DRAFT Programmatic Environmental Impact Statement

THE GRIZZLY BEAR IN NORTHWESTERN MONTANA

Montana Department of
Fish, Wildlife & Parks

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Helena, Montana 59620

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Montana Department of Fish, Wildlife and Parks

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I. INTRODUCTION

During the 1960s, a wave of environmental awareness swept our nation. This awareness grew from the realization that our natural resources were finite and connected ecologically, geographically, economically, socially, and politically.

The use and development of some of our natural resources had an impact on the abundance and condition of other natural resources. People throughout the country developed a protective attitude toward our air, water, and soils. The condition of our wildlife resources was used as an overall indicator of environmental health and became the focus of this new-found interest in conservation.

A long debate arose concerning the role of government in protecting rare animals, especially those threatened by human activities. The result was the Endangered Species Preservation Act of 1966, the Endangered Species Conservation Act of 1969, and the Endangered Species Act of 1973. Most states, including Montana, followed in the 1970s with endangered species legislation of their own.

The grizzly bear (Ursus arctos), Montana's state animal, was placed on the Endangered Species Act threatened species list in 1975. This status mandates special management actions to ensure its survival and enhancement of its habitat.

This environmental impact statement (EIS) is designed to assemble in one document all of the information relevant to the State of Montana's grizzly bear management program in northwestern Montana.

This EIS summarizes the information on the grizzly bear and its habitat in northwestern Montana. It summarizes the current grizzly management program and the legal, biological, political, and philosophical arguments on which that management program is based. The history of the program's evolution and the state's goals and management objectives are detailed. Future management is addressed, and possible alternatives and their impacts are explained.

The objectives of the EIS are to: 1) give a comprehensive presentation of the subject, 2) review the many variables involved, 3) develop a framework for review of alternatives, and 4) through public discussion, weigh the merits and impacts of various alternatives and select a program for better future grizzly bear management.

A. Historical Perspective

The Eurasian brown bear and the North American grizzly are considered the same species (Ursus arctos) (Herrero 1972). Current theory holds that this species developed its large size, aggressive temperament, flexible feeding habits, and adaptive nature in response to habitats created by intermittent glaciation. It is believed that ancestors of the grizzly bear migrated from Siberia across a land bridge at the Bering Strait at least 50,000 years ago. As the continental ice sheet receded about 10,000 years ago, the species began to work its way south over post glacial North America.

European explorers found grizzlies throughout most of the American West, including northern Mexico. It is not known exactly how many grizzlies lived in the U.S. before 1700, but based on historical sightings and modern-day densities, it is estimated that around 100,000 bears lived in parts of 17 states.

Almost without exception, bear numbers declined where man and bear came together for any length of time. The decline of the grizzly took less than 60 years, from the end of the trapping era in 1840 to the turn of the century. The decline was due to a number of things, including a reduction of prey because of market hunting associated with gold exploration and mining, construction of railroads, homesteading, predator control, and loss of habitat related to ranching, farming, and human settlement. Much of the killing was based on the notion that the grizzly bear posed a constant threat to people and livestock, and was incompatible with human activity.

Grizzlies were gone from west coast beaches by the 1870s, and gone from prairie river bottoms in the 1880s. By the turn of the century, they had disappeared from most broad, open mountain valleys. Fifteen years later most foothill country lacked grizzlies. Grizzlies were last documented in Texas in 1890; North Dakota in 1897; California in 1922; Utah in 1923; Oregon and New Mexico in 1931; Arizona in 1935; and Colorado in 1979. The present range of the grizzly is shown in Figure 1.

In the U.S., outside of Alaska, the grizzly survives in six ecosystems (Fig. 2): 1) in and adjacent to Yellowstone National Park; 2) Glacier National Park and the wilderness areas and associated lands south to the Blackfoot drainage and northwest to the Kootenai drainage; 3) the Cabinet Mountains and Yaak River drainage in the northwest corner of Montana; 4) the Bitterroot Mountains and associated wilderness lands north to the Salmon River and west to the Selway drainage in northcentral Idaho; 5) the Selkirk Mountains in northeast Washington and the panhandle of Idaho; and 6) the

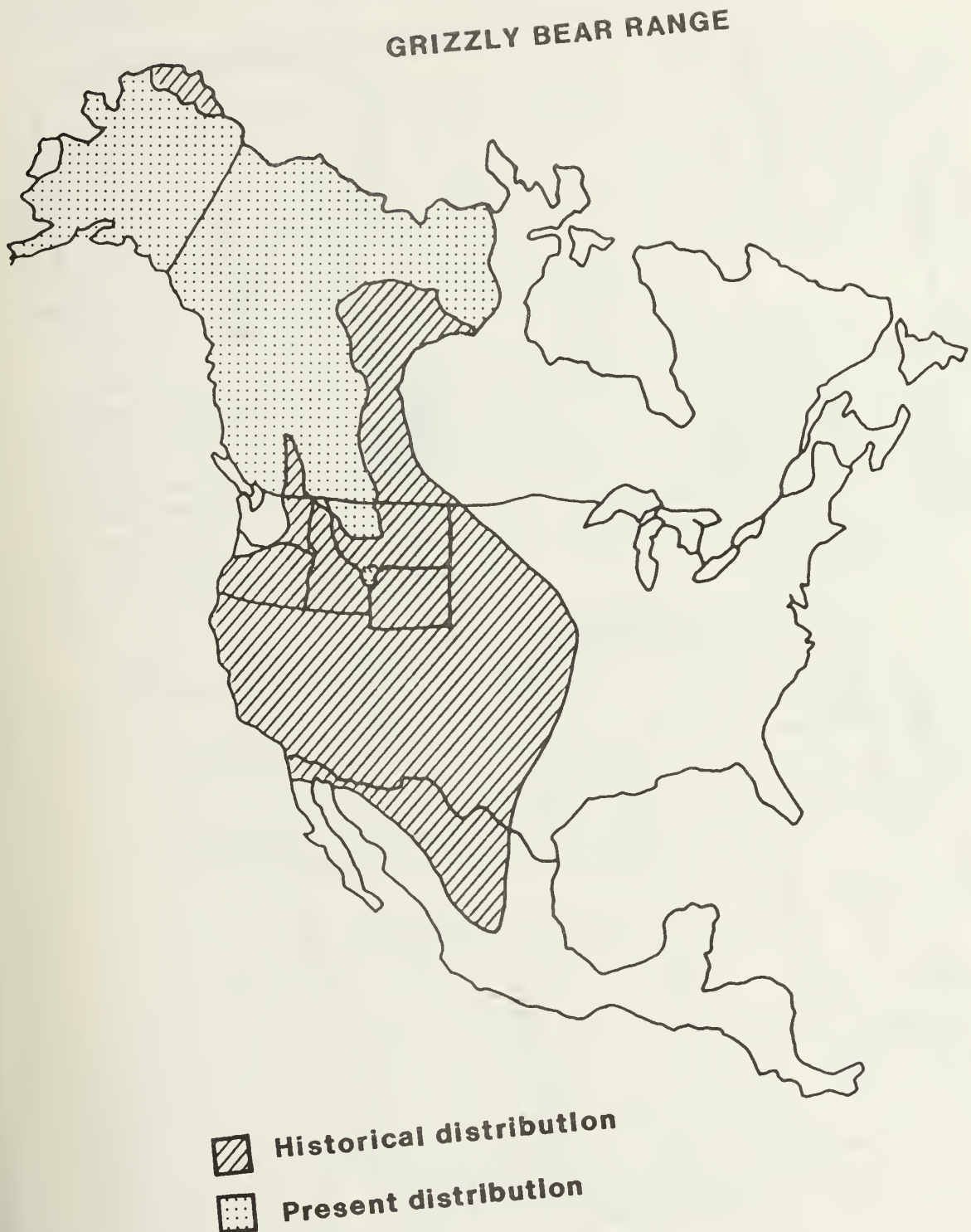


Figure 1. Present range of the grizzly bear in North America.

Figure 2. Grizzly bear ecosystems in the United States.

northern edge of the Cascade Mountains in western Washington.

B. Circumstances Leading to the Programmatic EIS

The degree of protection and the sophistication of management practices has grown steadily. In the 1960s, the importance of protecting fish and wildlife habitat began to emerge as a key public issue in wildlife management. Through all of the previous years, wildlife conservation was the goal, and was sought through the restriction and regulation of hunters and fishermen. Although effective, regulations and laws fail to address a more fundamental issue: the protection of fish and wildlife habitat.

Habitat protection under state authority began with stream preservation in the early 1940s. Generally, concern for, and protection of habitat appeared in state laws dealing with controlling natural resource development. These laws usually addressed specific resource issues such as surface mining and siting of major industrial facilities. An exception to this specific approach was the Montana Environmental Policy Act (MEPA) which was passed in 1971. On the national level, the National Environmental Policy Act (NEPA) was passed in 1969.

MEPA, patterned closely after its federal counterpart, includes three basic parts:

1. It establishes a policy for a productive and enjoyable harmony between man and his environment.

2. It requires state government to coordinate state plans, functions and resources to achieve various environmental, economic and social goals.

3. It establishes that each person is entitled to a healthful environment and has a responsibility to enhance and preserve the environment.

The Montana Fish and Game Commission (MFGC) adopted rules for implementing MEPA. These rules provide for the preparation and distribution of a programmatic review to evaluate a series of actions, programs or policies that affect the quality of the human environment. Grizzly bear management in Montana is being addressed within the framework of MEPA and its regulations. This programmatic review concerns that portion of Montana known as the "Northern Continental Divide Ecosystem" (NCDE) and the "Cabinet-Yaak Ecosystem" (CYE).

Hunting in general, and grizzly bear hunting in particular, were addressed previously under the provisions of MEPA. One year after the passage of the Act, the "Annual Statewide Harvest of Big Game Animals", an EIS, was written and

reviewed. An addendum to the hunting EIS titled, "Environmental Impact Statement on the Sport Hunting of the Grizzly Bear", was written and circulated for public review in July 1975. Both of these documents were written and reviewed before the adoption of the current rules. In the public review of both these documents, no comment critical of the Montana Department of Fish, Wildlife and Parks (Department) management program was offered.

In addition to these periodic environmental evaluations, the Commission holds public meetings as part of the annual season-setting process. The Commission agenda and season-setting procedure is a public process, accessible and open to new data, information, and opinion. Tentative seasons and quotas for big game are set every January and copies of those tentative recommendations are mailed to sportsmen and other interested parties. In March, a special public meeting is held and the Commission solicits public comment and suggestion. All season-setting decisions on the coming hunting season are completed by the end of August. This procedure is repeated annually. The more detailed public analysis inherent in MEPA is used periodically when the need for such analysis is evident. It is in this context that this programmatic EIS is prepared and circulated for comment.

C. Ecosystems Evaluated in this EIS

Montana contains all or portions of four of the six areas identified as occupied by grizzly bears in the Grizzly Bear Recovery Plan (USDI 1982). Of these four, only the NCDE and CYE contain enough grizzly habitat within the state to allow for the Department program, by itself, to significantly guide the management of grizzly bear. Although Montana's management program influences grizzly management in other areas (like the Yellowstone), management in those areas requires a joint effort with adjacent states.

This document, therefore, describes only the Department's program as it pertains to areas in and adjacent to the NCDE and CYE in Montana. The management directions for the Selway-Bitterroot and Yellowstone grizzly bear ecosystems are not included.

D. Historical Review

To properly evaluate Montana's grizzly bear management program, it is important to have some historical perspectives on past events and management actions. The outline below provides a brief review. Past actions by the Department are underlined.

1804-06	Lewis and Clark Expedition
1807	Montana's First Settlement

1862	Homestead Act
1872	Yellowstone Park created
1885	Peak of Cattle Boom
1889	Montana becomes a state
1905	First hunting licenses for residents
1910	Glacier National Park Created
1913	Legislation creating the Sun River Game Preserve
1917	Montana Fish and Game Commission publishes an article seeking game animal status for bears
1921	Use of dogs to hunt bears prohibited Statute against enticing or luring game animals is enacted
1923	Bears are declared game animals
1929	Spotted Bear Preserve formed
1930	Predator control (and use of poisons) is extensive
1936	Spotted Bear Preserve abolished
1940	First Big Game manager hired for the Montana Fish and Game Department Bob Marshall Wilderness created
1941	Grizzly bear survey work by Cooney (1941) Spring season on grizzlies closed Grizzly bear season closed on the west side of the south fork of the Flathead River
1947	Sun River Game Range acquired Killing bear cubs or females with cubs prohibited
1948	Regulations specifically prohibit baiting bears
1953	Grizzly bear survey work (Stockstad 1953, 1954)
1954	Surveys indicate an increase in grizzly populations (Marshall 1955); however, the need for more accurate population trend monitoring and density estimates was documented
1955	Grizzly bear season on the south fork of the Flathead River reopened Grizzly bear surveys (Marshall 1955)
1956	Cooney (1956) reports 439 grizzly in Montana outside of parks Rognrud (1956) grizzly bear surveys
1957	Survey for possible grizzly bear study area (Onishuk and Stockstad 1957)
1960	Multiple Use and Sustained Yield Act
1964	Wilderness act passed
1967	First grizzly license sold and trophy license required (resident license $1 nonresident $25) Mandatory reporting of grizzly kills and submission of heads and hides of harvested bears implemented
1969	National Environmental Policy Act (NEPA)
1971	Grizzly license purchase date by July 1

	Resident license fee raised to $5 and nonresident to $35.
	Montana Environmental Policy Act (MEPA)
1973	Lincoln Scapegoat Wilderness created
	Endangered Species Act passed
1974	Moratorium on grizzly hunting in the Yellowstone Ecosystem
	Grizzly hunting season in the Cabinet-Yaak Ecosystem closed
	Border grizzly project studies initiated
	Department grizzly bear survey in northwestern Montana (Hamlin & Frisina, 1975)
1975	First environmental impact statement on grizzly bear management prepared
	Grizzly bear listed as threatened in the lower 48 states by the U.S. Fish and Wildlife Service
	Annual quota of 25 man-caused grizzly bear mortalities implemented in northwestern Montana
1976	East Front grizzly bear studies begun
	Resident license increased to $25, nonresident $125
1979	Great Bear Wilderness created
1981	Nonresident license increased to $150
	Flathead Indian Reservation grizzly bear management plan written
1982	Grizzly bear recovery plan approved
	Nonresident license increased to $175
	Mission Mountain Wilderness created
1983	Female subquotas established
	Cabinet-Yaak grizzly study initiated
1984	Programmatic environmental impact statement on all aspects of grizzly management initiated
	Resident license increased to $50, nonresident to $300
1985	State law passed restricting sale of grizzly parts

II. DEPARTMENT GOALS AND MANAGEMENT OBJECTIVES

A. Montana Fish and Game Commission (MFGC) Policy

MFGC is the policy making arm of Montana's Fish and Wildlife Program. Section 87-1-301(1), Montana Codes Annotated (MCA), requires the Commission to "set policies for the protection, preservation, and propagation of the wildlife, fish, game furbearers, waterfowl, nongame species, and endangered species of the state for the fulfillment of all other responsibilities of the Department as provided by law." This section recognizes the Commission's responsibility to address endangered species.

The legislature has given specific policy direction to the Commission on the issue of grizzly bears. Section 87-5-301, MCA, states:

> "It is hereby declared the policy of the state of Montana to protect, conserve, and manage grizzly bear as a rare species of Montana wildlife."

Section 87-5-302 describes the Commission's power with regard to grizzly bears.

Within this legal framework, the Commission developed a grizzly bear policy in Section 12.9.103, ARM (Appendix A). That policy addresses the need to protect grizzly habitat, the need to pursue grizzly research, the role of sport hunting and grizzly management, depredations, and the appropriate department response to depredations, and requires compliance with federal regulations relating to grizzly bears. It is within this framework and that described by the Endangered Species Act (16 U.S.C. Sec. 1531, et seq.) that specific department goals for the grizzly bear are developed.

B. Specific Department Goals for the Grizzly Bear

1. Department Goals

To provide the people of Montana and visitors with the optimum outdoor recreational opportunities, emphasizing the tangible and intangible values of wildlife and the natural and cultural resources of authentic, scenic, historic, scientific, and archaeological significance, in a manner:

a. Consistent with the capabilities and requirements of the resources,

b. Recognizing present and future human needs and desires,

c. Ensuring maintenance and enhancement of the quality of the environment.

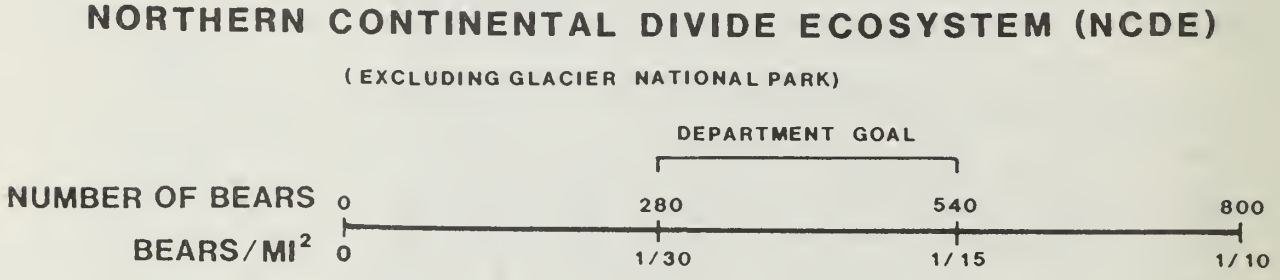
2. Wildlife Program Goal

To protect, perpetuate, enhance, and regulate the wise use of wildlife resources for public benefit now and in the future.

3. Grizzly Bear Management Objectives

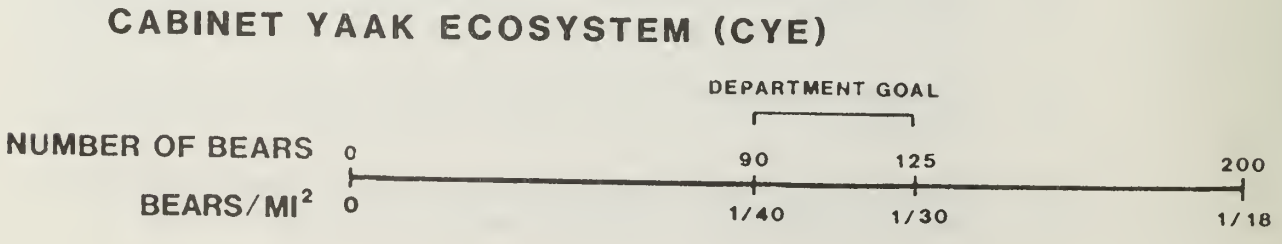
Northern Continental Divide Ecosystem (NCDE)

To manage for a recovered grizzly bear population and maintain distribution in the management area as defined in Figure 3, and seek to maintain the habitat in a condition suitable to sustain the population (excluding Glacier National Park) at an average density between 1 bear/30 mi^2 to 1 bear/15mi^2.



Cabinet-Yaak Ecosystem (CYE):

To manage for a recovered grizzly bear population and maintain distribution in the management area as defined in Figure 4, and seek to maintain the habitat in a condition suitable to sustain the population at an average density of 1 bear/40 mi^2 to 1 bear/30 mi^2.



