

2. Biology, History, and Management of Kodiak Bears

2.1 Biology

Bears on Kodiak have long been recognized as the largest in the world. An adult male can stand more than 10 ft tall when on his hind legs and 5 ft when on all four legs. Kodiak bears weigh as much as 1,300 lbs. Females are about 20 percent smaller and 30 percent lighter than males. The oldest known wild Kodiak bear was a 35-year old sow. The oldest boar was 27 yr old.

Cubs are born in the den during January or February. Weighing less than a pound at birth and with little hair and closed eyes, they suckle for several months, emerging from the den in May or June and weighing 15–20 lbs. Typical litter sizes are two to three cubs, and most cubs stay with their mothers for three years. More than 25 percent of the cubs die before they leave their mothers, with cannibalism by adult bears (predominantly males) being one of the major causes of death. Bears that have recently left their mothers have high rates of mortality. These subadult bears (three to five years of age) are also the ones most likely to come into conflict with people.

Kodiak bears become sexually mature at five years and can continue to produce cubs throughout their lives. The average interval between litters is about four years. Mating season is during May and June. Kodiak bears are serially monogamous (having one partner at a time) and stay together for a couple of days to a couple of weeks during mating. As soon as the egg is fertilized and divides, it enters a state of suspended animation until autumn when it finally implants on the uterine wall and begins to grow again.

Although Kodiak bears are often referred to as carnivores, they are technically omnivores (using a variety of foods). They actually spend more time eating grass, plants, and berries than they do eating meat. Fish are an important part of their diets, but few Kodiak bears expend the time or effort necessary to chase and kill mammals. Bears use the most nutritious parts of their food to maximize weight gain. Grass and forbs are only used while bears are rapidly growing in the spring and early summer. Brains, flesh, and eggs are preferred parts of the salmon. Internal organs of deer, elk, and cattle are eaten first when one of these animals is killed or scavenged. Berries are used most often when they are ripe and sugars in the berries are at the highest level.

Kodiak bears begin entering their dens in late October. Pregnant sows are the first to go to den; males are the last. Males begin emerging from their dens in early April, while sows with new cubs may stay in dens until late June. Some males may forego denning, staying active all winter.

Bears do not defend territories, but they do have traditional areas that they use each year (home ranges). They are naturally diurnal (active during the day), but when faced with competition for food or space, they adopt a more nocturnal (active at night) behavior. Because of the rich variety of foods available, Kodiak bears have some of the smallest home ranges of any bear population. Although generally solitary in nature, Kodiak bears often occur in large groups

in areas of concentrated feeding. Because of this, they have developed a complex language and social structure. Only one person has been killed by a bear on Kodiak in the past 70 years, and about once each year a bear injures a person.

2.1.1 Kodiak Bear Research

During the past 40 years, biologists have learned much about Kodiak bears. In the early 1960s, biologists began gathering baseline biological information on bears (Troyer 1962). As they refined methods of capturing and marking bears (Troyer et al. 1962) and incorporating radio telemetry in 1967 (Berns and Hensel 1972), biologists became more efficient at estimating bear movements and density. Their studies also provided the first objective data on sex and age ratios (Troyer and Hensel 1969), reproduction (Erickson et al. 1968; Hensel et al. 1969), litter sizes (Troyer and Hensel 1964), behavior (Troyer and Hensel 1964), cannibalism (Troyer and Hensel 1962), dentition (Troyer and Hensel 1969), and denning (Lentfer et al. 1972).

During the 1980s and 1990s, there was another surge of baseline and applied bear research on Kodiak. Extensive use of radiotelemetry on bears living near Terror Lake (Smith and Van Daele 1990), on southwest Kodiak Island (Barnes 1990), on the Aliulik Peninsula (Barnes and Smith 1997), and on the Spiridon Peninsula revealed denning, feeding, movement, and reproductive history patterns. Lip tattoos and ear tags were applied to 401 bears between 1982 and 1997 to investigate mortality rates and movements of bears that were not radio-collared (Smith and Van Daele 1990). Perhaps the most significant result of this massive amount of research was development of an objective method of measuring bear population densities and trends on specific parts of Kodiak Island (Barnes et al. 1988).

