteristically near streams and protected coastal areas, which also are favoured by brown bears. Conflicts between bears and this new user group are predicted. Most permanently occupied residences have a history of nuisance bear problems whether or not incidents appear in the file of DLP reports. We suspect that bush residents, including seasonal residents, often do not report bears killed in defense of life or property.

Fish and game management personnel, who work close to areas where bears are concentrated, frequently experience problems with nuisance bears. A minimum of 12 salmon counting weirs are manned for 3-15-week periods each summer by 1-4-person crews on Kodiak and Afognak Islands. Mobile field crews monitor fishing and hunting activities and conduct research nearly year-long, with peak activity from April through November. Only 4 bears were killed by fish and game workers from 1974-1986 (Table 1), a remarkable record considering the high frequency of bear encounters they experienced.

Conflicts between brown bears and resource development activities have been relatively minor to date. Large-scale logging, which began on Afognak Island in 1975, has resulted in few nuisance bear problems. Since 1960, 3 bears are known to have been killed by forestry workers. Only 1 DLP bear kill was associated with the Terror Lake hydroelectric project on northern Kodiak Island, although in 1983 over 400 workers occupied the project site, where bear density was estimated at more than 1 bear/4 km^2 (Smith and Van Daele 1988). Use of an oil-fired incinerator, prohibition of firearms, presentation of frequent bear safety lectures to workers, and the presence of a government environmental monitor on the project contributed to the low incidence of serious conflicts with bears.

Conflicts between brown bears and sport fishermen are increasing. Sport fishermen were involved in only 1 of 88 DLP incidents from 1974-1986, but several bears were found shot near popular streams during that period. Numerous reports of conflicts between sport fishermen and bears have been received, along with occasional unverified reports of sport fishermen shooting bears. Commercial guiding of sport fishermen is rapidly increasing in the Kodiak Archipelago, threatening to concentrate large numbers of people in areas of high bear density.

Other "non-consumptive" recreationists, including photographers, campers, and hikers, are also susceptible to conflicts with brown bears. Photographers can be particularly intrusive. Incidents of photographers baiting bears and approaching bears at dangerously close range have been reported. One DLP kill by a photography guide occurred from 1974-1986.

Impacts of Kills on the Brown Bear Population

Presently the DLP kill in the Kodiak Archipelago is a relatively small mortality factor. From 1974 to 1986 the annual reported DLP kill averaged only 7.2 bears (range = 3 - 15) (Figure 2). The annual sport harvest averaged 147 bears during the same period (Alas. Dept. Fish and Game, unpubl. data). However, because DLP kills most often occur near villages or near popular deer hunting areas used heavily each year, the population could be reduced in localized areas. Mature females were particularly susceptible to DLP mortality from 1974-1986 (Table 5). Given that females have small home ranges (Smith and Van Daele 1988), we envision a situation where most adult females with home ranges intersecting a village or popular deer hunting area would eventually be killed. A high rate of unreported kills could further exacerbate this situation.

The loss of maternal females in DLP incidents impacts the population by direct mortality and by orphaning of cubs. Five cubs were killed and 35 cubs were orphaned in the 19 DLP incidents involving maternal females. Although cubs as young as 7 months may be self-sufficient (Johnson and LeRoux 1973), it is suspected that few cubs orphaned at less than 2 years old survive.

Loss of adult males and subadult bears to DLP mortality is undesirable, but probably has low potential for seriously impacting the bear population. Subadult bears, particulary males, are prone to conflicts because of their sometimes bold behaviour, which people often interpret as aggressive. Miller and Chihuly (1987) suggested that subadult males may be less sedentary than subadult females and therefore more likely to come into conflict with humans.

Strategies for Managing Brown Bear Conflicts

A combination of preventative and corrective measures is used to help resolve bear-human conflicts in the Kodiak Archipelago. Education programs, permit systems regulating commercial activities, and inter-agency consultations on proposed land developments are aimed at preventing nuisance bear problems.