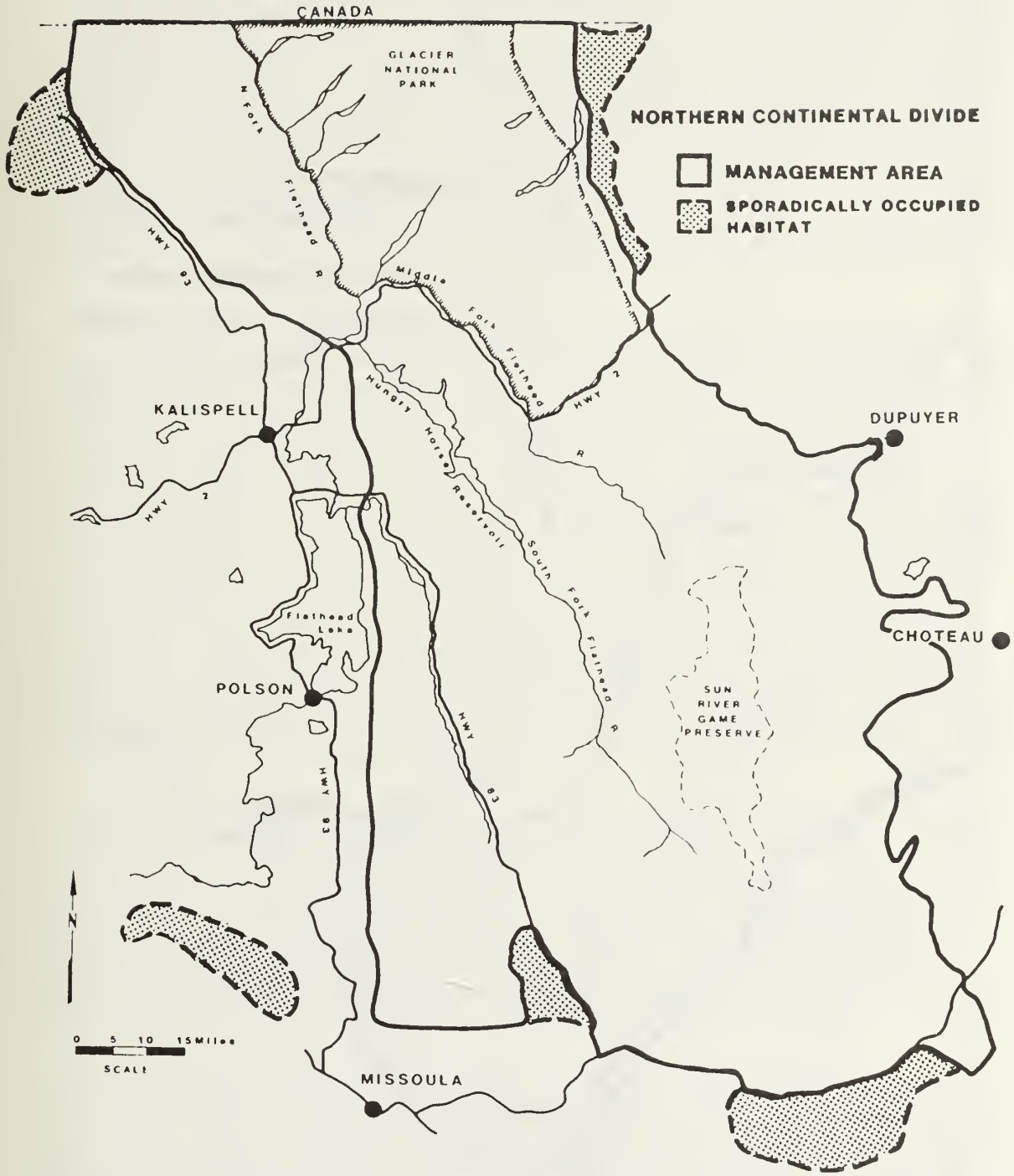


Figure 3. Grizzly bear management area for the NCDE.

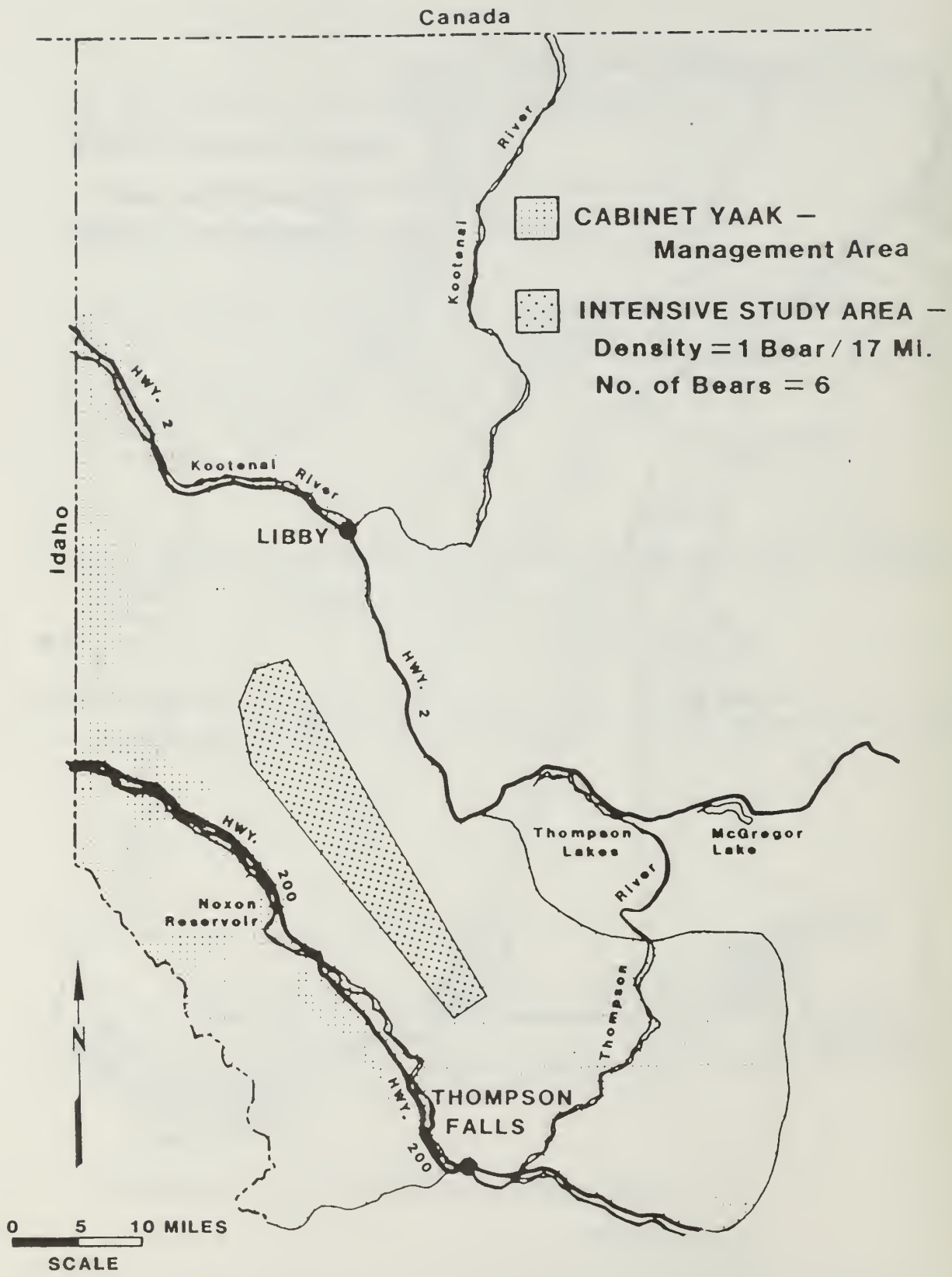


Figure 4. Grizzly bear management area for the CYE.

Justification for these objectives comes from several sources. Shaffer (1983) determined the minimum viable population (MVP) size (the smallest population with a 95% probability of surviving at least 100 years) of grizzlies to be 50-90 bears. Data from the Yellowstone population (Craighead et al. 1974) were used to determine this minimum population size. However, Suchy et al. (1985), also using data from the Yellowstone population, determined that the MVP varied from 40 to 125 by increasing mortality rates only slightly. Further, they reported that dropping the reproductive rate only 10% produced a 25-80% increase in the MVP. When such small variations in MVP models produce such wide variation in MVP estimates, care should clearly be taken in their interpretation.

Franklin (1980) suggested that continued evolution of a population would require a minimum effective population number of at least 500. The grizzly bear recovery plan (USDI 1982) established a goal of 560 bears for the NCDE. However, evidence exists that very small populations of grizzly bears have existed for long periods of time and remain stable. Roth (1976) reported a stable population of approximately 10 animals in Trentino, Italy since 1969. Sorenson (pers. comm., Norwegian Directorate for Wildlife and Freshwater Fish, Trondheim) stated that several distinct populations in Norway, numbering approximately 5-30 animals, have remained stable for decades following heavy hunting last century, and are now slowly increasing. Roth (1972), Elgmork (1978) and Mysterud (1977) report on small populations which have existed near densely populated areas by becoming nocturnal, avoiding confrontation with humans, and withdrawing from human contact.

The densities suggested as the objectives for the two ecosystems were selected because they should provide for the continued existence of populations in these ecosystems. Review of other densities reported in the literature (see Grizzly Bear Populations) for similar areas range from 1 bear/6 mi^2 for good quality habitat to 1 bear/58 mi^2 for more marginal habitat. Habitat in the CYE and NCDE is considered not to be of the highest quality nor of marginal quality, but is intermediate.

The objective for grizzly bear density in the CYE is lower than for the NCDE. The reasons for this difference are that there are significant differences in human impacts and land use patterns between the two ecosystems (see Jurisdiction and Land Use). The CYE is more heavily impacted than the NCDE.

The area of the CYE (Figure 4), which the Department wishes to manage for grizzly bears, is considerably larger than that suggested by the Grizzly Bear Recovery Plan (USDI 1982). As provided in this figure, the CYE line is not a recovery line nor a management situation line. Rather, the

Department's management activities outside of the Recovery Area are intended to allow population interchange with Canada and management of sporadic occurrences of bears which can be expected to occur at higher population levels.

C. Legal Context of Grizzly Management

As noted in Section II.A., state law and the MFGC have described the state policy for grizzly bear management. In addition, a number of other specific laws address the Commission's and the Department's authority to manage grizzly bears. MCA §7-5-302 states:

> "The commission shall have authority to provide open and closed seasons; means of taking; shooting hours; tagging requirements for carcasses, skulls, and hides; possession limits; and requirements for transportation, exportation, and importation of grizzly bear."

This section was enacted in 1969, prior to the enactment of the Endangered Species Act. In addition, grizzly bears are treated as a game animal under Montana law, Section §7-2-101(5), MCA. As such, they come under the Department's authority to establish hunting seasons, §7-1-304, MCA.

Ultimately, federal law controls the Department's authority to manage grizzly bears. The Endangered Species Act (16 U.S.C. 1531 et seq.) was enacted in 1973. Section 16 U.S.C. 1531, the purposes and policy statement of the Act, describes the congressional commitment to protect and conserve endangered and threatened species. The Department of Interior is authorized (16 U.S.C. 1533[c]) to list endangered and threatened species. Federal regulations, 50 C.F.R. Sec. 17.11 list the grizzly as threatened in the 48 conterminous states. Prohibitions that apply to grizzlies are described in 50 C.F.R. Sec. 17.40[b] (Appendix D). Among actions allowed with regard to grizzly bears in that regulation are the taking of grizzlies in self defense, the taking of nuisance bears when it has not been reasonably possible to eliminate the threats posed by such bears by live capturing and releasing in a remote area, and the taking of bears by hunting. In addition, the regulation contains prohibitions on import and export of the bear, on the sale of unlawfully taken bears, and on the transport of bears for commercial purposes.

The Endangered Species Act addressed the conservation of endangered and threatened species. Section 16 U.S.C. 1532(1) defines the terms "conserve," "conserving" and "conservation" to mean:

> ". . . to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which measures

provided pursuant to this chapter are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking" (emphasis added).

A recent case, Sierra Club v. Clark, F.2d , No. 84-5042,5134 (1985) construed 16 U.S.C. Sec. 1532(2) to mean that the Department of Interior, prior to allowing a regulated sport season on wolves, had to make a finding, supported by evidence, that wolves, a threatened species in Minnesota, were so populous as to meet the extraordinary case criteria. Based on that case, the Department and Commission must be able to establish that grizzly bear population pressure in an ecosystem are so extraordinary as to warrant a regulated taking, in order to justify a hunting season on grizzlies.

Finally, the Endangered Species Act, through its definition of "conservation," sets a clear mandate that the goal of endangered and threatened species conservation is recovery of the species. Likewise, a number of Federal Court decisions have held that the responsible agencies must do far more than merely avoid elimination of a protected species. Defenders of Wildlife v. Andrus, 428 F. Supp. 167 (1977).

The Department of Interior, MFGC, and the Department have a mandate to manage the grizzly bear in a fashion best intended to assure its recovery from the status of threatened species.

The Department was a cooperator in the development of the Grizzly Bear Recovery Plan (USDI 1982) and supports the management actions outlined in the Plan. The Department has initiated, modified and continued management activities recommended in this recovery plan. These Department activities are described in this EIS. Furthermore, information presented in this EIS should serve to compliment future recovery plans.

A. The Natural Environment

1. Geological History

The geological history of northwestern Montana has been described by Deiss (1958) and Montagne and McMannis (1961). The area has a rugged mountain topography separated by intermountain valleys. The Continental Divide of the Rocky Mountain Cordillera extends through Glacier National Park south to Rogers Pass. The mountains in northwestern Montana rarely exceed 10,000 feet, not as high as those elsewhere in the Rocky Mountains.

During the Proterozoic Era (approximately 600 million years ago), western North America was covered by water. Sands, silts, and clays were deposited across what is now northwestern Montana to an estimated thickness exceeding 15,000 feet. These deposits hardened and compressed into limestones, sandstones, shales, and argillites. Subsequent erosion during the Cambrian Period again reduced the area to sea level. Inland seas covered the area during the Paleozoic Era and deposited sediments known as the Cambrian, Devonian, and Mississipian rock formations.

Between 60-70 million years ago land was uplifted and tilted. Older deposits slid above younger formations and resulted in the Overthrust Belt, a formation with oil and gas deposits. Glaciers began to carve the mountains one million years ago, forming today's U-shaped valleys, hanging valleys, cirques, and horns.

2. Climate

The area is strongly influenced by maritime air masses moving east from the Pacific Ocean. Arctic air masses flow into northwestern Montana from the north. This oceanic influence decreases from north to south in northwestern Montana (Daubenmire 1969). Much of the moisture in these air masses has been depleted upon reaching the Continental Divide.

For every 1000 feet in elevation, there is an average decrease in temperature of 3.5°F. This has a marked influence on the length of the growing season, which varies greatly throughout the divide.

The lowest temperature ever recorded in the conterminous U.S. (-70°F) was set in northwestern Montana near Rogers Pass. Conversely, most area weather stations have recorded temperatures in excess of 100°F. Such extremes, however, are unusual although the annual and daily temperature ranges are large. Mountain nights above 70°F are unusual.

3. Vegetation

The rugged mountain topography of northwestern Montana creates complex local weather patterns and produces an array of vegetation. Relatively dry slopes occur in rain shadows, and cool, moist drainages occur in areas of high precipitation and cloud cover (Arno 1979). Major forest habitat types include Douglas fir (Pseudotsuga menziesii), spruce (Picea spp.), subalpine fir (Abies lasiocarpa), and western red cedar (Thuga plicata) (Pfister et al. 1977).

Many plant taxa have adapted to and depend on fires. Seral vegetation forms complex mosaics throughout the area. The history and influences of fire in the northern Rocky Mountains are given by Steele (1960), Habeck and Mutch (1973), and Arno (1980).

The grizzly bear management areas in northwestern Montana were stratified into 6 major regions (Figs. 5 and 6) discernible on the basis of major climax forest communities, understory unions, precipitation, and landform. Region boundaries and vegetative descriptions were assessed using Arno (1979), Pfister et al. (1977), and Daubenmire (1969). Primary river drainages were considered separately because they provide unique and superior foraging habitat for the grizzly bear.

Region 1

Region 1 occurs in extreme northwestern Montana and includes the entire CYE. This area is under the strong influence of Pacific maritime air masses. The region experiences high precipitation, and is generally humid and cloudy (Arno 1979). Representative coniferous vegetation includes western hemlock (Tsuga heterophylla) and western red cedar. Grand fir (Abies grandis) and western white pine (Pinus monticola) are also more prominent here than in other regions of the state. The region's mildest weather conditions are in the vicinity of the Kootenai River drainage.

Region 2

Arctic air masses are much more frequent here than in Region 1. As a result, the representative conifers listed for Region 1 are much less abundant and are restricted to valley bottomlands and other sheltered areas. Climax forest habitat types typical of Region 2 include Douglas fir, spruce, and subalpine fir. Ponderosa pine forests (Pinus ponderosa) are more common in the southern portion of this region. Extensive stands of seral lodgepole pine (Pinus contorta) and climax or seral Douglas fir can be found throughout the region. Region 2 extends from the western edge of the NCDE east to the Continental Divide.

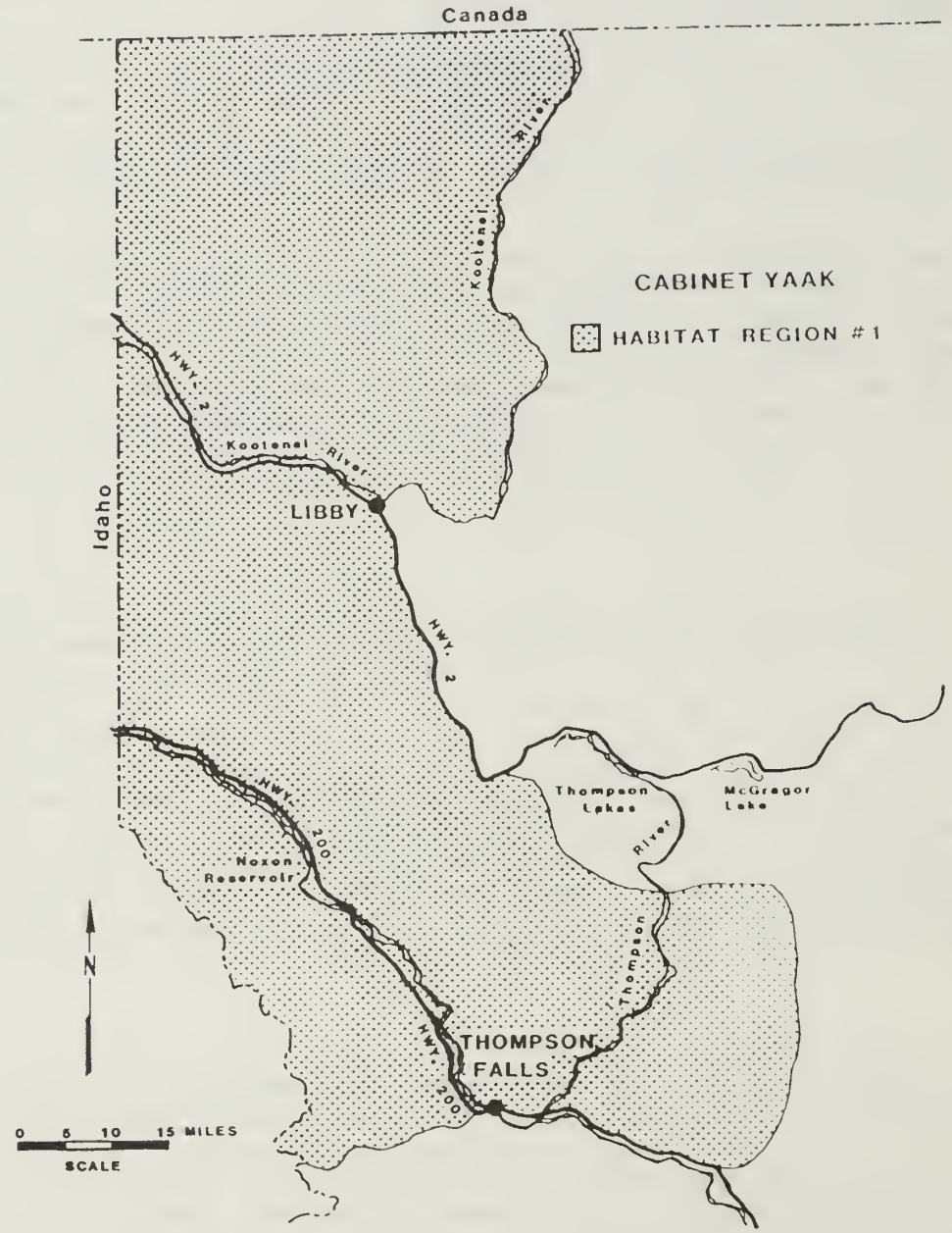


Figure 5. Habitat regions in the CYE.

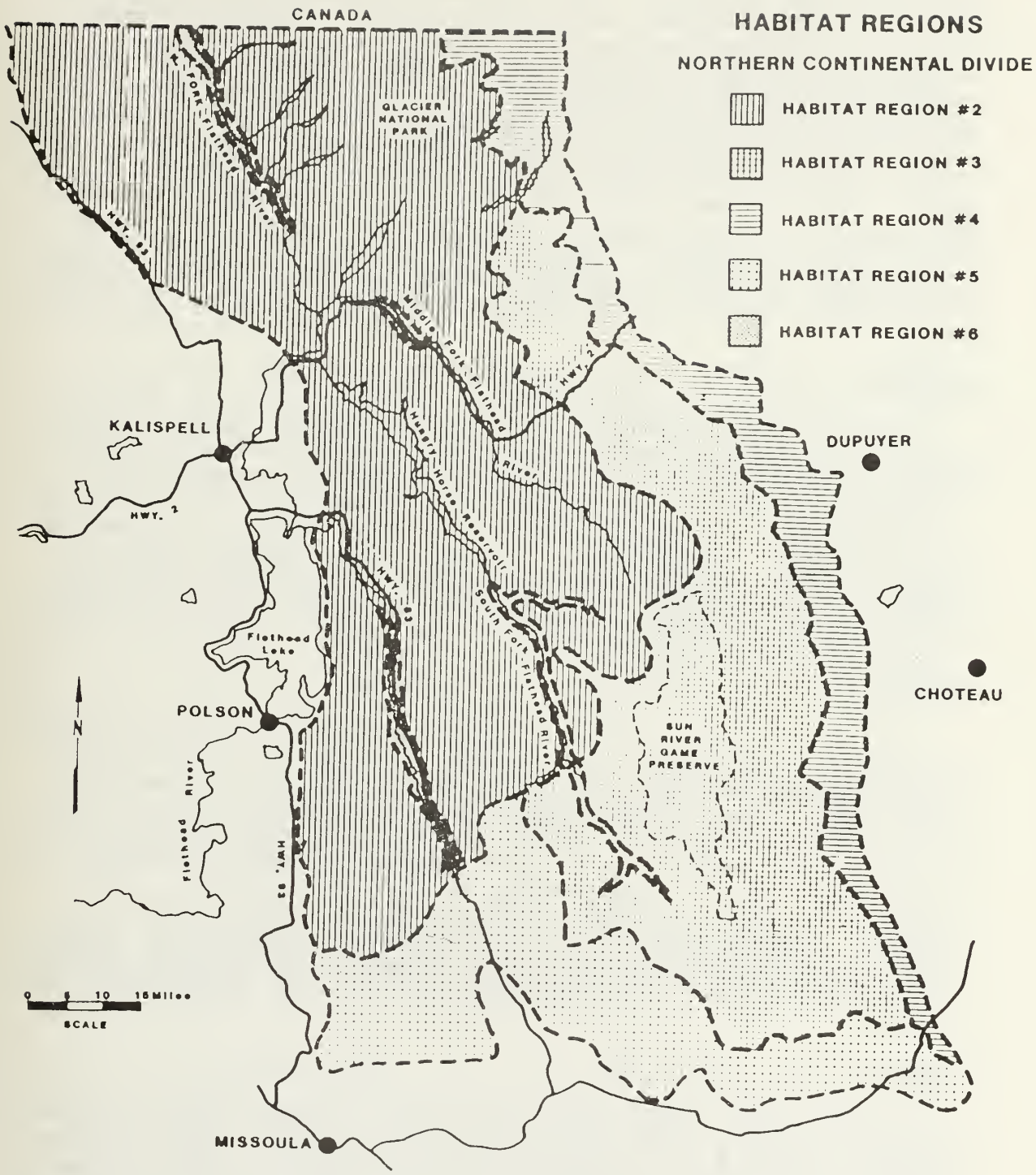


Figure 6. Habitat regions in the NCDE.