2.2 History

Kodiak's geologic character is not conducive to preserving fossil evidence, so there is no way to confirm how long bears have been on the islands. Kodiak bears have, however, been isolated from other bear populations since the last ice age (about 12,000 years ago) and during that time have developed into a unique subspecies: *Ursus arctos middendorffi*. A detailed account of the history of bears on Kodiak can be found in the monograph *The History of Bears on the Kodiak Archipelago* (VanDaele 2002). The following historical information is excerpted from that document.

2.2.1 Alutiiq People

Humans first arrived on the islands approximately 7,500–8,000 years ago, and paleontologic evidence of Kodiak bears is found in some of the oldest midden sites of these ancient Alutiiq people. At that time, the Alutiit hunted bears, using their meat for food, hides for clothing and bedding, intestines for rainproof parkas, long bones for tools, and teeth for adornment. Because of the spiritual relationship between the bear and the Alutiit, skulls were left in the field. Because it was the only large land mammal on the archipelago available, the bear was an important subsistence food for the Alutiit.

Bears were usually stalked by groups of two or three hunters armed with bows and arrows. The bear arrow was about 32 in. long and had a barbed bone point 7 in. long with an inserted end blade of slate. If the bear attacked, the hunters defended themselves with spears. Archeologists

suspect that there were 65 villages and about 8,000 people on the archipelago by the early 1700s (Clark 1968). Fetishes and other artistic renditions of bears occur in archaeological sites on Kodiak as old as 2,500 years. Myths and traditional stories about bears are common in all Alaska Native traditions, and those recorded from the Alutiit are similar to stories told by Yup'ik elders in western Alaska and by Alutiiq elders. The main themes of the myths revolve around the similarity between bears and humans, including the ability of bears to change into people and vice versa, and the mystical nature of bears because of their proximity to the spirit world.

2.2.2 Russian Occupation and American Acquisition

Russia's Bering expedition bypassed Kodiak in 1741, but in 1784, Russians actually landed on the island. Soon thereafter a flood of independent trappers and Russian entrepreneurs came to the area to capitalize on the abundant fur resources. Bear hides were considered a "minor fur" and sold for about the same price as river otter pelts (\$10 each). The number of bears harvested increased substantially when sea otter populations declined. After the United States acquired Alaska as a territory in 1867, bear harvests on Kodiak increased, peaking at as many as 250 bears per year. When commercial fishing activities increased in the late 1880s, and canneries proliferated throughout the archipelago, bears were viewed as competitors for the salmon resource and were routinely shot when seen on streams or coasts.

2.2.3 First Conservation Efforts

Around the turn of the last century, sportsmen and scientists recognized the Kodiak bear as the largest in the world. They also voiced their concern that bear populations were overharvested and were suffering the fate of other well-known big game animals around the world. One of the nation's first conservation organizations to address these concerns was the Boon and Crockett Club; the group lobbied for federal legislation to enforce wildlife regulations. The Game and Wild Bird Preservation and Disposition Act of 1900, also known as the Lacey Act, set the foundation for the first legal protection of much of America's wildlife, including Kodiak bears. The bears also benefited from laws designed to protect salmon from increasing harvests, including establishment of the Afognak Island Forest and Fish Culture Reserve in 1892.