Response to Problems • Complaints of nuisance bear problems are most often not given on-site attention by wildlife managers because of inadequate manpower and funding. Where a conflict appears to have long-term adverse implications or is an immediate threat to public safety, an on-site investigation may be made and advice offered on preventing further conflicts. A state law which makes it illegal to store food or garbage in a manner that attracts bears provides managers some leverage in getting people to clean up potential attractants.

Communication with Villagers • An adversarial relationship between some villagers and government agencies charged with protecting brown bears has hampered progress in solving nuisance bear problems in villages. Government agencies are often criticized for a "do nothing" approach because they will neither translocate nor kill nuisance bears. Villagers are becoming more aware that improvements in garbage disposal and food storage practices can reduce conflicts with bears, and village governments are expected to assign a higher priority to these problems in the near future. Replacing village landfills with oil-fired incinerators probably is the best alternative for reducing nuisance bear problems, but implementing the method may be difficult because of high cost.

A vigorous program of information and education in the villages is needed. The staff of the Kodiak National Wildlife Refuge recently began a program in the village schools to explain wildlife and land management activities, and plans to incorporate a segment on brown bear life history and bear-human conflicts in the near future. Occasional visits to villages to investigate nuisance bear problems and to conduct public meetings on wildlife issues have been too irregular to be effective.

A program was begun in 1983 to involve village public safety officers in a liaison role in nuisance bear situations. Communications between managers and villagers have improved with the assistance of the officers, but frequent turnover and inadequate training of new officers have been problems.

Bear Population Management • Maintaining the bear population below its carrying capacity with liberal hunting has long been the management policy in extreme northeastern Kodiak Island, where approximately 90% of the human population occupies less than 10% of the land. Although the bear population has increased there since the end of the intensive program of killing bears on cattle ranches in the 1960's, the bears are still sparse compared to other areas of the Kodiak Archipelago which are subject to much more conservative hunting regulations. Consequently, relatively few bear-human conflicts occur in this area despite high levels of human activity.

Land-Use Regulations • Regulation of land-use in the Kodiak Wildlife Refuge, although broadly addressing protection of habitat for all wildlife, specifically identifies prevention of brown bear-human conflicts as a major objective. Since 1983, special use permit systems regulating sport fishing guides, hunting outfitters, and recreational guides have been implemented on the refuge. The permit systems were initiated in response to a rapid development of commercial operations catering to hunters, sport fishermen, and other recreationists. The expansion of those commercial operations, if allowed to continue unchecked, was recognized as having high potential for increasing bear-human conflicts. A ceiling of 24 permits for sport fishing guides and 18 permits for transporter/outfitter operations was established. Additional time/area zoning restrictions were also imposed, along with limitations on party sizes. The intent of the special use permit system is to prevent displacement of bears from important feeding sites, reduce the risks of bears becoming conditioned to specific camp sites, and to provide high quality recreational opportunities (U.S. Fish and Wildl. Serv. 1987).

Regulation of non-guided recreational use of Kodiak National Wildlife Refuge is less stringent than that of commercial uses. General limitations on all refuge users, which are considered important to minimizing bear-human conflicts, include prohibiting use of off-road vehicles, jet-powered boats, and helicopter and wheel-plane landings.

Public Education • A variety of educational efforts, with a common theme of increasing public awareness of ways to avoid conflicts with brown bears have been implemented through cooperative efforts of ADF&G and FWS. Emphasis is on reducing attractions to bears, avoiding areas of high seasonal bear density, dealing with actual confrontations, and on realistically portraying the danger posed to humans. Efforts are directed at the general public, villagers, and bush residents. A brochure entitled "The Bears and You", which provides basic information on bear life history and avoidance, is distributed statewide at visitor centres and natural resource agency offices. Another brochure specific to Kodiak brown bears is distributed locally. Slide-talks and lectures to various local groups and interviews with local news media are presented frequently. The Kodiak National Wildlife Refuge visitor centre provides interpretive programs on a year-round basis with special emphasis on brown bears. The visitor centre draws a

large segment of tourists as well as local residents, including school classes.