Region 3

Region 3 is much higher in elevation and drier than the other habitat regions. This region includes much of the Bob Marshall and Scapegoat wilderness areas. Dramatic temperature fluctuations and severe chinook winds influence the vegetation on the east side of the Continental Divide. Much of the precipitation moving east from the Pacific Ocean has been depleted before air masses reach the Divide. Precipitation also decreases in a southerly direction along the divide. Because of winter chinooks and generally lower snowpack, this region often experiences severe drought conditions during the summer. Subalpine fir is the most extensive forest habitat type, with white-bark pine (Pinus albicaulis) stands dominating high elevation ridges. The most expansive areas of alpine vegetation occur in this region.

Region 4

Region 4 is that area of habitat along the interface between the Rocky Mountain Cordillera and the Great Plains. This region extends from the international border south to the Rogers Pass area. This low-elevation region is a complex mosaic of grasslands, shrublands, and aspen (Populus tremuloides) grovelands. Limber pine (Pinus flexilis) savannas are common on dry sites at low elevations. Wet seeps, bogs, marshes, and glades are especially prominent microhabitats in this region.

Region 5

Region 5 lies in the southern portion of grizzly bear habitat in the NCDE. The region includes the Rattlesnake Wilderness and a narrow band south of the Bob Marshall Wilderness. Many of the conspicuous plant taxa of the more northern and western regions are rare. Although the region is under the influence of Pacific climate, precipitation is relatively low. Intermountain forest species such as western larch (Larix occidentalis), alpine larch (L. lyallii), ponderosa pine, and beargrass (Xerophyllum tenax) characterize this region (Arno 1979). Broad valley grasslands dominated by bunchgrasses occur in intermountain valleys.

Region 6

This region includes large intermountain river floodplains. Such river bottoms provide unique and superior foraging habitats. Vegetation composition in river floodplains is similar among all regions. Deciduous trees and shrubs (Salix spp., Cornus spp., Alnus spp., Populus spp., and Betula spp.) are common. Coniferous overstory is variable, depending on location. This region, while of utmost importance to grizzly bears, is the most limited. The North

Fork of the Flathead and Swan rivers are considered superior to the upper South Fork of the Flathead, Kootenai, and Clark Fork.

4. Wildlife

The habitat used by the grizzly bear in northwest Montana is rich in other forms of wildlife. The variety is a function of great diversity in climate, soil and topography. The abundance of many species is also a function of this diversity, but mainly is related to the unusual security of grizzly country.

All ten of Montana's other big-game mammals share the grizzly's habitat. The general absence of roads, year-round residents, intensive farming, and heavy livestock use benefits every big-game animal.

Pronghorn (Antilocapra americana) and woodland caribou (Rangifer tarandus) occur in very small portions of the grizzly's range. Pronghorn are restricted to a small amount of prairie bordering the east front. Caribou are very rare and have been observed a few times in the last 30 years in the Whitefish Mountains and the northern edge of the Yaak drainage.

Whitetail deer (Odocoileus virginianus), elk (Cervus elaphus), black bear (U. americanus), and mountain lions (Felis concolor) are found throughout grizzly country in some of the most abundant populations found anywhere in the U.S. Mule deer (O. hemionus) are also found throughout the grizzly's range, but they prefer the drier more open country bordering the management areas.

Moose (Alces alces), bighorn sheep (Ovis canadensis), and mountain goats (Oreomnus americanus) are found in relatively small numbers scattered in numerous drainages throughout the CYE and NCDE.

In addition to the big-game animals, at least 41 other species of mammals are found in grizzly bear habitat. These include four shrews (Sorex spp.), eight bats, three rabbits, four squirrels, two marmots (Marmota spp.), two chipmunks (Eutamias spp.), and thirteen other rodents.

The lynx (Lynx lynx), wolverine (Gulo gulo), wolf (Canis lupus), northern bog lemming (Synaptomyx borealis), and hoary marmot (Marmota caligata) seem to survive best in country used by the grizzly bear. All of Montana's predators and furbearers, except the least weasel (Mustela nivalis) and northern swift fox (Vulpes velox), use the same habitat.

The third edition (1985) of P.D. Skaar's Montana Bird Distribution lists 381 species observed in Montana. Of

these, 273 have been observed in the northwest corner. This is the greatest variety found anywhere in Montana. About 180 bird species breed in the area; over 120 species winter over in parts of the CYE.

Our grizzly bear management areas support two endangered bird species: the bald eagle (Haliaeetus leucocephalus) and the peregrine falcon (Falco peregrinus). Between 1,000 and 1,500 bald eagles feed along the Flathead River drainage during their fall migration and about 16 pair nest in grizzly bear management areas every spring. Peregrines are reported several times each year in the Flathead River drainage.

At least 30 of Montana's 84 species of fish are found in northwestern Montana. Of this number, 23 are known to occur in grizzly bear management areas. All of the state's salmonids, except coho (Oncorhynchus kisutch), are present and grizzly habitat supports some of the best bull trout (Salvalinus malma), westslope cutthroat trout (Salmo clarki lewisi), and kokanee (O. nerka) spawning sites in Montana.

Grizzly bear habitat contains 10 of Montana's 17 species of reptiles, including at least six snakes, two turtles, and two lizards. The same country supports 10 of the state's 17 amphibian species, including five frogs, four salamanders, and one toad (Bufo boreas).

B. The Human Environment

1. Social and Economic Considerations

a. Population and Distribution

Table 1 shows human census figures for the entire state compared with those for 14 northwestern Montana counties, including Cascade, Flathead, Glacier, Granite, Lake, Lewis and Clark, Lincoln, Mineral, Missoula, Pondera, Powell, Sanders, Teton and Toole.

The proportion of Montana's population in northwestern Montana was 38% in 1960, 42% in 1970, and 43% in 1980. The 1984 Census placed Montana's total population at approximately 824,000. (Figures for 1984 are unavailable by county.) Estimates of the 1983 population indicate that 42% of Montana's population is located in northwestern Montana. Projections indicate that northwestern Montana's population will be approximately 43% of the state's total population by 1990 (Table 1).

Table 1. Montana Population, 1950-2000.

Year	State Population	Northwestern Montana Population	% Total Population in Northwestern Montana
1950	591,024	N/A	N/A
1960	674,767	259,100	38.4
1970	694,400	294,200	42.4
1980	786,690	340,000	43.2
1983	816,300	345,400	42.3
1990	859,900	372,700	43.3
2000	935,600	410,000	43.8

Source: 1950-80 - MT Dept. of Commerce, Census and Economic Information Center Figures
1983 - Census and Economic Information Center; Estimates October 1984
1990-2000 - Census and Economic Information Center Projections

b. Economy

1) Timber

The 1983 production of lumber, paper, and wood products in Montana was valued at $750 million. This represents 14.4% of Montana's economy. Total timber harvest in Montana in 1981 was 1,035 million board feet (MMBF), with 84% (867 MMBF) coming from northwestern counties. Lincoln, Flathead, Missoula, and Sanders counties accounted for 70% of Montana's timber harvest in 1981 (Keegan et al. 1981, Montana Department of State Lands, 1982).

2) Agriculture

Agriculture is Montana's number 1 industry, accounting for approximately one-third of the state's total annual income. Montana ranks second nationally in the amount of land in farms and ranches. Cash receipts from agriculture in Montana totaled over $1.8 billion in 1982, with 14 northwestern counties contributing 23% (Montana Department of Agriculture, 1984).

3) Tourism

Tourism contributed $625 million to Montana's economy. Nonresident visitors totaled over 2.2 million and contributed $423 million to Montana's economy in 1983. Northwestern Montana counties which rank high include Cascade, Flathead, Lewis and Clark, Lincoln, Missoula, and Powell (Dailey 1984).

4) Recreation

There are 494 public recreation sites in Montana, of which two-thirds are state owned. One hundred forty-two of these sites are located within northwestern Montana. (Visitation figures are available only for state-owned sites.) Visitation at all Montana state-owned sites was 4,469,700 visitor days in 1983. Northwestern counties received 23% of this use.

a. Hunting and Fishing

Fifty-six percent of the total license sales in Montana in 1983 were within northwestern Montana (Table 2).

Table 2. Montana hunting and fishing license sales, 1950-1983.

Year	Sales-Montana	Sales-Northwestern Montana
1950	285,150	N/A
1960	375,196	N/A
1970	967,947	N/A
1980	1,120,144	N/A
1983	1,250,518	697,423

5) Hydroelectric Production

Eight of Montana's 22 hydroelectric plants are located in the northwest. These eight plants have a total production capacity of 1,331.3 megawatts, nearly 63% of the state's total hydroelectric capacity (Montana Department of Natural Resources and Conservation, 1984).

6) Hydrocarbons

a) Coal

Coal accounted for 65% of the total energy produced in Montana in 1982. One-quarter of the U.S. demonstrated reserve base of coal is in Montana. In 1983, Montana provided 28,660,284 tons of coal, with none coming from the northwest (Ibid).

b) Natural Gas

Natural gas accounted for 7% of the total energy produced in Montana in 1982. The U.S. Dept. of Energy estimated Montana reserves at 870 billion cubic feet in 1982. Total Montana production was 52.4 billion cubic feet in 1983. The northwest accounted for 27% of this production (Ibid).

c) Crude Oil

Crude oil accounted for 22% of Montana's total energy production in 1982. Montana reserves were estimated to be 216 million barrels in 1982. The total amount of crude oil produced in Montana in 1983 was 29.7 million barrels with 10% coming from the northwest (Ibid).

d) Minerals

Lincoln County has recently become western Montana's leading mineral producer since the mines closed in Butte. W. R. Grace Co. operates a vermiculite mine near Libby and Asarco operates a silver and copper mine near Troy, which is the nation's largest silver producer (Ibid).

C. Jurisdiction And Land Use

1. Jurisdiction

The grizzly bear occupies over 5.5 million acres of land in the NCDE. Grizzly bear management areas transcend federal, state, private, and corporate ownership. The U.S. Forest Service administers 63% of the ecosystem (Table 3). Four wilderness areas (the Bob Marshall, Scapegoat, Great Bear, and Mission Mountains) constitute approximately 36% of the ecosystem. The National Park Service, with administrative responsibilities for Glacier National Park, controls 18% of the ecosystem. The Blackfeet and Confederated Salish/Kootenai Reservations manage 7% of the ecosystem. Corporate owners of grizzly bear habitat include Plum Creek Inc., Champion International, Montana Power Company, and Anaconda Mining Company. Private holdings are most prevalent along the North Fork of the Flathead River, and in the Swan River Valley. Other private parcels occur along the Middle Fork of the Flathead River and along the Rocky Mountain Front.

The area designated for grizzly bear management in the CYE is over 2.3 million acres. The U.S. Forest Service (Kootenai and Lolo National Forests) administers approximately 85% of this area. Corporate ownership comprises 8%, and state lands 1%. Private parcels occur primarily along the Clark Fork, Kootenai, Bull, and Yaak rivers, and comprise approximately 6% of the grizzly bear management area for the CYE. The majority of the CYE is in Montana, but is contiguous with habitat in the Panhandle National Forest of Idaho. The Cabinet Wilderness (93,784 acres) is approximately 4% of the management area. Numerous potential mining claims occur along the wilderness boundary.

2. Habitat Management Situations

The federal government has stratified grizzly bear habitat in the NCDE into 3 management situation categories

Table 3. Management of the NCDE by agency and acreage (USDA Forest Service, Flathead National Forest).

Agency or Unit	Acres (thou.)	Percentage of Ecosystem
U.S. Forest Service		
Flathead	2,056	
Lewis and Clark	776	
Lolo	281	
Helena	180	
Kootenai	207	
Subtotal	3,500	63.0
National Park Service	1014	18.0
Bureau of Land Management	24	0.4
Department of State Lands	196	4.0
Indian Reservation	362	7.0
Private*	454	8.0
Wilderness Acreage		
Bob Marshall	950	
Scapegoat	240	
Great Bear	709	
Mission Mountains	73	

* Includes private and corporate ownership.

following the general methods outlined in the Management Guidelines for the Greater Yellowstone Area. Three management situations were developed, based on habitat values and grizzly bear distribution, which set the framework for land management in the NCDE. Indian reservations, state, and private lands are unstratified at present. These management situations are currently being delineated and are in the public review stage. Because private lands are not stratified at present, percentages of the land base for these situations do not equal 100%.

Management situation 1 areas are considered the most important for recovery of the species. These areas contain important seasonal or yearlong habitats for free-ranging grizzly bears. Federal management direction will seek to minimize grizzly/human conflict and will favor the needs of the grizzly bear over land-use practices, but nuisance bears will be controlled. As currently mapped, 73% of the federal land in the NCDE is considered management situation 1 (USDA files, Flathead National Forest).

Approximately 8% of the federal land in the NCDE is currently mapped as management situation 2. These areas lack distinct grizzly population centers and highly suitable habitat does not occur. Grizzly bears are important, but

are not the primary consideration in these areas. Federal direction may maintain or improve habitat and may seek to minimize grizzly/human conflict. However, these are not the most important considerations and other land-use needs may be maintained. If future information shows that these areas are needed for recovery, then the area would be reclassified as management situation 1.

Management situation 3 areas are those where grizzly bear presence is possible, but infrequent. These areas are centers of human population and development and thus grizzly bear presence is undesirable. In management situation 3 areas grizzly bear habitat maintenance or improvements are not management considerations. Grizzly bear presence and factors contributing to their presence will be discouraged. All grizzly bears frequenting an area will be controlled. Approximately 0.4% of all federal land in the NCDE is presently considered management situation 3.

3. Changes in Land-Use Patterns

Patterns of land use in the NCDE are best described in terms of major resource uses, including logging areas, recreation sites, hydroelectric developments, grazing land, and residential subdivisions, discussed below.

a. Timber Resource

Approximately 59% of the grizzly bear habitat administered by the U.S. Forest Service in the NCDE is on the Flathead National Forest (Table 3). Thus timber related activities on this forest are particularly relevant. To track all changes in the land base in the forest would be difficult. However, several data sets are useful. By examining the acres of the Flathead forest altered by clear-cutting and seed-tree cutting in ten-year blocks, it is possible to trace changes in grizzly bear habitat. Timber harvest greatly increased during the period from 1940 to 1979. Approximately 35,000 acres (55 mi^2) were clear- cut or seed-tree cut during the period 1970-1979 (USDA Forest Service files). Since 1910, approximately 157 mi^2 of timber have been cut in the Flathead using these methods. Many of the older cuts now support productive second-growth stands. Since 1910, 30,000, 27,000 and 25,000 acres have been cut from Glacier View, Swan, and Hungry Horse ranger districts, respectively.

Of the 5,588 mi^2 of nonwilderness grizzly bear habitat in the NCDE, approximately 45% of the sections contain a road. Road closures instituted by the U.S. Forest Service restrict traffic seasonally or permanently in 23% of these roaded, square-mile sections.

b. Recreation

Patterns of recreational activities for the Flathead National Forest, expressed in "Recreational Visitor Use Days" (RVUD), are given in Table 4. These data, for the period 1976-1983, incorporate primitive, dispersed, and developed recreational use. Between 1976 and 1981, the Flathead National Forest experienced an increase in recreational visitor-use days. This trend appears to be reversing from 1981 to the present. Hungry Horse and Spotted Bear ranger districts receive the most recreational use.

Table 4. Recreational visitor use days on the Flathead National Forest, 1976-1983.

District[a]	1976	1977	1978	1979	1980	1981	1982	1983
	[b]							
Hungry Horse	36	N/A	210	309	N/A	378	334	281
Glacier View	9		50	52		88	85	91
Swan Lake	68		132	144		125	114	107
Spotted Bear	--		201	200		194	215	138
TOTAL	113		593	705		785	748	617

[a] Tally Lake not included
[b] In thousands

SOURCE: Flathead National Forest files

Visitor-use days in the Bob Marshall and Scapegoat Wilderness areas increased during the period 1975-1980, and have gradually declined from 1981 to the present (Table 5). While dispersed recreational activities appear to be increasing within the wilderness areas over recent years (R. Lucas, pers. comm., USDA Forest and Range Experiment Station, Missoula, MT), most activities occur along several major arteries. Since the official wilderness designation in 1979, recreational use in the Great Bear Wilderness has exceeded 20,000 visitor days per year.

Glacier National Park is a focal point for recreationists in the NCDE. Park visitations increased from 718,938 in 1956 to over 2 million in 1983 (Table 6).

Table 5. Visitor Use Days in four wilderness areas in the NCDE: 1975-1983.

Year	Visitor-Use Days[a]			
	Bob Marshall	Great Bear	Scapegoat	Mission Mountains[c]
1975	124,700	----[b]	15,300	38,100
1976	142,000	----	41,400	47,100
1977	149,400	----	32,900	39,100
1978	156,300	----	33,700	18,000
1979	156,300	22,100	36,300	19,300
1980	166,300	23,300	48,400	13,500
1981	154,000	30,400	32,600	13,300
1982	178,200	57,300	27,900	12,500
1983	152,300	37,600	25,950	11,900

[a]Visitor day = 1 person for 12 hours or any combination thereof.
[b]Data not available
[c]Eastern side of wilderness only. Data from 1975-77 seem inaccurate (R. Lucas pers. comm.)

SOURCE: Use of National Forest Units, National Forest Preservation System (U.S. Forest Service).

c. Residential Subdivision

Several areas in the NCDE contain private land where subdivision is presently occurring. Because Montana has few subdivision, zoning, or building regulations, the extent of land development in grizzly bear habitat is difficult to assess (Jonkel and Demarchi 1984). However, the Border Grizzly Project (Jonkel 1983b) has inventoried land ownership patterns and land exchanges in several areas of the NCDE. From 1950 to 1984, a minimum of 584 land parcels have been exchanged (Table 7). These parcels total 28,477 acres (approximately 45 mi^2). Of the 4 areas inventoried, 66% of the acreage sold was in the North Fork of the Flathead River. Private lands in these areas are located primarily in the valley bottoms and benchlands. Information obtained for the Swan River Valley indicates an 86% increase in housing units, and a 78% increase in population between the years 1970 and 1980 (letter from Lake County Lands Services Department 1985).

Subdivision is also occurring on the Rocky Mountain East Front. Particularly relevant subdivision locations occur along the Dearborn, Sun, and Teton rivers. No systematic inventory has been conducted in this portion of the NCDE.

Table 6. Visitor use data for Glacier National Park, Montana, 1956-1984.

Year	No. of Visitors	Backcountry Camp Days
1956	718,938	N/A
1957	759,161	
1958	706,841	
1959	722,338	
1960	724,538	
1961	739,982	
1962	966,100	
1963	811,214	
1964	642,000	
1965	847,104	
1966	907,839	
1967	884,049	6,665
1968	964,493	5,131
1969	1,051,165	6,872
1970	1,241,603	6,592
1971	1,303,073	24,765
1972	1,392,145	26,574
1973	1,398,958	27,538
1974	1,406,643	28,257
1975	1,571,393	24,785
1976	1,662,678	28,978
1977	1,656,212	30,109
1978	1,601,131	24,395
1979	1,446,236	25,323
1980	1,475,538	22,640
1981	1,786,843	17,744
1982	1,666,431	16,198
1983	2,204,131	15,507
1984	1,946,783	15,032

SOURCE: Glacier National Park files

Table 7. Data on land exchanges in the NCDE.