2.2.4 Volcanic Eruption

Kodiak's ecosystem changed suddenly and drastically on June 6, 1912, when Mount Katmai (*Novarupta*) erupted. A series of three major eruptions blew six cubic miles of the mountain into the air, depositing as much as a foot of ash on Afognak Island and on northern Kodiak Island. Winds drifted the ash, and rains washed it into lakes, completely filling some lakes that were as deep as five feet. Residents reported that many animals, including bears, were blinded and made bold by hunger. Salmon-spawning was seriously impacted; a few salmon, however, were still able to return during the summer and were available for bears. Vegetation was quick to recover, and the ash was credited with increasing productivity of grass, shrubs, and especially spruce in later years. While the eruption had a major impact on the bears on the northern islands, it was not detrimental to the entire population.

2.2.5 Harvest Regulations

Professional interest in guided Kodiak bear hunts, and a concern for unregulated resource use in frontier lands such as Alaska, prompted the territorial government's newly established Alaska Game Commission to abolish commercial bear hunting (selling the hides) on the archipelago in 1925. A limit of three harvested bears per year was established, and, in 1926, bear harvesting was prohibited during the summer months, except for in defense of life or property (DLP). The new regulations limiting harvest to three bears per hunter applied to the Alutiit as well. The Commission also required that any nonresident hunter in Alaska be accompanied in the field by a registered big-game guide. As professional guiding was implemented along with other hunting regulations, many guides became successful because of Native knowledge and experience in guiding.

At about the same time, the commission, in conjunction with local Kodiak sportsmen's groups, took an active role in increasing the diversity of the archipelago's wildlife by importing Sitka black-tailed deer, Roosevelt elk, muskrat, beaver, mountain goats, and snowshoe hares. In 1932, the commission prohibited bear hunting on Afognak Island, and for the next eight years that island was managed as a bear sanctuary.

2.2.6 Conflicts with Cattle

The impacts of the new regulations seemed to restore bear populations on the Kodiak archipelago. By the 1930s, ranchers on northeastern Kodiak Island reported an increase in bear problems and demanded action. The Game Commission sent a biologist and a team of hunters to eliminate problem bears on the ranches in 1939, and seven bears were killed. In their final report, however, the agents discouraged the idea of further bear-control efforts. They suggested managing the island primarily for "fur, fish, and game" resources, including bears, but managing it in such a way that individuals could continue to defend their livestock. As a consequence of the agents' report, the Game Commission did not liberalize bear-hunting regulations nor did it pursue any further active bear control.

2.2.7 Kodiak National Wildlife Refuge and World War II

To address the dilemma of conserving bears while protecting cattle and residents, President Franklin D. Roosevelt established the Kodiak National Wildlife Refuge (KNWR) by Executive Order in 1941. The refuge withdrew 1,957,000 acres from unreserved public domain to preserve the natural feeding and breeding range of bears and other wildlife. The area encompassed all of Uganik Island and most of southern and western Kodiak Island, except for the Karluk Indian Reservation. A one-mile shoreline strip, included within the refuge boundary as described by executive order, remained open for settlement, sale, or other disposition under the public land laws applicable to Alaska, or to classification and lease for fur farming or other purposes. In 1958, these exceptions involving the shoreline strip were removed through a public land order.

World War II brought an unprecedented increase of people, structures, and activity to Alaska. The population of Kodiak city swelled from about 400 to more than 20,000. A submarine base, an air station, a fleet weather command, and an army command post were established near Buskin River. Remote submarine and aircraft observation posts were developed on numerous islands and capes in the archipelago. The Army also developed logging operations

on Afognak Island. While sport hunting for bears declined during the war, indirect impacts on bears abounded, and, in 1942, the Game Commission reduced the bag limit on the archipelago to one bear per year.

Refuge establishment and the war did little, however, to quell the concerns about bears preying on salmon. During the 1940s, the sockeye escapement on the Karluk River dwindled, and bears were cited as a leading cause of the decline. One study indicated that bears killed a third of the salmon entering the Karluk River before they had a chance to spawn, resulting in a loss of \$3 million per year. Fishermen called for bear control, and sportsmen across the nation lobbied against it. Follow-up studies revealed that bears did kill a large number of salmon, but the vast majority (98 percent) were fish that had already spawned, and that the impact of bears on future salmon runs was minimal. After considering these diverse opinions and results of the studies, as well as the concerns of fishermen and continued concerns about bear-cattle interactions, the Alaska Game Commission again opted to forego any bear control or hunting-season liberalization. It did, however, pass a new regulation in 1957 that protected maternal female bears statewide. The next year, that protection was extended to also include dependent cubs.