Educating hunters about avoiding conflicts with bears is particularly challenging. Hunters are armed and aware that a bear may be encountered. Many hunters believe that bears are particularly dangerous, a notion that has been reinforced by recent media attention focused on incidents in which deer hunters were mauled by brown bears in the Kodiak Archipelago. Deer and elk hunters are targeted in a brochure which provides information on how to hunt, camp, and care for game while avoiding bear conflicts in the Kodiak Archipelago. The real danger posed by brown bears is not downplayed in the brochure.

Hunters who visit the ADF&G office in Kodiak are routinely handed a copy of the brochure on avoiding bears and given a brief verbal warning to heed its contents. The brochures are also distributed locally at businesses and government offices frequented by hunters. Local and national news media, attracted by the sensationalistic nature of the problem, have nevertheless been cooperative in communicating essential points on avoiding bears to hunters. Frequent communication through all media of information on bear safety is considered important because Alaska has a transient population, which includes a large contingent of military personnel and many first-time hunters. Comments from hunters indicate that the information program has made progress and suggests that a further expansion of educational efforts is warranted.

Review of Land Developments • Major developments and resource extraction activities on public lands are subject to governmental interagency review for potential environmental impacts. The process provides an opportunity to direct developments away from sites with high potential for bear-human conflicts. Developments on private lands are subject to few restrictions and little opportunity is afforded wildlife managers to influence developments with potential for bear-human conflicts. An informal advisory program for informing the public and other agencies about living and working safely in brown bear habitat is conducted cooperatively by the ADF&G, the FWS, and the Alaska Department of Public Safety.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

The issue of bear-human conflicts in the Kodiak Archipelago will increasingly challenge wildlife managers. Continued growth in the resident human population and increased exploitation of recreational opportunities in brown bear habitat will continue into the foreseeable future. We interpret increasing kills of brown bears in defence of life or property as an indication of a much higher level of bear-human interactions throughout the area, one that could have important long-term implica-tions. Available information indicates that the brown bear population of the Kodiak Archipelago is stable and has not been seriously affected by human activities. Nevertheless, we are concerned whether present management practices are adequate to maintain the current status.

Growing demands on the resources of the Kodiak area will require a greater commitment by state and federal agencies toward resolving bear-human conflicts. The need to upgrade current educational, advisory, and enforcement programs is clear. Specific tasks we have identified include improving the quality and distribution of educational pamphlets, increasing efforts to educate hunters on bear safety, preparing slide and/or video programs specific to Kodiak situations, improving information programs for village schools, and increasing efforts to solve nuisance bear problems in villages. The latter effort should improve the reporting rate of DLP kills in villages by improving the level of cooperation. Accomplishing these tasks would be a long-term contribution to the brown bear management program.

Available enforcement resources should be redirected to focus on critical areas and time periods when bear-human problems are most prevalent. In 1985, state and federal law enforcement officers began an annual patrol with the Kodiak National Wildlife Refuge marine vessel to monitor hunting activity and trouble-shoot nuisance bear problems in October and November. We believe that in-the-field contacts with hunters are important in preventing conflicts with bears and we recommend increased efforts in that regard.

Another priority is to improve compliance with DLP regulation. The law is necessary for the safety of people in bear habitats, but it can be misused for the unwarranted killing of bears. There is need for more prompt and aggressive investigation of DLP killings to differentiate between legitimate killings and killings for convenience. More strict enforcement of the DLP regulations carries the risk of a decreased reporting rate, however.

A continued increase in DLP brown bear kills may necessitate innovative measures to reduce and compensate for losses. On the Kodiak National Wildlife Refuge this might entail quotas on numbers of both commercial and non-commercial users of specific areas

with high bear densities. Reducing the number of bear harvest permits in localized areas with high DLP kill will be considered. Modification of deer hunting regulations may be required to minimize conflicts between bears and hunters.

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The Honourable Titus Allooloo, Minister