Period	No. of Parcels Exchanged	No. of Acres
HUNGRY HORSE-MARTIN CITY-CORAM-WEST GLACIER		
<1950	13	321
1950-54	3	170
1955-59	5	238
1960-64	1	53
1965-69	14	800
1970-74	18	726
1975-79	29	933
1980-84	28	1,085
NYACK-ESSEX-PINNACLE		
<1950	7	392
1950-54	2	8
1955-59	1	5
1960-64	3	10
1965-69	5	14
1970-74	13	612
1975-79	15	345
1980-84	9	193
BLANKENSHIP BRIDGE AREA		
<1950	0	0
1954-54	0	0
1855-59	3	53
1960-64	6	878
1965-69	7	498
1970-74	7	377
1975-79	46	1,415
1980-84	18	497
NORTH FORK OF FLATHEAD RIVER (EXCLUDING POLEBRIDGE)		
<1950	5	196
1950-54	6	377
1955-59	2	260
1960-64	9	535
1965-69	40	2,990
1970-74	54	2,436
1975-79	103	3,311
1980-84	112	8,749
TOTAL	584	28,477

Source: (Jonkel 1983b)

IV. DISTRIBUTION AND HABITAT SELECTION

A. Distribution

Grizzly bear range in northwestern Montana is continuous with Alberta, British Columbia, the Yukon, Northwest Territories, and Alaska (Herrero 1985). Evidence is also presented by Picton (In Press) indicating a sporadically occupied corridor of habitat between the NCDE and the Greater Yellowstone Ecosystem. The present distribution of grizzly bears in northwestern Montana (Figs. 3 and 4) is a small portion of the total North American Range. It is recognized that grizzly bears are occasionally found outside of these boundaries.

B. Habitat Selection

The process of habitat selection can be described as a stratification, with an increasing number of environmental constraints being imposed upon the grizzly bear from one level to the next (Johnson 1980). These four types of selection, described below, are referred to as available habitat, home range location, habitat unit selection, and food item selection.

1. Available Habitat:

In grizzly habitat not all elevational zones are available to the grizzly bear in all areas. Intermountain valleys of Montana, such as the lower South Fork of the Flathead River have been drastically altered by man, and this segment of the NCDE population now has restricted opportunity to use river floodplain vegetation. Telemetry data from the South Fork (Mace and Jonkel 1980) showed that grizzlies occupying areas to the west of Hungry Horse Reservoir generally do not cross the Swan Crest to use the Swan River floodplain, although they are physically able to do so.

Grizzly bears do not presently use bottomlands along the main stem of the Flathead River adjacent to the Mission Mountains, as they no doubt historically had (Servheen 1981). Bears in this region now confine certain seasonal activities to the low-elevation habitat units directly abutting the mountain front. Grizzly bear distribution at low elevations along the Rocky Mountain East Front (RMEF) (Schallenberger and Jonkel 1979, Aune and Stivers 1982) is likewise restricted by human activity and habitation.

The North Fork of the Flathead River presents a different picture of habitat availability. In this area grizzly bears still have the opportunity to use low elevation river bottom habitat. This undoubtedly reflects the relatively low levels of human encroachment into these habitats as compared to the other areas discussed.

Telemetry data from all areas of Montana show that, at least seasonally, grizzly bears use the lowest elevations permitted by man. This suggests that the riparian vegetation of intermountain valleys is of special seasonal importance to bears. Analyses (Craighead et al., 1982) show the value of low-elevation habitats to the grizzly bear. Habitat analyses were divided into 3 climactic zones. The "temperate zone" (the lowest elevations) was found to have the highest habitat index of all. Craighead et al. (1982) also found that the "subalpine zone" ranked higher than the "alpine zone", and concluded that "the plant energy resource of the subalpine zone is three to four times as great as the alpine zone, and thus is more critical to the welfare and survival of the grizzly bear." Thus, it may be assumed that maximum numbers of the grizzly bear can only be maintained if the species continues to have the opportunity to use both the temperate and subalpine climatic zones. Unfortunately, these 2 zones are highly used by man as well.

2. Home Range Location

Telemetry data (P. McLellan, pers. comm. University of British Columbia, Vancouver; Servheen 1981, Aune and Stivers 1982) suggest that two home-range selection patterns exist in local population segments, those being: 1) some individual animals live almost exclusively (except for denning) in low-elevation habitats, and 2) other individuals maintain home ranges in more mountainous ("remote") locations. The extent of this latter pattern is unclear because most trapping efforts to date have taken place at lower elevations.

There is evidence that grizzly bear reproductive success is tied to elevation. Preliminary data (McLellan, pers. comm.) show that adult females with established home ranges in low-elevation flood plain habitats have larger litters than females living in upper-elevation mountainous areas. If this finding holds for all areas with river flood plain habitat, then grizzly bear productivity in a given area may be determined primarily by the availability of lowland habitats.

Grizzly bears are solitary animals. With the exception of family units and during the breeding season. However, a grizzly bear "society" does exist in a given area, and its members interact. The species has a highly developed behavioral hierarchy that tends to determine the distribution and habitat-use patterns of individual bears. For black bears, displacement and dispersal of certain age and sex classes are keyed to both habitat quality and behavioral interaction (Rogers 1977).

Male grizzly bears generally have larger annual home ranges than females (Table 8). Home range sizes for all age and sex classes are larger in the East Front than other

Table 8. Home range size for grizzly bears in the NCDE.

	South Fork Flathead River[1]			North Fork Flathead River[2]			East Front[3]			Missions[4]		
Age/Sex Class	$\bar{x}$	SD	N	$\bar{x}$	SD	N	$\bar{x}$	SD	N	$\bar{x}$	SD	N
Adult Male	119	66	4	162	71.6	7	213	44	4	236	167	2
Subadult Male	95	47	5	62.5	2.1	2	496	337	4	-	-	-
Adult Female	40	0	1	65	54	7	160	75	9	114	98	2
Subadult Female	36	0	1	19	0	2	117	27	4	34	0	1

[1]Mace & Jonkel (1979, 1980)
[2]McLellan & Jonkel (1980)
[3]Aune 1985, Aune et al. (1984)
[4]Servheen (1981)

areas. The species is not considered territorial as temporal and spacial overlap has been frequently observed.

Within the limits of topographic opportunity, there are also constraints imposed by the seasonal availability of food. Thus, the home range of a grizzly bear may be composed of several, seasonally-separated ranges. While grizzlies may be found at many elevations, and in all available habitats, certain sites are preferred over others (Jonkel 1983b). The location of these seasonal ranges has been tied to the distribution and phenological stages of preferred food plants, and the distribution of prey and carrion (Pearson 1975, Russell et al. 1979, Servheen 1981, Craighead et al. 1982, Aune and Stivers 1982, Hamer and Herrero 1983, Knight et al. 1984).

3. Habitat Unit Selection

Specific habitat units selected by grizzly bears have been described both seasonally and annually for several areas of Montana, Idaho, and Wyoming. Regional variation in habitat component use is a reflection of variable climate, landform structure, and human land-use patterns. These regional differences in habitat selection are closely reflected in the food habits data (Mace and Jonkel, In Press).

Statistical analyses of habitat use and habitat availability have been conducted at the habitat component or cover type level in the South Fork of the Flathead River (Zager 1980), in the Mission Mountains (Servheen 1981), and in Yellowstone National Park (Knight et al. 1984). Habitat

use but not availability has been examined by McLellan and Jonkel (1980), the Border Grizzly Project (Jonkel 1983), Aune et al. (1984), and by Kasworm (pers. comm., Montana Department of Fish, Wildlife & Parks, Kalispell).

Several patterns in grizzly bear habitat-use arise from these analyses. It is possible to describe between 74 and 93% of all seasonal habitat use in terms of only 5 component groupings. In other words, although grizzlies use many habitat units throughout the year, only 5 appear to be disproportionately important in all areas studied. The data provided by the above authors were stratified by 2 seasons: spring-early summer and late summer-autumn (Table 9). Habitat use and habitat availability data are given by Servheen (1981) and Zager (1980).

Table 9. Percentage of radio-fixes in each of 5 habitat component groupings by season (spring-summer/summer-fall).

	Timber	Mesic Site[1]	Po Tr[2]	Burn	Talus	Total
East Front	32/46	22/13	30/26		0/8	84/93
South Fork	26/25	60/21		0/31		86/77
Mission Mountains	50/28	32/50		0/2	0/6	82/86
North Fork[3]	33/64	41/13	-----	0/11	---	74/88
Average	35/41	39/24	30/26	0/15	0/7	82/86

1=includes swamps, seeps, creek bottoms, avalanche chutes
2=*Populus tremuloides* stands
3=from Rockwell et al. (1978).

That habitat components not listed (Table 9) are unimportant to the grizzly bear is not suggested. However, these data do show that there are specific components important to bears in all regions, and these are timber, mesic sites, and burn shrubfields. The aspen component, especially important in the East Front, is an ephemerally mesic component. Shrubfields created and maintained by natural fire are of great importance to grizzly bears throughout their range in Montana, because they produce high-energy fruits (Martin 1979). The mosaic of habitats produced by fire are felt to maintain optimum grizzly bear habitat (Schallenberger 1974, Martinka 1976, Russell et al. 1979, Zager 1980). With current aggressive fire suppression, grizzly bear habitat, especially in the wilderness areas, will continue to degrade.

Grizzly bears occasionally use areas altered by timber harvest but do not show a preference for them (Zager 1980).

Most timber harvest in the NCDE occurred in the 1960s and as such most cuts are only a few decades old. It is probable that as these cuts age, increased grizzly use will occur.

Habitat quality has been assessed subjectively in several areas. Unfortunately, areas having the largest habitat data bases lack specific grizzly bear habitat-use information. Craighead et al. (1982) provided detailed habitat quality evaluations for "ecological land units" in the alpine and subalpine zone of the Scapegoat Wilderness. The habitat quality rankings were based on random samples of habitat, chemical evaluation of food quality, and acreages of each ecological land unit. They further stratified habitat quality by 3 climactic zones.

Mace (1984) evaluated grizzly bear habitat components in the Bob Marshall Wilderness Area. In his analysis, habitat components were stratified by major "vegetation type". Each of 28 vegetation types was then evaluated for seasonal forage (habitat) quality using food coverage values and preference ranks. Habitat component ratings were also developed for the Rattlesnake Wilderness Area by Tirmenstein (1983). Habitat quality ratings using LANDSAT technology are being investigated in Glacier National Park (Martinka and Kendall, In Prep.). Craighead et al. (1982) outlined and discussed 7 essential environmental habitat characteristics, those being: space, isolation, sanitation, food, denning, vegetation types, and safety.

4. Food Selection:

The grizzly bear forages on a wide variety of plant and animal species. Specific food items vary geographically (Servheen and Wojciechowski 1978, Mace and Jonkel, In Press) and among individuals. Individual variation in diet can be attributed to preference and availability of items.

Two major grizzly bear nutrient regimes are present within the NCDE with the Continental Divide separating them. Each regime contains certain nutrients from which bears obtain most of their energy. East of the Divide and south into Yellowstone National Park, underground roots, tubers, berries, and bulbs are important as are the nuts of whitebark pine (Pinus albicaulis). West of the Divide, energy from fruit sugar is most important. While the grizzly bear may eat a wide variety of foods, several are disproportionately preferred over others (Mace and Jonkel 1983, Knight et al. 1984)(Table 10). It is these major diet items that are most likely to explain habitat-use patterns.

5. Denning Ecology

Grizzly bears in general spend from 5 to 6 months in winter dens (Nelson et al. 1983). Den sites are usually in mountainous terrain above 6,600 ft. (Jonkel 1983,

Table 10. Major foods of the grizzly bear in the NCDE.

Name	Part consumed	Season[a] s,sum,f	Location[b]
Angelica spp.	stems, leaves	s,sum	all
Astragalus spp.	roots	s,sum,f	1
Claytonia spp.	bulb	s,sum,f	all
Equisetum spp.	foliage	s,sum,f	all
Erythronium spp.	corm	s	1,2
Fragaria spp.	foliage, fruit	s,sum,f	all
Hedysarum spp.	roots	s,f	1
Heracleum lanatum	stems, leaves	s,sum	1,2,3,4
Ligusticum spp.	stems, leaves	s,sum	1,2,3,4
Lomatium spp.	roots	sum,f	1,2,3,4,5,6
Osmorhiza spp.	stems, leaves	s,sum	1,2,3,4
Oxytropis spp.	roots	s,f	1
Pinus albicaulis	nuts	s,f	3,5,6
Trifolium spp.	foliage	s,sum,f	1,2,3,4,5
Taraxacum spp.	foliage	s,sum,f	1,2,3,4,5
Amelanchier spp.	fruit	sum,f	1,2,3,4
Cornus stolonifera	fruit	sum,f	1,2
Prunus spp.	fruit	sum,f	3
Rhamnus alnifolia	fruit	sum,f	1
Shepherdia spp.	fruit	sum,f	1,2,3
Malus spp.	fruit	sum,f	4
Vaccinium globulare	fruit	sum,f	all
V. scoparium	fruit	sum,f	5
Grasses	foliage	s,sum,f	all
Animal matter	meat	s,f	all

[a] s=spring, sum=summer, f=fall
[b] 1=North Fork Flathead River (Mace and Jonkel In Press, McLellan 1982)
2=South Fork Flathead River (Mace and Jonkel In press)
3=East Front (Aune and Stivers 1982)
4=Mission Mountains (Servheen 1981)
5=Yellowstone National Park (Knight et al. 1984)
6=Scapegoat Wilderness (Craighead et al. 1982)

Servheen and Klaver 1983, Aune et al. 1984). Grizzly bears generally den from mid October to late November and leave the den in April or May of the following year. Grizzlies generally remain in the vicinity of the den for at least 1 week before seeking spring foods at lower elevations.

Research has shown that reproductive status and sex play a role in the time of den emergence (Craighead and Craighead 1972, Vroom et al. 1980). However, considerable variation among individuals occurs in all areas.

Data on the denning ecology of grizzlies in 2 areas of Montana are presented in Table 11. Of particular interest from a management perspective are the approximate dates when barren females, and those with young, leave the denning area in the spring. Information from the RMEF (Aune et al. 1984) and from the Mission Mountains (Servheen and Klaver 1983) show that females with young leave the denning area at less predictable times than other age or sex classes (Table 12).

Table 11. Information on denning behavior of grizzly bears in the NCDE.

Sex	Age[a]	Reproductive status[b]	Date of movement to den	Date of movement from den
	MISSION MOUNTAINS (Servheen and Klaver 1983):			
F	14	S	11-15	< 3-31
F	15	P	10-14	5-4
F	16	W/Y	11-6	---
F	7	W/Y	10-10	5-4
F	?	W/Y	11-1	---
F	CUB		11-15	4-4
F	1		11-?	---
F	2		11-19	---
F	2		11-?	---
F	9	S	11-17	---
	EASTERN ROCKY MOUNTAIN FRONT (Aune et al. 1984):			
F	10	W/Y	11-18	3-28
F	19	W/Y	11-20	5-13
M	6	S	< 10-6	4-7
F	11	P	11-13	4-28
F	20	P	11-22	5-15
F	3		10-30	4-19
F	7	S	10-28	4-2
M	3		11-?	4-27
F	21	W/Y	11-4	4-13
F	12	W/Y	11-4	3-26
F	?	P	10-25	4-18
F	4	S	11-2	4-21
M	2	S	11-5	4-18
F	10	W/Y	11-19	4-13
F	13	S	10-6	4-23
F	5	W/Y	10-12	4-11
F	2	S	10-12	4-30
F	22	W/Y	10-30	4-18
F	4	W/Y	10-30	5-4
F	9	S	11-3	3-27
M	7	S	11-28	4-9
M	4	S	11-22	4-21
M	SA	S		4-?
F	6	W/Y		4-1
F	24	W/Y		4-30
F	A	S		5-4
F	A	W/Y		4-30
F	SA			< 4-?
M	A	S		4-11
M	SA	S		< 4-?
M	A	S		4-26
M	SA	S		< 4-?

a: SA=Subadult, A=Adult
b: S=solitary, P=pregnant upon den entry-with cubs upon den emergence, W/Y=with young.

Table 12. A summary of spring den departure information[a].

Population segment	Average Date	Range in Date	Standard Deviation
Females with young: (n=17)	20 April	26 March-15 May	15.7
Solitary females (n=7)	18 April	27 March-4 May	13.3
Males (n=8)	16 April	7 April-27 April	8.5
All females (n=24)	19 April	26 March-15 May	14.6

[a]Data from Servheen and Klaver (1983), and Aune et al. (1984)

V. GRIZZLY BEAR POPULATIONS

A. Densities

Estimated ranges of grizzly bear densities (mi^2/bear) in the NCDE for 12 units (Fig. 7) were based on similarity in habitat-use patterns, mortality patterns, home-range size and overlap, levels of human activity and encroachment, pooled expertise from professional biologists, and other factors (Appendix E). These estimates (Table 13) were developed utilizing known minimum densities from five study areas (Table 14, Fig. 7) within and adjacent to the ecosystem and applying them to larger areas. Reynolds and Hechtel (1980) reported that extrapolations of bear densities from areas and habitats of intensive study give the best population estimates. Others (Zunino and Herrero 1972; Martinka 1974; Pearson 1975; Lortie 1978; Miller and Ballard 1982; Tompa 1984; van Drimmelen 1984) estimate population numbers using data extrapolated from intensive study areas. This procedure is widely used for other species (Schemnitz 1980). In areas where direct extrapolation was judged to be inappropriate based on habitat, human impacts, and pooled expertise of other professionals, we applied a lower conservative density. Table 15 compares our estimate of minimum density with those from other populations.

Table 13. Grizzly bear density estimates for the NCDE.

UNIT	AREA ($mi.^2$)	DENSITY ($mi.^2$/bear)			NUMBER	
		Min.[a]	Low	High	Low	High
Glacier National Park	1583	8	8	6	193	264
Red Meadow	215	--	15	10	14	22
Whitefish	831	--	25	18	33	46
St. Mary	211	--	20	10	11	21
Badger-Two Medicine	323	--	20	16	16	20
Swan Front	780	--	30	20	26	39
South Fork	1624	19	15	10	108	160
East Front	1119	22	18	12	62	93
Mission Mountains	1044	56	45	25	23	42
Scapegoat	1903	28	30	18	63	106
	----		--	--	---	---
TOTALS	9633		18	12	549	813
TOTAL (excluding Glacier National Park)	8050		23	15	356	549

[a] These densities are those reported in the literature or from re-evaluated data from research studies (Appendix E).

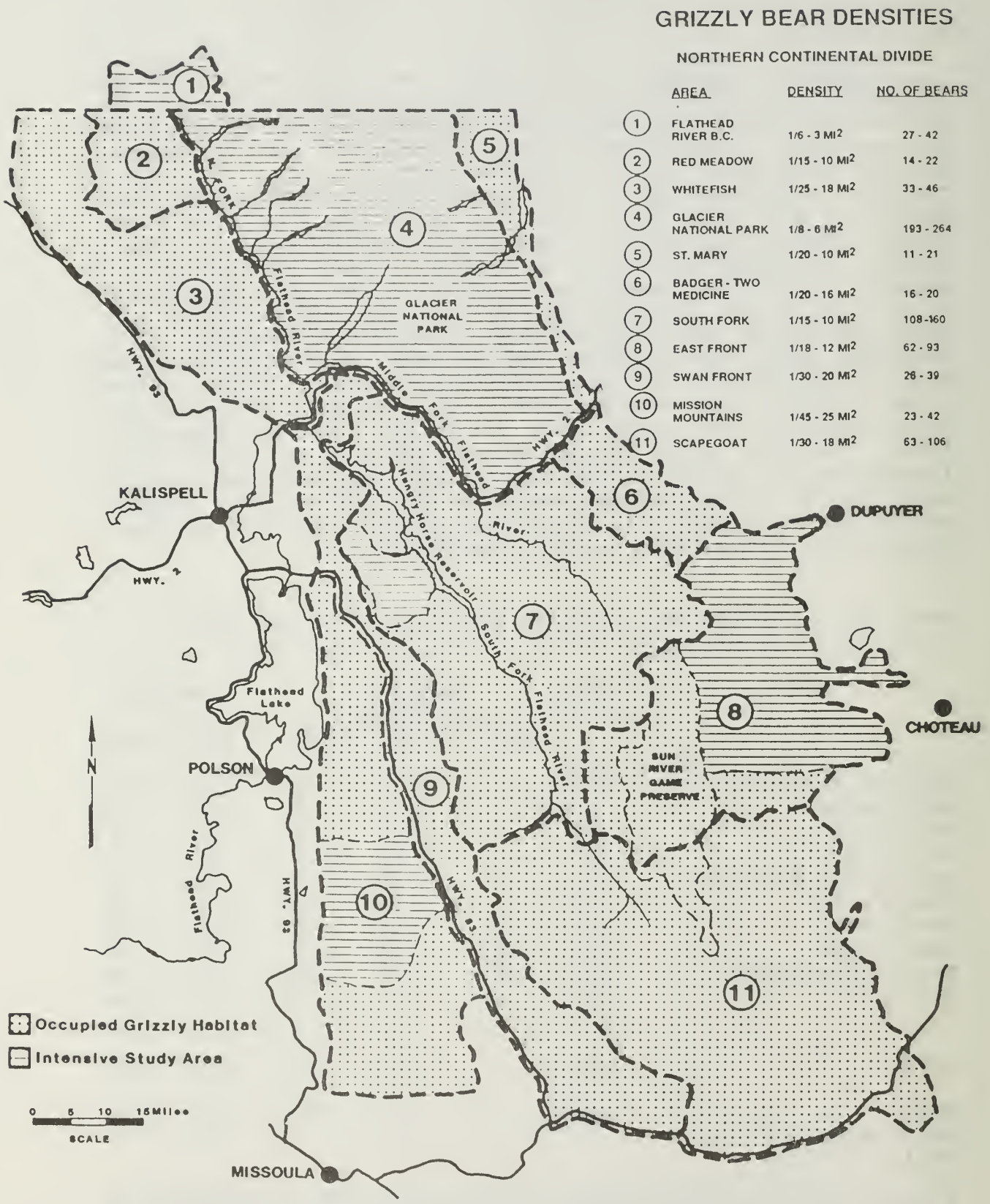


Figure 7. Grizzly bear density estimates in the NCDE.