2.2.8 Changes in Alutiiq Use of Bears

The Alutiiq continued to subsistence hunt for bears after the first harvesting regulations were developed in 1925. (See chapter 4, section 4.2, for more information on the history of subsistence hunting.) Gradually, however, subsistence hunting for bears diminished, in part due to more complex regulations and a burgeoning deer population, which provided an alternate source of red meat. Some Alutiiq hunters continued their traditional harvest activities through the 1940s, '50s, and '60s. Bear hides, meat, and other parts were used locally, and some hides were sold for income³. Legally sanctioned subsistence bear hunting was opened by the State of Alaska from 1985 through 1987, but there appeared to be little interest. In 1997, the subsistence bear hunt was reinstated under federal management, with a limited number of permits available to each of the Kodiak archipelago villages (see section 2.2.9).

2.2.9 After Statehood

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

During the 1960s, state biologists worked with ranchers along the Kodiak road system to examine and reduce the predation problem. During the project, 15 bears were killed by agents, and several more were killed by hunters and ranchers. Biologists reported cattle and bears as not compatible. Potential solutions included poisons, fences to isolate cattle ranges, and reduction of land disposals in areas with bears.

³ Information provided by Sven Haakansen, Sr., born in Ouzinkie and presently living in Old Harbor

Sportsmen concerned about bears being killed because of conflicts between bears and cattle published articles that described a “secret” state-sanctioned program that employed the use of fighter pilots to shoot bears from the air. There was also a detailed description of the ground efforts by biologists and the ongoing anti-bear campaign by ranchers. In spite of this public pressure, the state continued its involvement in dispatching problem bears and attempted to capture and move some bears. From 1966 through 1969, the state authorized the use of dogs to hunt bears on northeastern Kodiak Island.

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

In late 1970, the state issued a policy curtailing bear-control programs. Ranchers suffering losses could continue to take bears in DLP, but could not shoot bears from airplanes or poison them. Sport hunting was to be the primary means of reducing bear numbers, and hunting regulations were liberalized. Ranchers were upset with the decision and continued to devise ways to protect their livestock without government intervention.

2.2.10 Federal Legislation

Discovery of the Prudhoe Bay oil field and a national surge of environmental awareness resulted in new legislation that affected Kodiak. In 1971, the Alaska Native Claims Settlement Act (ANCSA) resolved many long-standing land issues with aboriginal Alaskans statewide. The impacts were felt strongly on the archipelago as large areas of the coastline (the Karluk River drainage; Sitkalidak, Spruce, and Whale islands) and most of the forested areas of Afognak and Raspberry islands were conveyed to Native corporations. Federal management of the National Forest lands on Afognak was threatened, and KNWR lost control of 310,000 acres of prime bear habitat (more than 17 percent of refuge lands). Other pertinent new legislation included the Wilderness Act, the Endangered Species Act, the National Environmental Policy Act, and the Marine Mammals Protection Act. Also in 1972, the government review found that as much as 97 percent of the refuge qualified as wilderness under the guidelines of the Wilderness Act.

Sharp increases in the demand for bear-hunting permits occurred in 1972 and again in 1973. Restrictions in season length on the Alaska Peninsula and the loss of polar bear hunting due to the Marine Mammals Protection Act were partially responsible for the surge. In 1975, the state created 19 exclusive guiding areas on the archipelago. The state also began distributing most of the bear hunting permits on Kodiak Island by lottery. Twenty-six hunt areas were established, Alaska residents were allocated at least 60 percent of the permits, and all harvested bears had to be inspected by a state biologist in Kodiak.

2.2.11 Draft Management Plans

To address the changing relationships and uses of bears, the Alaska Department of Fish and Game (ADF&G) developed a series of draft management plans for bears on the Kodiak archipelago in 1977. The plans called for specific management priorities, including areas that would provide high-quality hunting conditions, areas where bear conflicts with livestock and

people would be minimized, and areas that would be managed to provide opportunities to view and photograph bears. In spite of the effort and public input involved in developing these plans, the Board of Game did not formally adopt them.

2.2.12 Timber Harvest

The USDA Forest Service (USFS) started planning the first timber sale on Afognak Island in 1966. Many local citizens were surprised by the plan to renew logging on Afognak after a 25-yr hiatus, and they were opposed to clearcut harvesting, noting the slow regeneration times for trees that had been previously cut from the island. In response to these protests, and because of the newly established National Environmental Policy Act, USFS delayed the sale and drafted an environmental impact statement. Projected impacts on bears included disturbance by logging activities and road traffic, disruption of salmon feeding areas, increased hunter access, and increased bear-human encounters resulting in bears being killed in DLP situations. Finally, in 1975, USFS began construction of a logging road between Kazakof (Danger) Bay and Discoverer Bay, and timber harvesting began in 1977.

Under ANCSA's provisions, the Native villages of Afognak, Kodiak, and Ouzinkie selected many of the prime forest lands on Afognak Island as well as many of the coastal areas. Koncor Forest Products began managing timber harvests on Kodiak and Ouzinkie lands in 1978, and the next year Afognak Native Corporation took over management of its recently acquired lands. Passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 added the northwestern portion of Afognak Island to the refuge, but it also curtailed USFS management on the island. In subsequent years, the rate of timber harvest was greatly accelerated over original projections.

2.2.13 Hydroelectric Development

In 1979, the Federal Energy Regulatory Commission began working on an environmental impact statement for the Terror Lake hydroelectric project. The project was to include an earthen dam on Terror Lake on KNWR and a six-mile-long tunnel through a mountain ridge to a penstock and powerhouse in the Kizhuyak River drainage. The proposed project was to be the first significant invasion of inland bear habitat on Kodiak Island. To address the opposition encountered from the public and agencies, a mitigation settlement was negotiated in 1981. The settlement was precedent-setting in its scope, providing for studies of project impacts on salmon, mountain goats, and bears during the three years of construction and two years of operation of the project. It also set aside most of the state and Kodiak Island Borough lands on the Shearwater Peninsula to be managed as wildlife habitat (including a livestock-grazing prohibition) and established the Kodiak Brown Bear Research and Habitat Maintenance Trust (also called the

Kodiak Brown Bear Trust). The Kodiak Brown Bear Trust is a 501(c)3 nonprofit corporation created as part of the 1981 mitigation agreement (see Appendix S) between U.S. Fish & Wildlife Service (USFWS) and the Alaska Industrial Development Authority that allowed the construction of the Kodiak Electric Authority's Terror Lake Hydroelectric Project within the boundaries of KNWR. In the end, the forethought and planning were successful, and there were few negative impacts on bears that could be directly related to the Terror Lake hydroelectric project.

2.2.14 Increased Research Efforts

Human alteration of bear habitat on Kodiak and Afognak islands spurred renewed interest and funding for bear research on the archipelago, resulting in a surge of baseline and applied bear research on Kodiak through the 1980s and 1990s. Extensive use of radiotelemetry on bears revealed denning, feeding, movement, mortality rates, and reproductive history patterns. Perhaps the most significant result of the research was development of an objective method of measuring bear population densities and trends on specific parts of Kodiak Island. Application of this technique to several parts of Kodiak Island, along with some extrapolation to the rest of the archipelago, provided the first refined estimate of bear numbers (2,980) and density (0.62 bears per square mile).