Table 14. Grizzly bear density estimates from study areas in and adjacent to the NCDE.

UNIT	AREA ($mi.^2$)	DENSITY ($mi.^2$/bear)	NUMBER
Glacier National Park (Martinka 1974)	1583	8	193
Rocky Mtn. East Front (Aune et al. 1984)	689	11.5-22.2	31-60
Mission Mtns. (Servheen 1981)	301	19	16
South Fork (Mace and Jonkel 1980)	128	10	13
Flathead River, British Columbia (McClellan 1984)	163	3.4-6.0	27-42

Kasworm (1985) estimated a density of 1/17 mi^2 for a small study area (Fig. 4) in the Montana portion of the CYE. However, sufficient information is not available to allow extrapolating this density to a larger area.

Comments received on the preliminary draft EIS suggest that the intensive study areas from which density estimates were obtained are not representative of the ecosystem and were pre-selected because of unusually high numbers of grizzly bears. This, however, does not appear to be the case.

The grizzly bear research study on the East Front (Aune 1985) was pre-selected to investigate the impacts of oil and gas exploration. The South Fork of the Flathead study area (Joslin et al. 1977) was pre-selected to investigate grizzly bear-timber harvest relationships. For the Mission Mountains, Servheen (1981) states: "The Mission Mountains in western Montana were chosen for this study because of recurring man-bear habitat conflicts in low elevation areas on both sides of the range, and increasing forest management activities affecting habitat quality and availability."

Martinka (1974) used a representative study area in Glacier National Park to extrapolate to the remainder of the Park. McLellan's (1984) study area in British Columbia was pre-selected to complement Border Grizzly Project studies in the adjacent United States.

Table 15. Summary of grizzly bear population densities in North America, Europe, and USSR.

DENSITY (mi^2/bear)	LOCATION	REFERENCE
11.5-22.2	Rocky Mtn. East Front (MT)	Aune et al. (1984)
19.0	Mission Mountains (MT)	Servheen (1981)
3.9-6.0	Flathead River (BC)	McClellan (1984)
8.2	Glacier National Park (MT)	Martinka (1974)
7.0-11.0	Glacier National Park (BC)	Mundy and Flook (1973)
31.0-58.0	Yellowstone National Park	Craighead et al. (1974)
33.0-39.2	Jasper Natl. Park (Alberta)	Russell et al. (1979)
30.5-46.5	Banff Natl. Park (Alberta)	Vroom (1974)
40.2-53.7	Swan Hills (Alberta)	Nagy and Russell (1978)
8.8-10.5	Southwest Yukon	Pearson (1975)
18.5	Northern Yukon	Pearson (1976)
9.3-14.7	Mt. McKinley Natl. Park	Dean (1976)
0.6	Kodiak Island, Alaska	Troyer and Hensel (1964)
16.6	Western Brooks Range (AK)	Reynolds and Hechtel (1980)
57.0	Eastern Brooks Range (AK)	Curatolo and Moore (1975)
110.0	Central Brooks Range (AK)	Crook (1972)
39.0	Southern Norway	Elgmork (1978)
2.0	Abruzzo Natl. Park (Italy)	Zunino and Herrero (1972)
3.9	Northeast Siberia (USSR)	Kistchinski (1972)
6.4	Kamchatka Peninsula (USSR)	Ostroumov (1968)

There is no doubt that researchers in each area attempted to maximize capture success within each predetermined area. This was usually accomplished by placing snares in the highest quality habitat within the study area.

If these study areas had been selected based on high grizzly bear density, such a procedure would lend credibility to research and management's ability to make correct judgements on relative density and habitat quality in the absence of intensive research. If not, they may be considered representative of the NCDE.

B. Density Estimation

1. Literature Review

A review of 15 grizzly/brown bear density estimation procedures revealed that basically six methods have been used with some modifications to a few. Two studies (Zuinino and Herrero 1972, Elgmork 1978) have calculated densities based on a predefined study area and a population estimate derived from signs of bear presence. Two other studies (Dean 1976, Martinka 1974) employed a method which again involved use of a predefined study area and a population estimate based on unduplicated sightings of individual bears and family groups. One study (Troyer and Hensel 1964) used a census of bears employing the Schnabel technique (marked to unmarked animals) to estimate population size in a predefined study area. Miller and Ballard (1982) employed the Peterson Index (mark recapture) for a predefined search area (study area) following an experimental bear removal project. They adjusted the population estimate to reflect unequal capture probability of females with cubs and an unrepresentative sample of cubs. They did not employ the boundary strip (Otis et al. 1978) assuming instead that for each bear captured with a portion of its range outside the study area there was a bear not captured outside the study area with a portion of its range within the area.

Five of the 15 studies reviewed (Russell et al. 1979; Pearson 1975, 1976; Curatolo and Moore 1975, and Servheen 1981) employed a technique using a predefined study area and a population estimate for the area including only marked and identifiable unmarked bears. Pearson (1976) differed from this only in that he used a known number of females and an assumed sex ratio of 50:50 to estimate the number of males. Reynolds and Hechtel (1980) used the same technique as these previous 5 studies with a modification. They subtracted from their population estimate the number of bears equal to the number of average home ranges derived from the portions of bear's home ranges that were outside the study area. One study (McLellan 1984) used only marked bears to determine population size for an area defined by the core area used by the marked bears. Only two of the 15 studies (Aune et al. 1984, Mace and Jonkel 1980) employed the technique of using

the composite home range of marked bears and a population based on marked and identifiable unmarked bears.

In summary, only 2 (Troyer and Hensel 1964, Miller and Ballard 1982) of 15 studies employed formal estimation techniques and both studies were in high density areas. Four studies (Martinka 1974, Dean 1976, Elgmork 1978, Zuinino and Herrero 1972) employed population estimates based simply on either sign of bear presence or unduplicated sightings. Only one study (McLellan 1984) used only marked bears to determine population size. Ten (Aune et al. 1984; Mace and Jonkel 1980; Curatolo and Moore 1975; Servheen 1981; Reynolds and Hechtel 1980; Miller and Ballard 1982; Russell et al. 1979; Pearson 1975, 1976; Troyer and Hensel 1964) of the 15 studies used marked and identifiable unmarked bears to determine population size. In 80% (12 of 15) of the studies researchers used a study area defined at the initiation of the study.

2. Systematic Estimation Techniques

Commentary received on the preliminary draft of this EIS suggested that alternative density estimation techniques were more applicable. These suggested techniques have generally not been applied by bear researchers because they apply to closed populations (Caughley 1977, Otis et al. 1978), DeMaster et al. 1980, Furnell and Schweinsburg 1984, Seber 1982). Closed population estimation usually involves the use of the Peterson estimate (mark-recapture) described by the above authors. This technique yields an accurate result only when the following four assumptions are met (Caughley 1977, p. 142): 1) the probability of capturing an individual is the same for all individuals in the population, 2) no animal is born or immigrates to the study area between marking and recapturing, 3) marked and unmarked individuals die or leave the area at the same rate, and 4) no marks are lost. Another underlying assumption of this technique is that trapping and observation are done in a systematic or random manner.

Otis et al. (1978) reported that if recruitment and mortality occur during a study, the population estimate will be too high, and that any violation of the closure assumption biases the estimators they present. They further reported that estimators are significantly biased if the equal capture probability assumption is violated.

DeMaster et al. 1980 reported that the estimation technique they described and used (also used by Furnell and Schweinsburg [1984]), results in imprecise estimates with sample sizes of less than 50, but is more precise with sample sizes above 150, given a proportion of marked animals in the population of between 0.1 and 0.2.

Techniques described by Caughley (1977), Otis et al.

(1978) and Seber (1982) also require adding a boundary strip of 1/2 the average home range diameter to the area used by the estimated number of animals in a study area. This reduces the density estimate in an attempt to account for areas used by animals that are beyond study area boundaries. This technique also requires two assumptions: 1) the population has constant density, and 2) the range of movement is not too variable so that the average home range diameter is constant over the population area. Seber (1982) states, however, that "any marked departures from [these two assumptions] will lead to wide fluctuations in the estimates of [density and average home range diameter]".

Strandgaard (1967) suggested that to use the Peterson estimate for roe deer (Capreolus capreolus) it is necessary to capture and mark at least 67% of a population to be sure that the sample is representative of the population. Begon (1983) in a review of the uses of mathematical techniques in ecology, stated "It seems clear, therefore, that mathematical sophistication does not, in itself, guarantee the practical utility of an ecological technique." He further indicated that the problems of population estimation using mathematical techniques will only be solved by "(a) studies that are so soundly based on an understanding of the study animal's biology that the assumptions are only marginally violated; (b) methods that are designed by statisticians to be robust in the face of violations which prove to be unavoidable; and (c) ecologists who are aware of the problem. Such sentiments are surely not applicable only to capture-recapture techniques."

It has also been suggested in commentary on the preliminary draft of this EIS that statistical confidence intervals be calculated for our NCDE population estimate as well as for the five study areas. However, to place such intervals on the estimates also requires that several assumptions be met. Caughley (1977 p. 33) states: "Many books on sampling warn that the estimate of confidence limits from sampled counts is valid only when samples are taken at random. And so it is, within the restricted definition of "valid" favored by statisticians. A statistical conclusion is valid only when the data on which it is based were collected according to the axioms underlying the appropriate statistical model. Axioms such as the normal distribution of variables, independence of observations and randomness of sampling underly most statistical tests, and on most occasions that these tests are used the axioms are violated, sometimes slightly, sometimes grievously."

Of the five intensive studies within or adjacent to the NCDE, none employed a systematic or random population estimating procedure. In developing the population estimate for the entire NCDE, we applied densities to nine units based on density estimates from the five intensive study areas and judgement of the factors discussed in Appendix E.

Therefore, it would be inappropriate and is not possible to derive statistical confidence limits for this estimate.

Methods used by the original researchers from the five study areas within or adjacent to the NCDE, although not systematic, do require some assumptions: 1) if only marked bears are used then every bear has been marked, 2) all areas used by marked bears are accounted for, 3) if observed unmarked bears are included then all bears have been marked or observed, and 4) all unmarked bears stayed within areas used by marked bears. As most assumptions for the systematic techniques discussed above can not be met for grizzly bears, neither are the above assumptions realistic. Certainly not all bears in an area are marked or observed. Caughley (1977, p. 25) states that "Even highly skilled observers usually underestimate [absolute density]". Census efficiency for an ideal research opportunity in Yellowstone National Park was only 77%; (Craighead et al. 1974). McCullough's (1981) reevaluation of this data indicated only a 56% efficiency. In very open habitat on the North Slope of Alaska it has been suggested that only 80-95% of some grizzly bear populations have been accounted for (Reynolds and Hechtel 1980, Curatolo and Moore 1975). Data from Montana, Alaska, and Canada suggest that density increases as the duration of a study increases (McLellan, pers. comm.; Aune, pers. comm.; Mace, pers. comm, Reynolds and Hechtel 1980, Curatolo and Moore 1975, Russell et al. 1979).

It is evident (see Literature Review above) that there are techniques available which allow population estimation without requiring assumptions that are difficult or unattainable for grizzly bears. Most grizzly bear studies have had density estimates developed under this realization (Table 15, and Literature Review above).

3. Study Areas Re-analyzed

Several commentors have suggested that the density estimates for the five intensive study areas discussed earlier were derived inappropriately because they followed techniques such as those discussed under Literature Review. Although these methods have merit and are applicable in many situations, in consideration of comments on our preliminary draft we chose to reevaluate the densities from the five study areas to make them consistent.

To obtain minimum densities for these study areas we used only marked (i.e. radio-collared) animals and their composite home range derived from radio locations. A second density estimate (Method 2) was derived using the above method and adding identifiable but unmarked animals. The third technique (Method 3) we used was the same as the second with the addition of a boundary strip to the bears' composite home range (Table 16). It should be noted that the composite home range developed from data for the East

Table 16. Re-evaluated density estimates for 3 study areas in the NCDE.

Study Area	No. of marked bears	No. of unmarked identifiable bears	Composite home range (mi^2)	Minimum[a] density (mi^2/bear)	Method 2[b] (mi^2/bear)	Method 3[c] (mi^2/bear)
Missions (Servheen 1981)	8	7	451	56	30	53
South Fork (Mace & Jonkel 1980)	7	6	134	19	10	19
East Front (Aune 1985)	26	32[d]	567	22	18	61

[a]Composite home range/marked bears.
[b]Composite home range/marked and unmarked bears.
[c]Composite home range and strip/marked and unmarked bears.
[d] Includes marked and unmarked bears.

Front was modified slightly to reflect Aune's (pers. comm.) knowledge of the area and excluded habitat known to be uninhabitable by grizzlies (Fig. 8). The composite home range for the South Fork (Fig. 9) was not modified because it did not include areas uninhabitable by grizzly bears. The composite home range for the Missions (Fig. 10) excluded the home range of a male (also excluded from Table 16) which moved to the East Front. For all study areas, the boundary strip added under Method 3 excluded unoccupied habitat known not to be available to marked bears.

Estimates from 2 of the 5 study areas were not re-evaluated. Martinka's (1974) estimate was derived from unduplicated sightings of unmarked animals and was not possible to reevaluate. McLellan's (1984) data were not available to reevaluate, but were known to include only marked bears and their core area of use.

Density estimates (D=N/A; where D=density, N=number of animals, A=area) always include some level of judgement on N or A or both. In deriving the densities for the NCDE we have attempted to keep these judgements both conservative and reasonable. In accomplishing this we utilized the pooled expertise of professional biologists from three separate reviews, comments from the public (both written and from public meetings), and input from special interest groups.

Because confidence intervals can not be calculated for the study area or NCDE density estimates, the minimum density for each study area (Table 16 and Appendix E) is presented to provide for public evaluation of the Department's judgements. These judgements were consistent from each study area to the surrounding density unit.

C. Reproduction

Grizzly bear litter size has been determined for five study areas within the NCDE (Aune et al. 1985; Jonkel, pers. comm.; Martinka 1974; McClellan 1984; Bureau of Indian Affairs). Table 17 provides a comparison of this information with that from other populations in North America. Reproductive potential from the NCDE is more favorable than for those in less productive habitats with limited food sources (Pearson 1975, 1976; Reynolds 1976; Miller et al. 1982). However, more information on reproduction would be desirable for the NCDE.

The potential for compensatory reproduction has been observed by Reynolds and Hechtel (1980). They reported that three of five females that lost their cubs were observed during the breeding season and judged to be in estrous. Craighead et al. (1976) reported that maximum reproductive rates for grizzlies in Yellowstone were a result of compensatory reproduction.

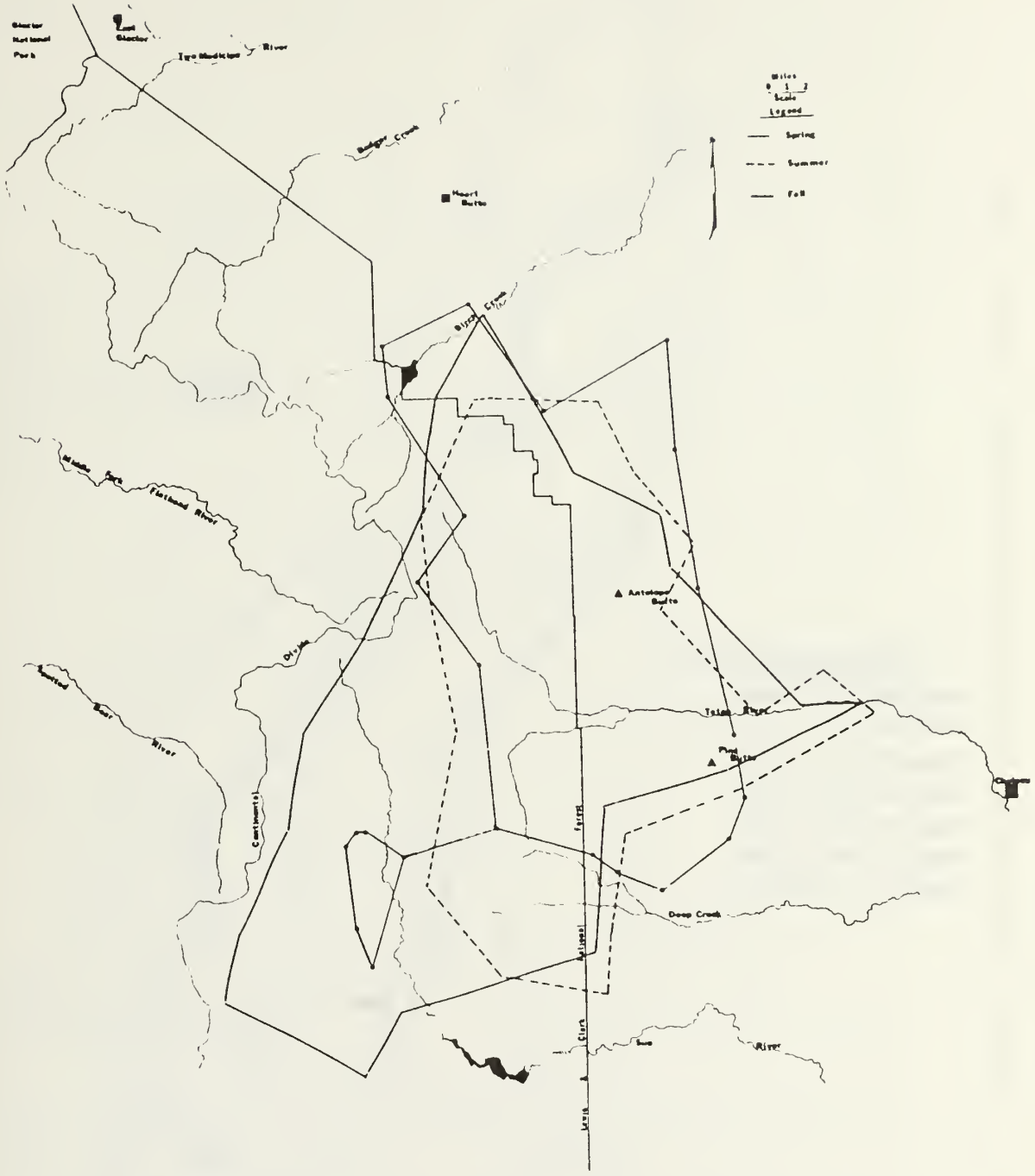


Figure 8. Composite home range map from the Rocky Mountain East Front (Aune et al. 1983).