Another significant event for bears in the early 1980s was a surge in the deer populations throughout the archipelago. By that time, deer had occupied all available habitat with an estimated population in excess of 100,000 and a peak harvest in 1987 with an estimated 13,791 deer killed by 6,022 hunters. Some bears actively preyed on deer, especially when they were concentrated on winter and late-spring ranges along the coast; in most cases, however, such predation seemed opportunistic at best. The number of bear-human encounters grew steadily, and it was evident that individual bears quickly discovered techniques to claim hunter-killed deer in the field and at campsites. Increasing encounters translated into more DLP bear mortalities. Efforts to educate hunters about bears were accelerated, with an emphasis on ways to avoid bear encounters and how to handle them if they occurred.

2.2.15 Oil and Gas Development

Commencing prior to 1976, a series of oil and gas lease sales have been attempted or conducted on either side of the Kodiak archipelago. Estimated recoverable reserves range between 150 million and 1.9 billion barrels of oil and as much as 2.920 trillion cubic feet of natural gas on the east side of the archipelago. Mean projections for the Shelikof Strait, on the west side of the archipelago, are 120 million barrels of oil and 680 billion cubic feet of gas. In all cases, the natural gas is characterized as "wet," or containing high proportions of volatile liquids, which would have to be separated and either re-injected into the field or transported.

Evaluation by the federal Minerals Management Service of the impacts from developing these resources included identification of 15 potential onshore sites on the east side of Kodiak Island, including several in KNWR, with other unspecified potential sites on the west side of Afognak Island and northwestern Kodiak Island.

No past hydrocarbon lease sale resulted in hydrocarbon field development; this is due to either failure to discover recoverable deposits in the Shelikof Strait (Lease Sale #60) or limited interest on the part of the oil industry because of the projected difficulty of operations with then-current technology on the east side of the archipelago. However, because of recent advances in deep-water drilling technology and acoustic survey techniques, along with the growing energy shortages in the nation, the region may be reconsidered for exploration and development in the future.

Predicting the configuration and impacts of hydrocarbon development on the archipelago may be as difficult as projecting the likelihood of discovering recoverable reserves if drilling occurs. Should hydrocarbon development take place, however, it is likely that impacts, on the bears and their habitat, of the development and associated human activities will become significant aspects of all bear-management considerations.

2.2.16 Exxon Valdez Oil Spill

In 1989, the oil tanker *Exxon Valdez* ran aground on a reef in Prince William Sound. Within the first week, oil dispersed to the islands of the Kodiak archipelago. Marine mammals, including sea otters, seals, sea lions, and whales, were oiled and poisoned; coastal birds and mammals were also affected because feeding and resting areas were tainted. Biologists were concerned that bears foraging in the oiled intertidal areas would be adversely affected. The intensity of human activity on beaches and near shore waters was increased by the presence of cleanup crews; resource managers recognized that the impact to bears of those workers was potentially greater than the impact of the oil itself. To minimize bear-human encounters, bear-safety training was required for everyone involved with the cleanup.

Bears were not directly harmed by the spill, although some were displaced, by cleanup crews, from traditional feeding and traveling areas. No one was injured by a bear, and no Kodiak bears were killed. To mitigate the adverse impacts of the spill, Exxon reached a settlement with the state and federal governments for \$1 billion. Paradoxically, the impacts of the oil spill and the subsequent cleanup and settlement proved to be beneficial to bears on Kodiak. Bear-safety training exposed thousands of workers to factual information about bears, and the media raised the consciousness of people around the world to the fragility of the ecosystem.

Political pressure mounted to preserve Kodiak's pristine habitats, and money from the *Exxon Valdez* settlement fund was the obvious source for land acquisitions. By the close of the 1990s, about 90 percent (290,000 acres) of the refuge lands that had been lost as a result of ANCSA were reinstated into the refuge, either through direct purchase or by means of conservation easements.

Using monies from the *Exxon Valdez* oil spill settlement fund, lands were also purchased on Afognak (83,299 acres) and Shuyak (26,665 acres) islands and transferred into state ownership. The Kodiak Brown Bear Trust coordinated a coalition of sportsmen and other wildlife conservation groups from around the nation to lobby for use of settlement funds to acquire Kodiak lands. The groups also directly contributed funding to protect small parcels of important bear habitat around the islands.

2.2.17 Bear Viewing

Although hunting continued to be the most popular human use of bears on Kodiak in the early 1990s, the area was experiencing an expansion of bear viewing and bear photography. The publicity the islands and the bears received during and after the oil spill and growth of statewide tourism motivated people to come and see the bears in their natural habitat. To address this public demand, a bear-viewing program was administered by KNWR in 1990. The program was cancelled after 1994 because of a legal challenge to the procedures used in awarding the

bear-viewing concession. Biologists studied bear-human interactions at the viewing areas and concluded that bears could tolerate viewing programs as long as the human activities were predictable and restricted to specific areas (Wilker and Barnes 1998).

Given the importance of the subject of bear viewing, a significant portion of chapter 6 (see section 6.6) is devoted to a discussion and recommendations on the topic.

2.3 Current Kodiak Bear Management

Kodiak archipelago bear research, management, and habitat protection are done cooperatively by ADF&G and USFWS.

Primary authority for managing the bears rests with ADF&G. The mission of ADF&G's Division of Wildlife Conservation is to conserve and enhance Alaska's wildlife and to provide for a wide range of uses for the greatest benefit of current and future generations. The specific objectives for management of Kodiak bears are

- to maintain a stable Kodiak bear population that will sustain an annual harvest of 150 bears, composed of at least 60 percent males;
- to maintain diversity in the sex and age composition of the bear population, with adult bears of all ages represented in the population and in the harvest; and
- to limit human-caused mortality of female bears to a level consistent with maintaining maximum productivity.

Kodiak bear population estimates were developed for nine study areas with the intensive aerial survey technique. This technique is a modification of the capture-recapture methods that initially used radio-collared bears to determine the chance of seeing bears in different types of terrain and vegetation (observability). Aerial transects are then flown within the study area to count bears, and total counts are multiplied by the observability factors to derive population estimates. Surveys are conducted in the spring, immediately following the bear-hunting season, prior to spring green-up and after most bears have emerged from their dens. At least one of the nine study areas is surveyed each year, and attempts are made to resurvey each area within five to seven years.

2.3.1 Kodiak National Wildlife Refuge

U.S. Fish & Wildlife Service, in managing KNWR, is primarily responsible for managing the habitat on the refuge; it is also charged with management of bears and their habitat in their natural diversity. ANILCA states the following:

The purposes for which the Kodiak National Wildlife Refuge is established and shall be managed include

- (i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, Kodiak bears, salmonids, sea otters, sea lions, and other marine mammals and migratory birds;
- (ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
- (iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and
- (iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

2.3.2 Hunting

The current bear population is above the minimum level set by the state's current objectives, and it supports an annual harvest of approximately 160 Kodiak bears (69 percent males) each year under tightly controlled regulations. About 5,000 resident hunters apply each year for a chance at the 319 bear permits (107 in fall and 212 in spring) available to them. Hunters who are not residents of Alaska vie for some 153 permits (53 in fall and 100 in spring) and must hire professional guides, paying \$9,000–15,000 per hunt. Since 1997, a federally authorized subsistence hunt allows issuance of as many as 11 bear permits for the six Native communities on the Kodiak archipelago (see chapter 4, section 4.2). ADF&G currently manages the resource to accommodate an average annual human-caused mortality (from all sources) of no more than 6 percent of the known population.