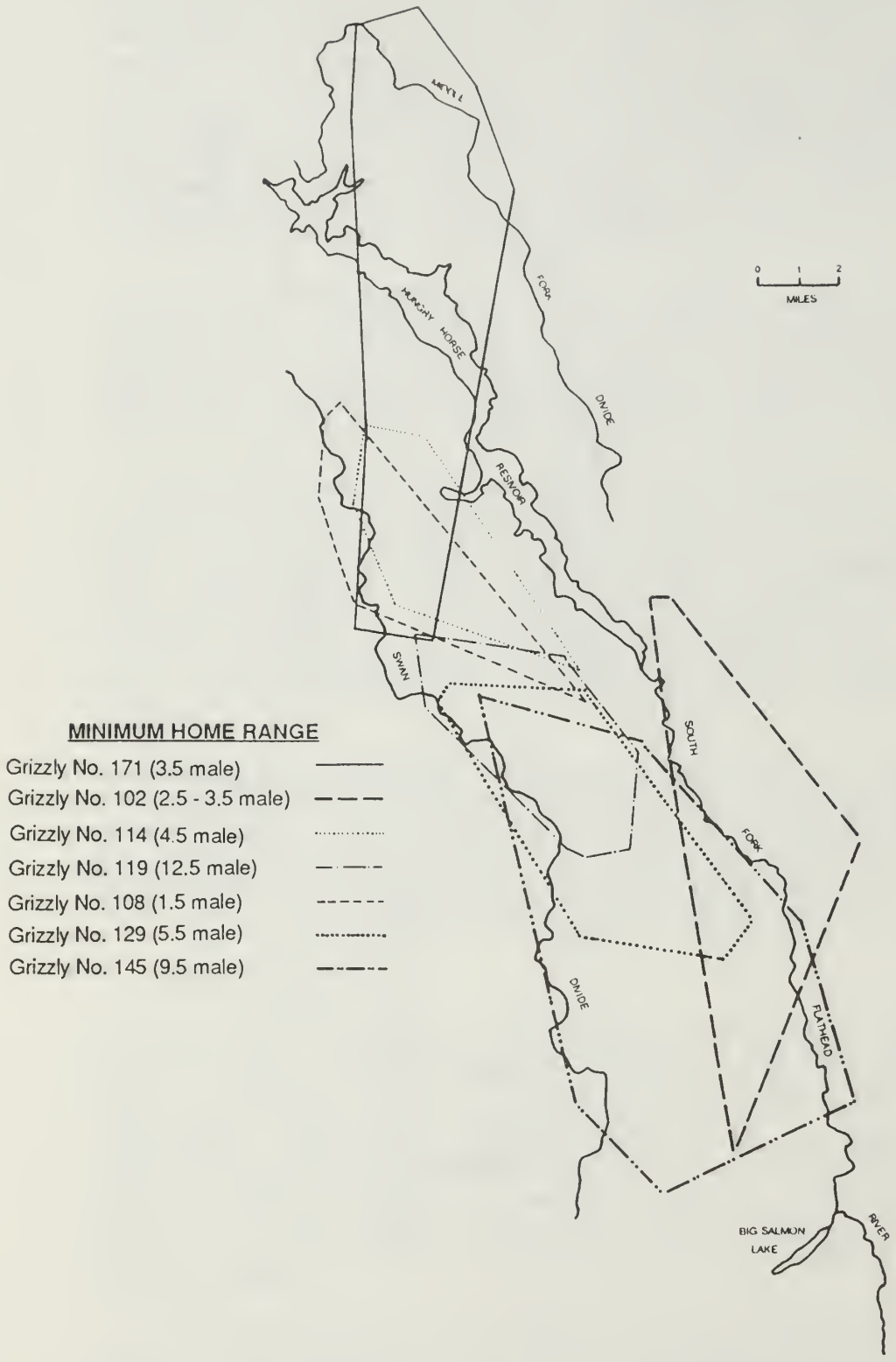


Figure 9. Composite home range map from the South Fork of the Flathead River (Mace and Jonkel 1979).

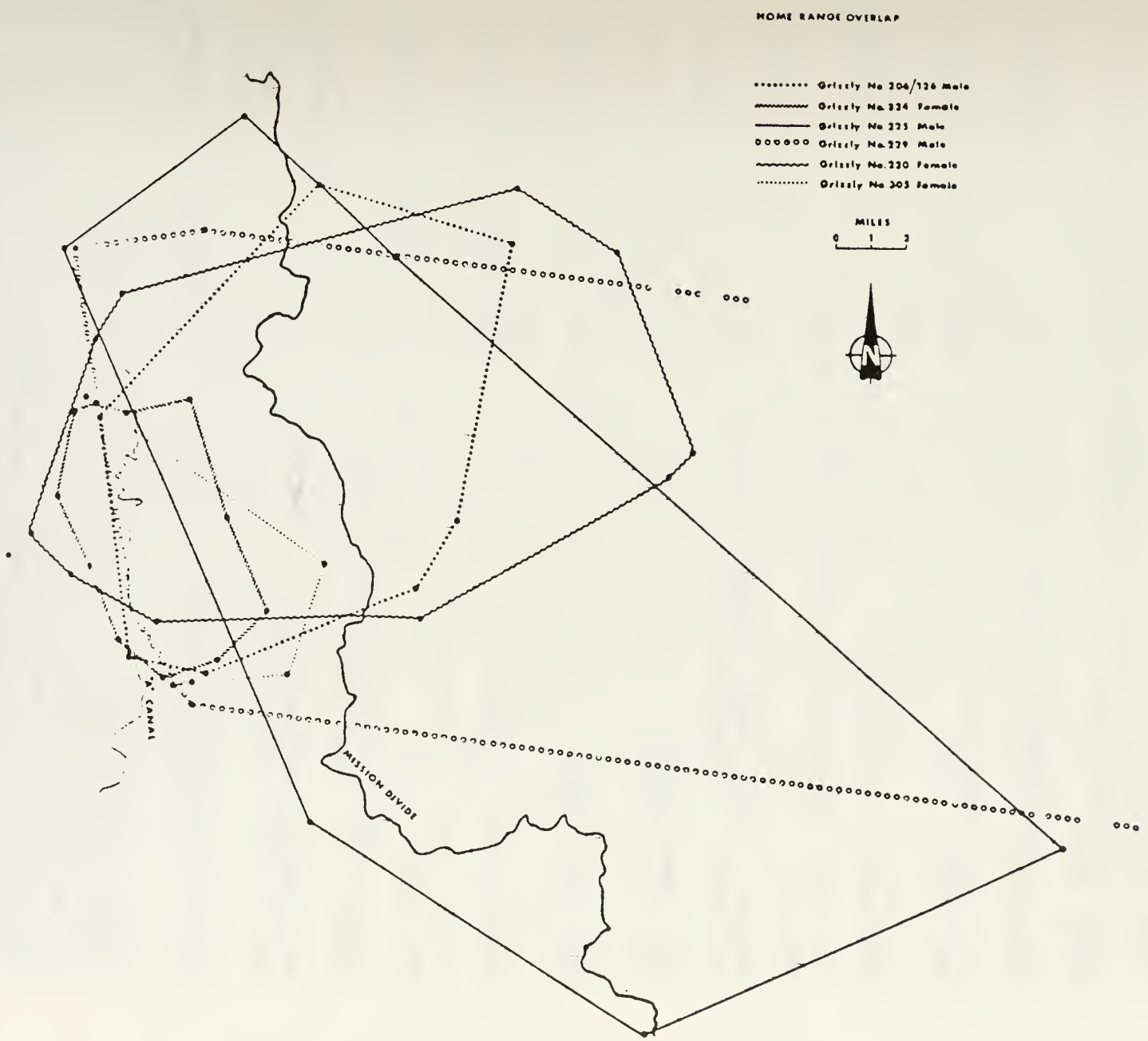


Figure 10. Composite home range map from the Mission Mountains (Servheen 1981).

Table 17. Reproductive characteristics of North American grizzly bear populations.

Location and Source	Mean litter size of cubs	Mean age at first litter	Litter frequency (years)
Rocky Mtn. East Front (MT)[1] (Aune 1985)	2.16	5.5	2.1
North Fork Flathead[1,4] River (MT)	2.66	5.0	
Mission Mtns. (MT)[1,5]	2.12	5.5	3.3
Flathead River, B.C.[1] (McClellan 1984)	2.5	5.5[a]	3.1
Kodiak Island, Alaska[1] (Hensel et al. 1969)	2.23	4-5	3+
Eastern Brooks Range, Alaska[1] (Reynolds 1976)	1.77	9.9	3+
Western Brooks Range, Alaska[1] (Reynolds and Hechtel 1980)	2.03	8.4	4+
Southwest Yukon[1] (Pearson 1975)	1.6	7.8	3+
Northern Yukon[1] (Pearson 1976)	1.4-1.8	7.5	4
MacKenzie Mountains, NWT[1] (Miller et al. 1982)	1.83	8[a]	3.8
Glacier Natl. Park (MT)[2,3] (Martinka 1974)	1.7		
Glacier Natl. Park (Canada)[2,3] (Mundy and Flook 1973)	2.0	5+	2.8
Yellowstone National Park[2] (Craighead et al. 1974)	2.24	5.8	3.4
Yellowstone National Park[2] (Knight and Eberhardt 1985)	1.9	6.2	3.0
McNeil River, Alaska[2] (Glenn et al. 1976)	2.5	6	3.6

[1]Hunted population
[2]Unhunted population
[3]Missing data is not available
[4]Jonkel, personal communication, University of Montana.
[5]Flathead Indian Reservation, Bureau of Indian Affairs files
[a]Earliest age observed

D. Age Structure

Few age composition data are available for grizzlies in the NCDE. Data from the RMEF (Aune et al. 1984) can be compared with other populations in North America (Table 18).

Table 18. Age structures of North American grizzly bear populations.

Location and Reference	Percent of Population					
	Cubs	Yearlings	Total	Subadults	Adults	Total
Rocky Mtn. Fast Front (MT) (Aune 1985)	23.1	18.2	41.3	25.2	33.6	58.8
Flathead River, BC (McClellan 1984)	15.1	17.9	33.0	23.6	43.4	67.0
Glacier Natl. Park (MT) (Martinka 1974)	17.0	15.0	32.0	---	---	68.0
Yellowstone National Park (Craighead et al. 1974)	16.5	12.2	28.7	24.0	47.3	71.3
Kodiak Island, Alaska (Troyer and Hensel 1964)	25.8	22.1	47.9	27.0	25.1	52.1
Eastern Brooks Range, Alaska (Reynolds 1976)	7.9	10.9	18.8	15.9	65.3	81.2
Western Brooks Range, Alaska (Reynolds and Hechtel 1980)	13.0	10.7	23.7	24.4	51.9	76.3
McNeil River, Alaska (Glenn et al. 1976)	15.0	9.3	24.3	13.5	62.1	75.6
Southwest Yukon (Pearson 1975)	7.3	17.1	24.4	31.7	43.7	75.4
Northern Yukon (Pearson 1976)	2	9	11	20	69	89
MacKenzie Mountains, NWT (Miller et al. 1982)	14.3	10.4	24.7	24.2	51.1	75.3

Low productivity in the southwestern Yukon accounts for the low proportion of young observed (Pearson 1975). Pearson (1975) considered this a result of energy-poor habitat, but speculated it might also typify a stable population with low mortality and recruitment. In the northern Yukon, Pearson (1976) indicated the low proportion of young was due to high mortality in these age classes.

The low percentage of cubs reported by Reynolds and Hechtel (1980) was also due to high mortality. Data from Miller et al. (1982) is from a population they consider to be over-harvested. McLellan's (1984) reported age structure is similar to Aune et al. (1984) and is from an area exhibiting an increase in grizzly bear numbers. Troyer and Hensel's (1964) data are also from a population exhibiting high productivity.

E. Mortality

Mortality rates by age class are not available for grizzly bears in the NCDE. However, of the mortality that has occurred, Aune et al. (1984) reports that 62.5% have been subadults and 37.5% adults, with an average of less than 1 female dying per year since 1977. Nonhunting mortality accounted for more than 50% of the total (Aune et al. 1984). The high subadult mortality may be due to subadult dispersal from an expanding population (Aune, pers. comm., Montana Dept. Fish, Wildlife & Parks, Choteau). Martinka (1982) reported average annual losses of 3.5% to 5% for a region encompassing most of the NCDE, a rate indicated in the literature as an acceptable level (Cowan 1972; Reynolds 1976; Lortie 1978; British Columbia Fish and Wildlife Branch 1979; Sidorowicz and Gilbert 1981; Tompa 1984, van Drimmelen 1984). Martinka (1974) had no data on mortality rates within Glacier National Park, but stated that mortalities outside the park had little effect on the population within the park. Craighead et al. (1974) reported an average annual known mortality of 8.3% in Yellowstone National Park, with 41%, 41% and 18% of the annual mortality occurring in adults, subadults and unknown age bears, respectively. Mortality rates by age class from the literature (Craighead et al. 1974; Miller et al. 1982; Mclellan 1984; Bunnell and Tait 1985) are reported in Table 19. Kasworm (1985) reported an average of 1.8 grizzly mortalities per year from 1950-1978 in the CYE.

Natural mortality is difficult to determine for grizzly bears but is considered low. The difficulty in determining this type of mortality comes from the fact that most of it probably occurs in cubs and, in other age classes from bears dying in their dens. These sources of natural mortality are difficult to determine, at best, without the bears being radio-collared. Therefore, we are not able to present any data on natural mortality in this EIS.

F. Population Regulation

The fact that grizzly bears have been exterminated from major portions of their original range suggests that human intolerance is the ultimate factor limiting grizzly populations. Natural grizzly bear population regulating mecha-

nisms are not well understood. However, habitat, as it affects productivity, is probably the ultimate natural factor controlling most bear populations. It has been suggested that productivity of bears is density-independent and that population regulation is largely a result of nutritional condition (Runnell and Tait 1981). Runnell and Tait (1981) support this argument with evidence from Rogers (1976) and Stirling et al. (1976) showing that female black and grizzly bears not gaining sufficient weight prior to denning do not produce cubs. Others offering evidence for bear productivity being density-independent and nutritionally based are Beecham (1980) and Hugie (In Press) for black bears, and Reynolds and Hechtel (1980) and Sidorowicz and Gilbert (1981) for grizzlies. Jonkel and Cowan (1971) reported that black bear reproduction approached zero in years when huckleberries (Vaccinium spp.) were scarce.

Table 19. Mortality rate (%) in each age class for several grizzly bear populations in North America.

Location and Source	Cubs	Yearlings	Subadults	Adults
Yellowstone National Park (Craighead et al. 1974)	30.3	21.7	23.4	10.1
Flathead River, BC (McClellan 1984)	22	16	8	5
MacKenzie Mountains, NWT (Miller et al. 1982)	27.0		24.5	13.1
Estimated for grizzly/brown bears (Runnell and Tait 1985)	30-40		15-35	16.8[a], 23.0[b]

[a]Subadult and adult female mortality combined.
[b]Subadult and adult male mortality combined.

Social intolerance resulting in subadult dispersal is one of the proximal mechanisms controlling both black and grizzly bear populations (Stokes 1970, Kemp 1972, Martinka 1976, Beecham 1980, Young and Ruff 1982), and probably bears in general (Runnell and Tait 1981). Beecham (1983) suggested that "reservoir" areas where black bears are not heavily hunted may be important in supplying immigrants to heavily hunted areas. Similarly, Pearson (1975) noted emigration of grizzly bears from the Kluane Game Sanctuary into an adjacent hunted population in the Yukon. However, Knight and Eberhardt (1985) reported the direction of subadult dispersal to be essentially random.

Martinka (1982) suggested that the Glacier National Park grizzly population may offset regional mortality through dispersal of grizzlies to habitats outside the park. Cowan (1972) had previously suggested that Glacier National Park was subsidizing the harvest outside the park. If this were the case, subadults should comprise a larger proportion of the mortality adjacent to the park. Such a finding has been reported by Pullianen (In Press) who noted that expansion of brown bears from Russia into Finland was accompanied by a large percentage of subadults in the harvest. However, mortality data from 1970 - 1984 in the NCDE show no significant (X^2=5.046, P=0.17) difference in age structure of the mortality ecosystem-wide as compared to within 10 miles of the park (Table 20). Mortality data analyzed in this way do not indicate extensive dispersal of subadults from the Park.

Table 20. Composition of total mortality[a] in the entire NCDE and within 10 miles of Glacier National Park, 1970-1984.

	Cubs and Yearlings	2-year-olds	Subadults	Adults
NCDE	22 (8.4)	26 (10.0)	82 (31.4)	131 (50.2)
Within 10 miles of Glacier Natl. Park, MT	14 (16.7)	8 (9.5)	21 (25.0)	41 (48.8)

[a]Mortalities for which the specific location was known (345 of 414 total).
[b]Number in parentheses is percentage of total mortality.

Mortality caused by adult male grizzlies has been documented and suggested as a possible population-regulating mechanism in grizzly bears (Egbert and Luque 1975; Glenn et al. 1976; Egbert and Stokes 1976; Pearson 1976; Craighead et al. 1976; Reynolds and Hechtel 1980; Stringham 1983). Young and Ruff (1982) observed a doubling of an unhunted black bear population (from 80 to 175) following removal of 23 adult males. They attributed the increase to improved subadult survival and ingress. Mortality caused by adult male grizzlies has not yet been observed in the NCDE.

G. Population Status

Our current estimate of the minimum population for the NCDE, based on the density estimates discussed earlier, is 549. Excluding Glacier National Park, the number is 356 grizzly bears. The Glacier National Park segment of this population has remained relatively stable at an average of 201 from 1967-1981 (Martinka 1982). Martinka (1982) further stated that the population in a region encompassing most of

the NCDE was viable and near the level of 500 proposed by Franklin (1980) as necessary for maintaining genetic variance. Shaffer (1983) reported that the minimum viable population size for the Yellowstone ecosystem was 50-90 grizzly bears.

Although methods used in deriving the population estimates varied, it is possible to compare historical grizzly bear population estimates. Cooney (1941) estimated 112 grizzly bears in a portion of the Flathead and Lewis and Clark national forests. This estimate was based on miles of trail traveled per bear or bear sign observed. Cahalane (1952) reported an estimated 120 grizzly bears in Glacier National Park in 1951. Based on the best information available, Hickie (1952) reported an estimate of 758 grizzly bears in all of Montana. Cooney (1953) reported a 1953 population estimate of 800 in Montana. Marshall (1955) reported an estimate of 700 grizzly bears for the entire state in 1954. He considered the harvest of 39 (5.6%) not to be excessive given the population estimate. Montana listed 439 grizzlies in 1955 in its population exclusive of national parks (Cooney 1956). Cooney (1956) also reported 100 for Glacier National Park. Hamlin and Frisina (1975) reported, based on a survey of professionals and user groups, that the grizzly population in Montana was at least stable and possibly increasing.

Several researchers have pointed out the difficulties of trying to estimate grizzly bear populations (Martinka 1974; Quimby 1974; Pearson 1975; Craighead et al. 1976; Reynolds and Hechtel 1980; Meagher and Phillips 1983). Although this information is valuable and should be obtained where feasible, inventories of grizzly bear populations are not required for management (Reynolds and Hechtel 1980; Archibald 1983; Johnson 1980). Further, to expect that carrying capacity can be determined at present, is unrealistic. Meagher and Phillips (1983) reported that the carrying capacity could not be determined for a population in Yellowstone that had been studied for 24 years.

Comparing historical information with our present estimates indicates the current grizzly bear population status in Montana is as high or higher than that reported 30-40 years ago. It appears that compensatory forces have allowed growth in Montana's grizzly bear populations. Factors which have probably contributed include acquisition of some key habitats, implementation of more conservative control programs, restrictions on hunting, and controls on predator poisoning. This growth has occurred in spite of habitat encroachment.

It should be noted that there are problem areas within the ecosystems. Aune (pers. comm.) indicates that the Badger-Two Medicine area is a high-mortality area. Claar et al. (In Press) stated that the population segment in the

Mission Mountains is declining. These problem areas will need special management attention.

A survey of our Department's biologists and wardens and our state's licensed outfitters was conducted to determine their assessment of the current trend of the grizzly bear population in Montana as well as its distribution. These surveys were designed simply to assess these groups' opinions. It was not meant to represent the state of the art in survey design, nor was it designed to be evaluated statistically. As discussed later in Section G, Trend Monitoring, this technique will be designed to provide for statistical evaluation if it is to be used in the future.

These informal surveys indicated that the distribution and status of grizzly bears in the NCDE is stable to increasing. The results for the CYE indicated the population and distribution are likely stable to decreasing. This supports the contention that a strong recovery effort is necessary for the CYE population.

It is difficult to use age data from hunter harvest to describe population status (Harris 1984a). This difficulty is a result of two possible but opposite interpretations of harvest age data. First, declining mean or median age of harvested bears over time may indicate that either the majority of older age animals have been harvested (i.e. overharvest) leaving mostly young animals to be harvested, or that underharvest has allowed the young age classes to increase. Secondly, increasing age in the harvest may indicate that underharvest is allowing increased survival and an increase in older age classes, or that overharvest has removed the majority of young age classes, leaving only older age classes for harvest (Glenn 1975, Swenson 1985, Bunnell and Tait 1985, Kolenosky In Press). It is important, therefore, that when using harvest age data to interpret population status, it should be considered in conjunction with other population and trend indicators.

Population modeling efforts using mortality data for the NCDE have been conducted by Klaver (pers. comm., Bureau of Indian Affairs, Pablo, MT) and Harris (1984a). Both models were updated using the most current mortality data of Greer (1985). Both Klaver and Harris have aptly demonstrated the problems encountered when using sex and age data from mortality records. They have demonstrated the need for a measure of hunter effort.

Harris (1984a) examined age and sex structure from simulated grizzly populations subjected to various harvest levels. He devised a statistical procedure based on harvest data to test the null hypothesis of overharvest, but concluded that the test was insensitive (power estimated to be less than 50%). When applied to 1970-1981 grizzly bear data from the NCDE, grouped by three-year blocks, the test was unable to reject the null hypothesis of overharvest at the

90% confidence level. However, when applied to 1982-1984 harvest data, the index indicated a 10% or less chance the population (for this time block) was declining (Harris pers. comm., University of Montana, Missoula).

Klaver has modeled the 1970-1984 mortality data for the NCDE using the traditional methods of Gilbert et al. (1978) and a simplified approach to the Fraser et al. (1982) method. This analysis shows that harvest rates have been declining in recent years and that population indices indicate a stable or increasing population (Klaver pers. comm.)

Population trend information is available for three intensive study areas within or adjacent to the NCDE. The portions of the ecosystem in the RMEF (Aune, pers. comm.) and the British Columbia portion of the North Fork of the Flathead River (McLellan 1984) are both stable to increasing. Grizzly bear numbers in the Mission Mountains are reported to be declining (Claar et al. In Press).

A task force appointed by the Interagency Grizzly Bear Committee met in 1984 in an effort to determine population size and trends in the NCDE. Their executive summary stated, "The available population data did not permit the task force to estimate total numbers of bears, to detect any significant trend or even to confirm population stability in the grizzly bear population of the Northern Continental Divide Ecosystem". However, they stated in the same summary, "While we are unable to eliminate the possibility of slow, long-term trends, we found no indication that current management threatens the population in this region" (emphasis added).

Our review of the population and trend information also failed to show any indication of a general decline in the NCDE population (see Population Status). In fact, there are indications that the population is stable or increasing.

Kasworm (1985) stated that there were 15 observations of females with young reported since 1975 in the CYE and that 8 of these have occurred since 1980 (Figure 11). He also developed a density estimate using the composite home range of 2 radio-collared bears and including a differentiation of track measurements which yielded 4 additional grizzlies. However, he indicated that this estimate could not be extrapolated to the entire ecosystem to estimate population size. This information and the results of the informal surveys discussed earlier indicate that the population in the CYE is stable to decreasing.

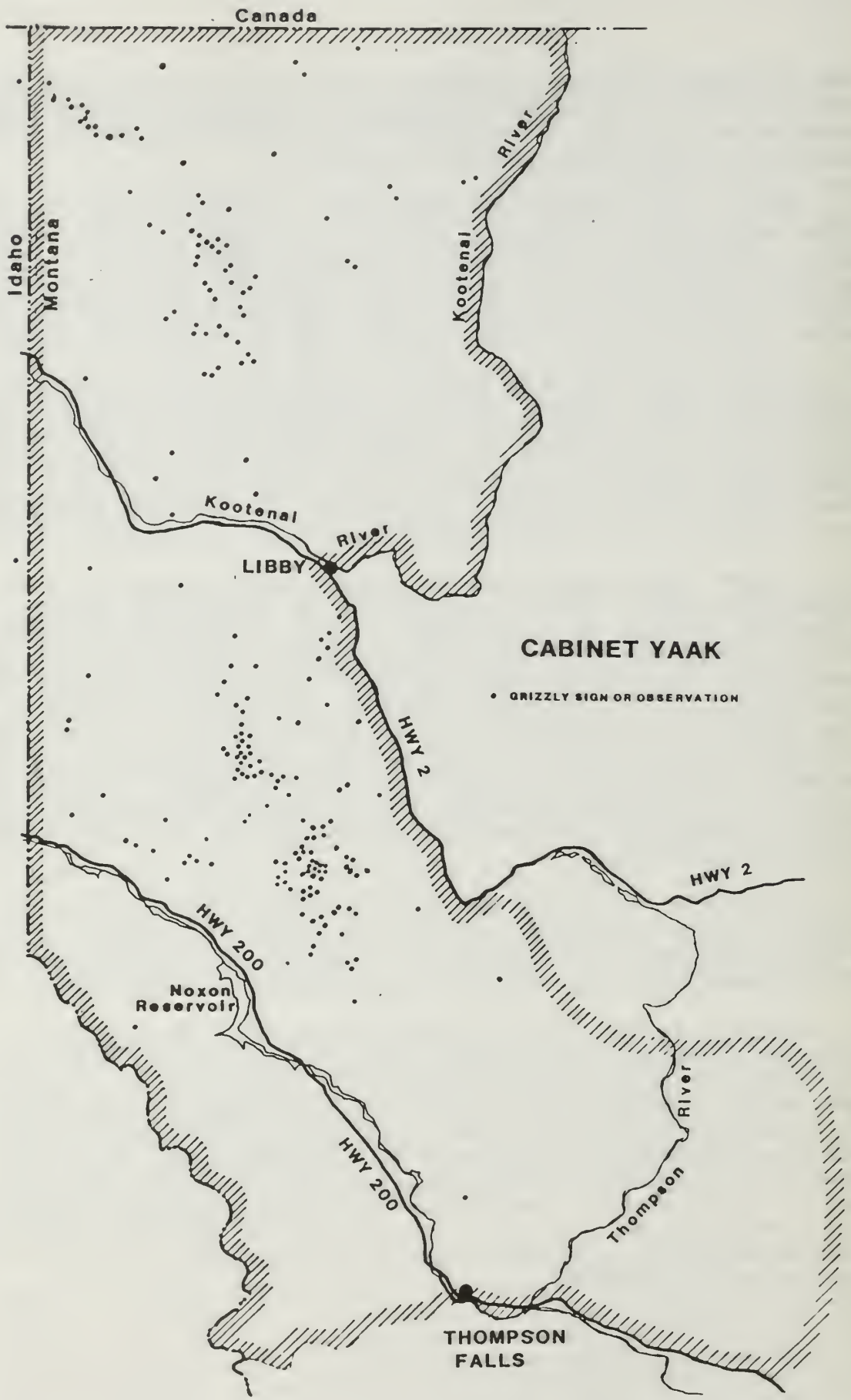


Figure 11. Grizzly bear sightings in the CYE, 1950-1984.

H. Trend Monitoring

To date, no direct method for monitoring grizzly bear population trends has been developed. Several methods have been tested including scent station indices (Ball 1980; Harris 1984b; Knight et al. 1984), surveys of concentration areas (Kendall 1985; Klaver and Claar 1985), scat counts (Roth 1980) and track and sign counts (Stockstad 1954, Marshall 1955, Rognrud 1956). The scent station index has been suggested as being useful for black bears (Lindzey et al. 1977, Carlock et al. 1983). However, this technique has shown limited success for other species to which it is more easily applied (Conner et al. 1983; Linhart and Knowlton 1975; Roughton and Sweeney 1982). Harris (1984b) reported that unrealistically large sample sizes would be required to detect even large differences in this index, especially if its initial value was low. He indicated that sample sizes for grizzly bears would be too small to allow scent-station indices to reflect changes in population abundance. Harris (1984c) discussed trend monitoring techniques for the grizzly bear and concluded that none were adequate for statistical precision. The difficulty, in addition to developing an appropriate direct trend monitoring technique for grizzlies, is that a reasonably accurate population estimate must be developed at the same time with which to compare the trend. To date no studies of this type have been initiated for grizzly bears.

One widely used technique involves no direct research on the bear. This is the survey or interview of professional biologists, foresters, and outfitters, as well as the general public regarding their judgment of grizzly/ brown bear population trends and status (Stockstad 1954; Marshall 1955; Rognrud 1956; Hamlin and Frisina 1975; Dean 1976; Elgmork 1976, 1978; Roth 1972; Layser 1978; Bjarvall 1980; Buchalczyk 1980; Hoak et al. 1983). Upon subsequent review, these surveys have generally been determined to reflect known long-term trends. Clearly, this technique is not adequate by itself to accurately monitor populations. However, in combination with periodic studies of population biology and other survey techniques, it could prove useful.

I. Augmentation or Reintroduction

Population augmentation or reintroduction has been considered, but to date has not been conducted by any agency. Jonkel (1983) and Kasworm (1985) recommend augmentation by reintroduction or cross-fostering of grizzly cubs with black bear sows to speed the recovery of the CYE grizzly bear population.

To document the willingness of states and provinces with current or historic populations of grizzly bears to accept individuals for reintroduction, the Department surveyed

(Appendix F) 21 states' and provinces' wildlife management agencies including Alaska, Arizona, California, Colorado, Idaho, Kansas, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, Alberta, British Columbia, Northwest Territories, Saskatchewan, Yukon. With the exceptions of Alberta and British Columbia, no state or province would or could foresee the possibility of accepting grizzly bears for reintroduction. Alberta and British Columbia will accept grizzlies provided that, first, they pay little or no costs, and second, they be provided with a history on each bear so that they may accept individual bears at their own discretion. Clearly, if the Department wanted to consider supplying surplus or other animals for augmentation programs outside Montana, that option would not be open. Federal law prohibiting augmentation anywhere in the United States (U.S. Public Law 98-473 Section 316) has now been changed. It is likely that augmentation will be possible in the near future.

In the past five years, seven individual grizzly bears have been added to the CYE population from other areas (Appendix D, Kootenai National Forest Plan 1985). These grizzly bears were moved to the CYE after causing nuisances and were not of the proper sex and age classes or behavioral characteristics to be selected for augmentation. Relocation efforts are significantly different in intent than are augmentation efforts.

The Kootenai National Forest has identified and evaluated 5 augmentation alternatives for the CYE (Appendix D, Kootenai National Forest Plan, 1985):

1. No action: continue to manage the native population to achieve recovery on its own within the guidance identified in the proposed action.

2. Augmentation with grizzly bears acceptable under existing relocation agreements; basically a continuation of past relocation efforts as has occurred since 1977.

3. Augmentation with specific bears of a predetermined sex and age placed into specific habitat conditions at the most opportune times. Essentially the type of augmentation practiced with other wildlife species.

4. Augmentation by means of cross-fostering grizzly bear cubs with black bear mothers. This procedure has been successful with raptors and cranes and groundwork has been laid working with black bears.

5. A mix of alternatives 2, 3, and 4 dictated by grizzly bear availability, knowledge of potential surrogate black bear mothers, and the condition and availability of nuisance bears.

This Plan states: "with or without augmentation the identified grizzly habitat on the Kootenai National Forest will be managed according to the guidance contained in the proposed Forest Plan and supporting documents to ensure the opportunity for the existing grizzly bears to prosper".

VI. MANAGEMENT PROGRAM REVIEW

A. Mortality Quota

Montana is the only state in the 48 conterminous states authorized to allow hunting of grizzly bears under the Endangered Species Act. This authority is granted by Chapter 1, Title 50 of the Code of Federal Regulations, Part 17, Paragraph 17.4, effective August 1, 1975 (Appendix D).

The Department, a member of the Interagency Grizzly Bear Committee, is the agency responsible for compiling grizzly bear mortality reports. These data are summarized, analyzed, and prepared in annual reports by the Department. Mortalities from all causes including hunting, control dispatches, transplants, illegal killing of marauding or menacing bears, and bears killed illegally for profit or mistaken identity (for black bears) are reported.

The Code of Federal Regulations established the mortality quota of 25 grizzly bears for northwestern Montana (Fig. 12). At the time these regulations were being amended, the Montana Department of Fish and Game (Woodgerd 1974) felt a conservative mortality quota of 25 was appropriate based on an average annual mortality of 28 (1967 through 1974).

The Department elected to be more conservative in 1983 when it established a female subquota of 9 for the NCDE (6 west of the Continental Divide and 3 east of the divide). These quotas involve the total man-caused grizzly mortality, including illegal kills, accidents, control actions, and hunter harvest. Thus, hunter harvest is adjusted to reflect the other sources of mortality. In addition, quotas are reviewed annually to determine if they need adjustment.

No other state or province which allows grizzly or black bear hunting, operates under a quota. Other management plans use harvest rates (Table 21). Although Bunnell and Tait (1980) suggest that quota systems are an insufficient regulatory device, Pearson (1975) suggested annual quotas were workable and could be changed in response to population status. However, he felt they were inappropriate for the Yukon. Indications are that the population of grizzly bears in the NCDE has been stable to increasing since the early 1970s (see Population Status in Section V). Thus, if the current estimate of the minimum population (356 exclusive of Glacier National Park) was applied in 1974, the 25 quota would represent a total mortality rate of 7.0%, a rate within the range reported in the literature (Table 21).

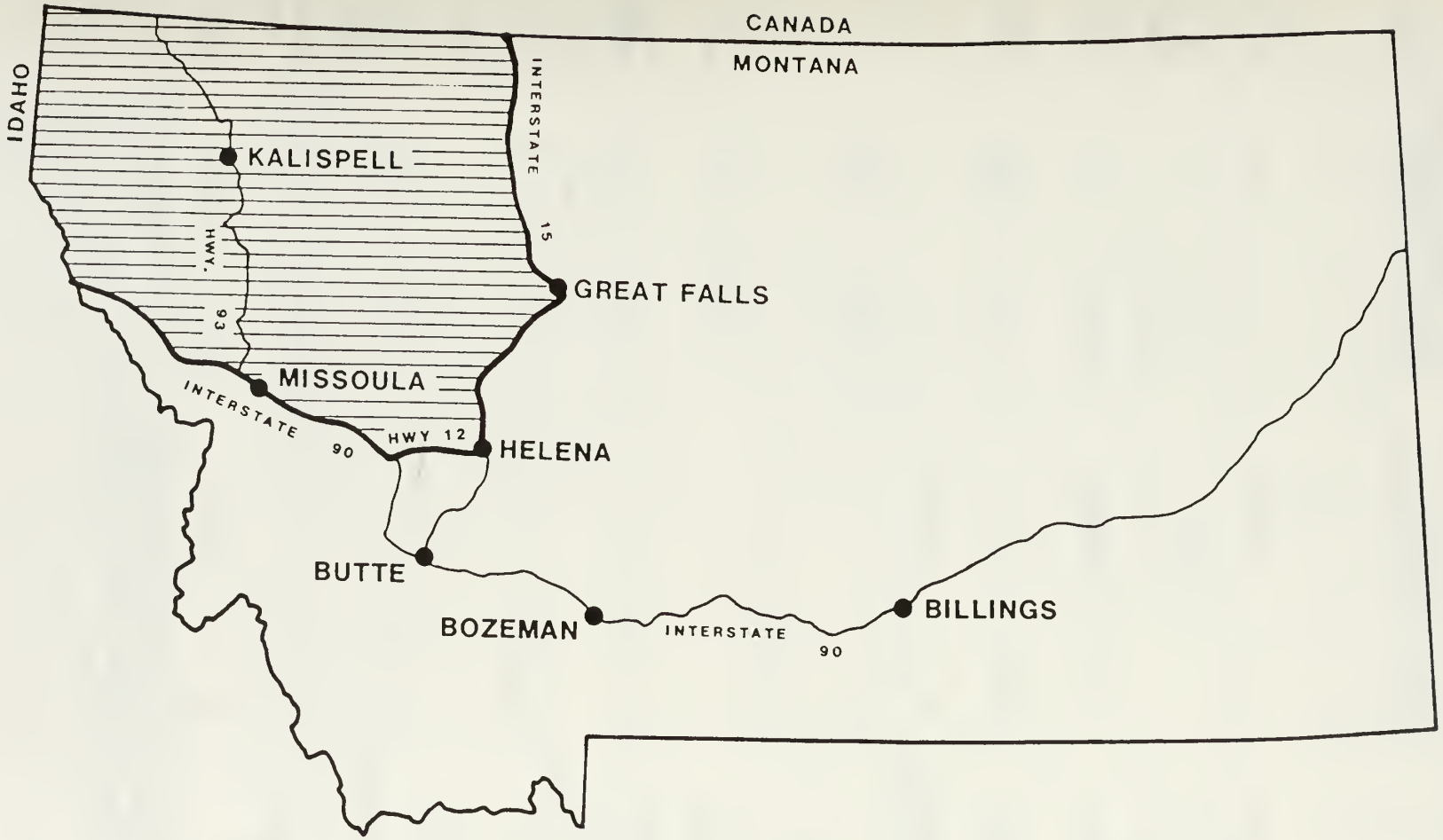


Figure 12. Area in which the annual mortality quota of 25 applies.

Table 21. Recommended and reported grizzly bear mortality rates.

Reference	HUNTER HARVEST		TOTAL MORTALITY		
	Total	Male/Female	Female	Adult	Total
Reynolds (1975)	3%				
B.C. Fish and Wildl. Branch (1979)		60:40			5%[a]
Tompa (1984)			2%[a]		3-5%[a]
van Drimmelen (1984)		65:35	2%[a]		3%[a]
Sidorowicz & Gilbert (1981)	2-3%			4.5%[a]	10.5%[b]
Lortie & McDonald 1977, Lortie 1978	3%	61:39			
B. Smith (pers. comm) Yukon Wildl. Branch)	4%				
Martinka (1974)					17%[b]
Craighead et al. (1974)					8.2%[a] 14.4%[b]
McCullough (1981)				30%[b]	13.2%[b]
Cowan (1972)	5-7%				
Bunnell & Tait (1980)					10.7%[b]
Harris (Unpublished)					6.4-[b] 6.6%
Average annual mortality in the NCDE, 1967-1984	3%	59:41	4.5%[b]	6%[b]	6%[b]

a Rate includes only man caused mortality.
b Rate includes all known causes of mortality.

B. Hunting Seasons

Since 1967, the grizzly hunting season in the NCDE has coincided with deer and elk seasons (approximately mid to late October through late November, except in the wilderness areas where the season opened September 15). Table 22 summarizes the 1984 season dates from other states and provinces. Hunting was discontinued in the CYE in 1974.

Table 22. North American grizzly bear hunting seasons for 1984.

State or Province	Season Dates[a]	Shortest Season	Longest Season
Montana	Sept. 15-Nov. 25	3 weeks/fall	2.5 months/fall
Wyoming[b]	April 1 -June 30 Sept. 1 -Nov. 15	2.5 months/fall	3 months/spring
Alaska	April 1 - June 30 Sept. 1 -Dec. 31 July 1 -June 30	2 weeks/spring	All year
Alberta	April 1 -June 4 Sept. 12-Dec. 1	6 weeks/spring	2.5 months/fall
British Columbia	April 1 -June 15 Sept. 1 -Nov. 18	4 weeks/spring	2.5 months/spring and fall
Northwest Territories	Aug. 15 -Oct. 31	2.5 months/fall	2.5 months/fall
Yukon Territory	May 1 -June 15 Aug. 1 -Oct. 31	6 weeks/spring	3 months/fall

[a]Data represent the range included if all areas and seasons (spring, fall, all year) are considered.
[b]Season dates are for 1974. Grizzly bear season was closed after 1974.

Season dates have a large influence on the sex ratio of bears harvested. Early fall and late spring seasons result in a higher percentage of females in the harvest (Troyer 1961, Pearson 1975, Stirling et al. 1976, Hugie In Press). The composition, by week, of the hunter harvest in the NCDE is presented in Table 23. Analysis of the hunter harvest

Table 23. Summary of weekly hunter harvest of grizzly bears in northwestern Montana, 1967-1984.

Category	Sept. 15-21	Sept. 22-28	Sept./Oct. 29-5	Oct. 6-12	Oct. 13-19	Oct. 20-26	Oct./Nov. 27-2	Nov. 3-9	Nov. 10-16	Nov. 17-23	Nov. 24-30	TOTAL
Adults	13 (12.9)[a]	7 (6.9)	6 (5.9)	7 (6.9)	9 (8.9)	31 (30.7)	13 (12.9)	9 (8.9)	5 (5.0)	2 (2.0)		101 (51.3)[b]
Subadults	8 (12.5)	2 (3.1)	8 (12.5)	4 (6.3)	6 (9.4)	19 (29.7)	9 (14.1)	4 (6.3)	2 (3.1)	1 (1.6)	1 (1.6)	64 (32.5)
2 Year Olds	2 (9.5)	3 (14.3)	7 (33.3)	1 (4.8)	1 (4.8)	3 (14.3)		1 (4.8)		3 (14.3)		21 (10.7)
Cubs-Yearlings	3 (27.3)		3 (27.3)	2 (18.2)		2 (18.2)	1 (9.1)					11 (5.6)
	26 (13.2)	12 (6.1)	24 (12.2)	14 (7.1)	16 (8.1)	55 (27.9)	23 (11.7)	14 (7.1)	7 (3.6)	6 (3.1)	1 (0.5)	197 (100)
Males	16 (11.8)	8 (5.9)	16 (11.8)	8 (5.9)	8 (5.9)	34 (25.0)	23 (16.9)	12 (8.8)	7 (5.1)	4 (2.9)		136 (59)
Females	13 (13.5)	9 (9.4)	10 (10.4)	9 (9.4)	13 (13.5)	23 (24.0)	6 (6.3)	6 (6.3)	3 (3.1)	3 (3.1)	1 (1.0)	96 (41)
Total	29 (12.5)	17 (7.3)	26 (11.2)	17 (7.3)	21 (9.1)	57 (24.6)	29 (12.5)	18 (7.8)	10 (4.3)	7 (3.0)	1 (0.4)	232 (100)

[a]Percent of the harvest from the period of September 15 - November 30, which occurred that week.
[b]Percent of total.

shows a sex ratio of 59% males to 41% females, a ratio similar to those recommended or reported in the literature (Troyer 1961, Pearson 1975, Lortie and McDonald 1977, British Columbia Fish and Wildlife Branch 1979, Johnson 1980, Lindzey and Meslow 1980, Kolenosky In Press). Harvest data for the spring season in the Kootenay region of British Columbia indicated a harvest composition of 67% male and 33% female (DeMarchi pers. comm. British Columbia Fish and Wildlife Branch, Cranbrook). Chi-square analysis indicates that significantly (X^2=5.13, P=0.02) more females are shot before October 20 than after. Troyer (1961) stated that since fall hunting produced a heavier harvest of females and the earliest part of the fall season is the most productive, seasonal restrictions would have the best results by limiting the early fall season. Spring hunting success was higher than that of the fall and produced a higher percentage of males (Troyer 1961). Stirling et al. (1976) based on modeling, suggested fall seasons may be detrimental to grizzly populations due to increased vulnerability of females. However, they didn't indicate season dates. Presumably, they used an early start for the fall season. Pearson (1975) reported a decreasing proportion of females in the total kill as the fall season progressed in the Yukon. He also suggests that opening the fall season after female grizzlies have denned is a management option to reduce female mortality. Reynolds (pers. comm.) stated that fall-only seasons in Alaska were used where harvest sex and age data indicated some caution was necessary.