2.3.3 Bears Killed in Defense of Life or Property

Bears may also be legally killed under the state's DLP provisions (5 AAC⁴ 92.410). A person may legally kill a bear if that person did not provoke an attack or cause a problem by leaving food or garbage lying around, and if that person has done everything else practical to protect life or property. Property is defined as a dwelling, means of travel, pets, or other valuable property necessary for livelihood or survival. A bear killed under DLP provisions must be reported immediately, and the hide and skull must be given to the state. Reporting rates for DLP mortalities are unknown, but suspected to be less than 50 percent of the actual kill.

During the summer of 1999, when the population of bears on Kodiak was at a historic high, as many problem bears (eight) were killed near the city of Kodiak as had been killed in the

⁴ Alaska Administrative Code

previous nine years combined. Kodiak Island villages also had more bear problems than ever, and deer hunters reported a dramatic increase in bear encounters islandwide, including the first fatal mauling in more than 60 years. The rash of bear confrontations was probably caused by a disastrous failure of berries, on which the bears depended for food in early August. Some of the worst winter weather in 40 years struck the island during the winter of 1998–99 and damaged the berry bushes so severely that they could not produce fruit. In their search for food, some bears found garbage, livestock, and dog food, bringing bears in close contact with people.

2.3.4 Changing Public Involvement

The reaction to these bear encounters by residents, visitors, and government agents reflected the increased tolerance and knowledge of the populace. Kodiak residents requested and received bear-education programs for school children, for public television and radio, and for ethnic groups. Waste management was enhanced by installation of bear-resistant dumpsters in rural areas on the Kodiak road system and by increased enforcement of litter laws. A previously installed electric fence around the community landfill was reinforced, vegetative cover within the fence was removed, and garbage was buried more frequently (see Appendix N). Deer and elk hunters were alerted to the potentially dangerous situation. When the fatal mauling occurred, media were quick to point out the hunter's errors rather than to blame the bear; law enforcement and wildlife officials did not hunt or kill the bear responsible for the mauling. All in all, the community pulled together to address the problems and everyone, including the bears, benefited.

Most of the people of Kodiak are proud of the fact that they live with the largest bears, and one of the densest populations of bears, in the world. They are willing to take an active role in ensuring continued coexistence. This increased ownership of the bears also resulted in a call to have a citizens advisory committee work closely with ADF&G, with the cooperation of KNWR, to develop this management plan addressing the wide variety of issues—including hunting, habitat, and viewing—that impact bears.

2.4 The Archipelago's Residents

The archipelago is also home for about 14,000 people, all residing in coastal areas. The City of Kodiak and associated road-connected communities include almost 13,000 people, with most of the remainder of the population residing in the six villages on Kodiak and Spruce islands. During the summer, the human population increases dramatically and disperses throughout coastal areas. Remote cabins and lodges are used in support of commercial fishing and recreational activities. Human use of inland areas is usually transient, with the exception of Afognak Island where extensive logging has been conducted for the past 25 years.

Kodiak bears contribute to Kodiak's economy by providing hunting, viewing, and other opportunities to enjoy wildlife and recreational pursuits in an unmolested natural setting. Along with Kodiak's commercial and sport fisheries, these activities, contribute to every aspect of the area's economy, including tourism, lodging, transportation, and related professions such as guiding. In fact, most businesses and jobs in Kodiak benefit directly or indirectly from the conservation of Kodiak bears and their habitat.

Bears also are responsible for economic losses to cattle ranchers, campers, and home owners, and bear-human interactions can result in destruction of private property and DLP bear mortalities.

Kodiak's balanced ecosystem, of which people are an integral part, forms the baseline from which this plan was designed. The plan is not intended to seek remedies for a threatened bear population; rather, it is an analysis of a successful coexistence between people and bears and an attempt to improve on that situation to accommodate shifts in human uses of bears. It also suggests ways to reduce people-bear conflicts in a mutually beneficial manner in the face of anticipated increases in human activities and impacts within the archipelago.