C. Female Protection

Since 1983 the hunting program in Montana has protected females through a female subquota of 9, and by prohibiting the taking of females accompanied by cubs (since 1947). Restricting the fall season might further reduce female mortality if the season opened on a later date, nearer the time when most females have denned. A spring-only season might also reduce current female mortality if the closing date were earlier than in other states or provinces (Table 22). Further protection might be provided by prohibiting 1) the shooting of females accompanied by any young, or 2) the shooting of any bear in a group. These alternatives will be evaluated later in this EIS (see Regulations in this section).

Current grizzly hunting regulations in other states or provinces do not include female subquotas. All include protection of females with cubs and some extend protection to females with yearlings or any young (Table 24). Some female protection is also provided by season opening and closing dates (Table 22).

Table 24. Summary of protection provided female grizzlies in states and provinces with current or historic grizzly bear hunting seasons[a].

State or Province	Protection for Females			
	None	With Cubs	With Yearlings	With Young
Montana		X		
Wyoming[b]		X		
Alaska		X	X	
Washington[c]	X			
Arizona[d]	X			
Idaho[e]	X			
NWT		X		
Yukon		X	X	X
Alberta		X	X	
British Columbia		X	X	X

[a]Based on correspondence from the indicated states and provinces.
[b]Prior to 1975 - grizzly hunting stopped in 1975.
[c]Prior to 1969 - grizzly hunting stopped in 1969.
[d]After 1929 until last record of a grizzly in 1935.
[e]Prior to 1946 - grizzly hunting stopped in 1946.

D. Closure Authority

The MFGC has the authority to close a hunting season at any time. Since 1975 grizzly bear hunting regulations provided for closure of the season at such time as the total mortality by human causes equalled 25. Beginning in 1983, the season would be closed on 48 hours notice west of the Continental Divide when 6 females have been killed by human causes, and east of the Continental Divide when 3 females have been killed by human causes. Since the quota was initiated in 1975, the season has been closed twice because total or female mortalities were approaching the quotas. In 1975 the season closed two weeks before scheduled because total mortality was approaching the quota. In 1984 the season closed one month before scheduled because female mortality was approaching the quota. Since inception of the quota, it has been recognized as improbable but possible that these quotas could be reached before the hunting seasons opened. In 1983 the scheduled season in hunting district 140 was not held because 4 mortalities due to mistaken identity (grizzlies killed that were mistaken for black bears) occurred prior to the opening. Alaska and the Canadian provinces and territories also have closure authority but not based on a quota system.

E. Other Regulations

Figure 13 shows grizzly bear hunting district boundaries for 1984. These boundaries change with management needs. Since 1967, hunters killing a grizzly have been required to report the kill within 48 hours to an officer of the Department. Then, they are required to present the hide and skull within 10 days to an officer of the Department for purposes of inspection, tagging, and recording the kill. Evidence of sex intact on the carcass or skin was also required. It was also prohibited for any person to remove any portion of a grizzly bear from the Montana without first obtaining a trophy license. Since 1947, the annual limit per grizzly bear licensee has been one grizzly bear of either sex. Taking of cubs, or females with cubs, has also been prohibited since 1947. Cubs were defined as young of the year. Alaska, Alberta, British Columbia, and the Yukon and Northwest territories all have regulations similar to Montana, with variations based on population status.

Montana hunters have been required to purchase specific grizzly bear licenses since 1967. Since 1971, these licenses had to be purchased before August 31. Since the hunting season has not opened prior to September 15, this regulation eliminates the possibility of a hunter killing a grizzly bear and then buying a license. License fees have increased periodically since 1967. These increases usually result in decreased license sales (Fig. 14).

F. Hunter Surveys

Hunter questionnaires have been distributed periodically to grizzly bear licensees to obtain information on hunter occupation, dates hunted, areas hunted, observations of bears, and hunter comments on regulations, seasons, etc. (Greer 1972, 1974a).

G. Trophy License Summary

As stated, all successful grizzly bear hunters must apply for a trophy license. Analysis of these mandatory licenses show that between 1967 and 1984, 96% of the hunters have harvested only one bear, 3.5% have harvested 2 bears, and 0.5% have harvested 3 bears. These results suggest that the grizzly bear harvest is well distributed among hunters and that there is no small core of successful hunters.

H. Season Setting Process

This discussion describes the process used by the MFGC in setting a grizzly bear hunting season. To begin with, recommendations are presented to the Commission at their January meeting in Helena, by the Wildlife Division of the Department. Following discussion and debate a tentative season is set by the Commission at this meeting. Following

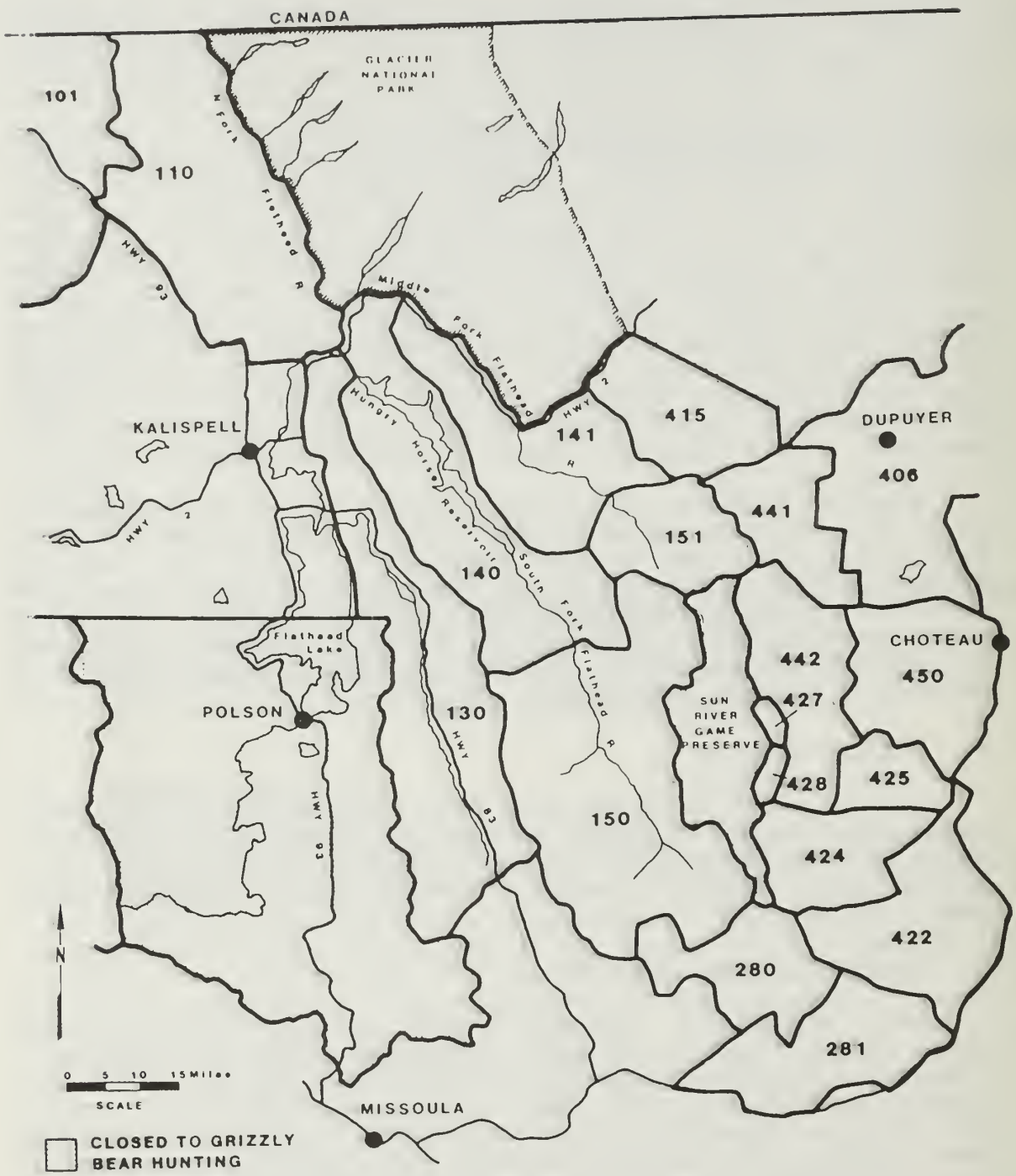


Figure 13. Grizzly bear hunting district boundaries in the NCDE.

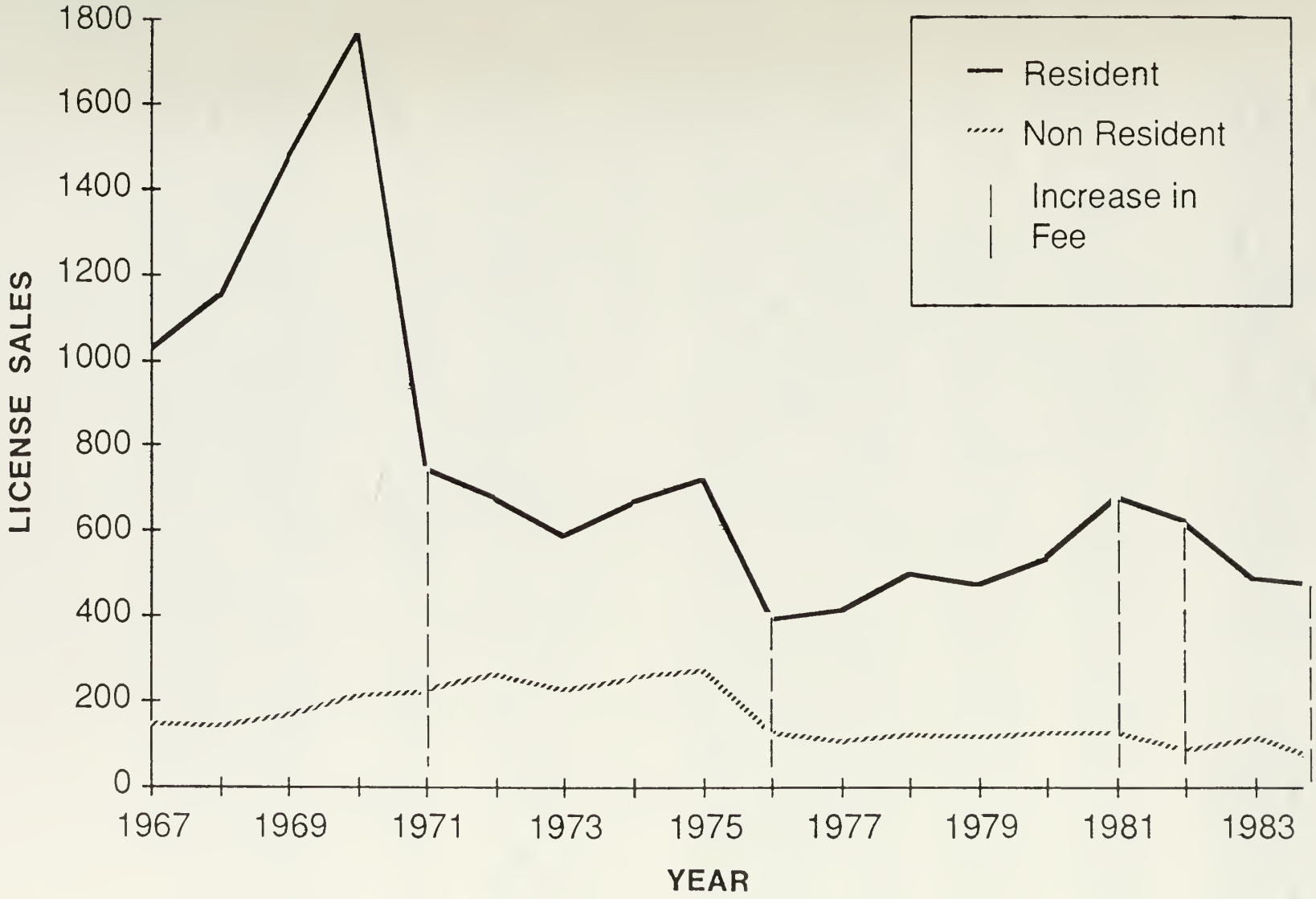


Figure 14. Grizzly bear license sales in Montana, 1967-1984.

this meeting, from January to March, each Region holds public meetings to solicit public input on the tentative recommendations. In March the MFGC holds a public meeting in Helena, to receive testimony on the tentative recommendations. One week after this meeting the MFGC adopts a final season structure.

VII. GRIZZLY BEAR MORTALITY IN THE NCDE

A. Total Man Caused Mortality

Grizzly bear mortalities from 1967 to 1984 (Greer 1967-1985) are presented in Table 25. Prior to the quota of 25 mortalities from all human causes (1975), the average annual mortality was 28 grizzly bears. Since 1975, an average of 19 grizzly bears have been killed annually.

Mortalities since 1967, stratified by hunting and nonhunting, are presented in Figure 15. The average proportion of hunting to nonhunting mortality during 1967-84 was 56:44%. Reported nonhunting mortality has exceeded hunting mortality in 5 of 18 years.

Male grizzly bear mortality exceeded female mortality in 14 of 18 years (Fig. 16). The ratio of male to female mortality averages 58:42% for the entire period (Table 25).

When sexes are combined, the ratio of adult to subadult mortality is 51:49% (Table 25). Ages of female grizzly bears in the total mortality are given in Figure 17. In all years, the average female taken was an adult (5 years of age or older). The average ratio of adult to subadult females for all years is 74:26%. Males in the total mortality are younger ($x=5.81$ years, $P=0.01$) than females ($x=7.88$ years). An average of 49% of the males since 1970 have been adults. The distribution of male ages from 1970 to 1984 are given in Figure 18.

B. Hunting Mortality

From 1975 to 1984 the average annual hunting mortality has been 10.6 individuals (range = 5-17) of which an average of 4.2 individuals (40%) are females (Table 25). Males in the hunter harvest are younger (mean = 5.83 years, $P=0.03$) than females (mean = 8.20 years) (Fig 19).

The ratio of adult to subadult animals in the hunter harvest, when sexes are combined, is 51:49% (Table 23, Fig. 20).

Adults comprise a greater proportion of female legal harvest than do subadults (Fig. 21). During the period 1968-1984, adult females have constituted 54% of the total female harvest. From 1975 to present, this adult female take has increased to 58% and the median age female has been 5 years old. For males, an average of 47% have been adults (Fig. 22), and their median age has been 4 years old.

Table 25. Summary of total known mortality of grizzly bears in the NCDE, 1967-1984.

Year	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	Total	Average
Hunt	22	9	28	9	13	14	14	17	13	11	5	7	11	11	11	17	8	12	232	12.9
Nonhunt	18	8	11	9	9	16	10	20	9	12	7	6	8	12	6	7	7	8	183	10.2
Total	40	17	39	18	22	30	24	37	22	13	12	13	19	23	17	24	15	20	415	23.1
Hunt																				
Male	16	5	19	5	3	7	5	12	6	6	2	6	8	6	8	8	7	7	136	7.6
Female	6	4	9	4	10	7	9	5	7	5	3	1	3	5	3	9	1	5	96	5.3
Nonhunt																				
Male		6	3	1	1	8	6	10	3	7	4	1	6	7	5	5	4	6	83	4.9
Female		2	6	4	3	5	3	7	6	5	2	5	2	5	1	1	3	2	62	3.6
Unknown	18		2	4	5	3	1	3			1					1				
Hunt																				
Adult		1	15	5	8	9	5	7	6	5	2	3	7	9	5	8	2	6	102	6.0
Subadult		4	8	4	5	5	9	9	7	6	3	4	4	2	6	9	5	6	96	5.6
Unknown		4	5														1			
Nonhunt																				
Adult		5	4	1	3	5	4	9	4	5	3	3	5	9	3	1	3	3	70	4.1
Subadult		3	6	6	3	10	4	11	5	7	3	3	3	3	3	5	4	5	84	4.9
Unknown					3	1	2	1			1					1				
Hunt																				
Adult M		0	11	3	1	4	2	4	3	2	1	2	5	5	3	4	2	3	55	3.2
Adult F		1	4	2	7	6	3	3	3	3	1	1	2	4	2	6	0	3	51	3.0
Unknown		4															1			
Nonhunt																				
Adult M		4	0	0	1	2	4	4	0	2	5	1	5	6	3	3	1	2	43	2.5
Adult F		1	4	1	2	3	1	4	4	3	1	2	1	4	0	1	2	1	35	2.1
Unknown			1		3	1	3				1					1				
Total Male	16	11	22	6	4	15	11	22	9	13	6	7	14	13	13	13	11	13	219	12.2
Total Female	6	6	15	8	13	12	12	12	13	10	5	6	5	10	4	10	4	7	158	8.8

[a]Some individuals were not classified by sex, but were included in totals.

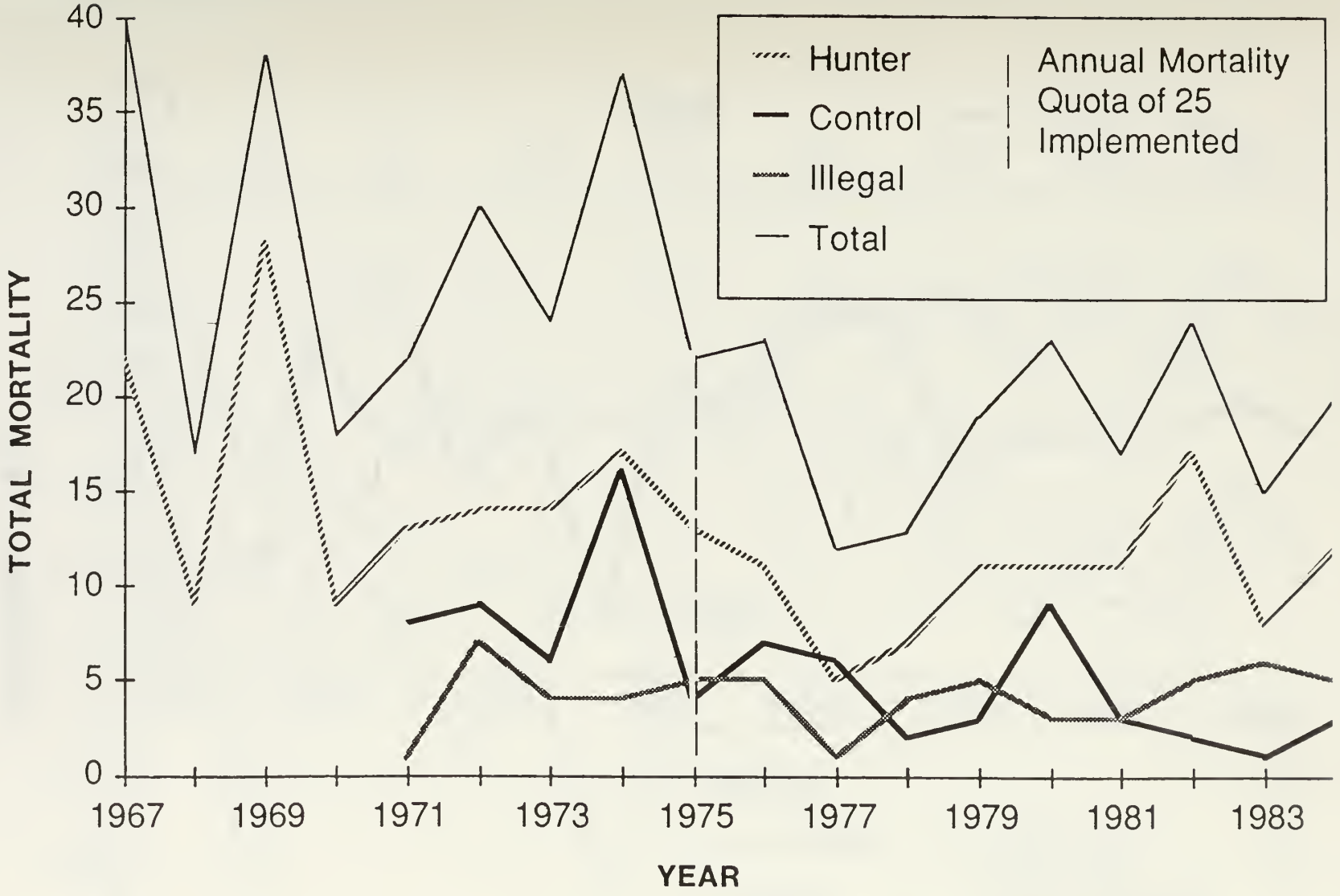


Figure 15. Total known mortality of grizzly bears by sex in the NCDE, 1967-1984.

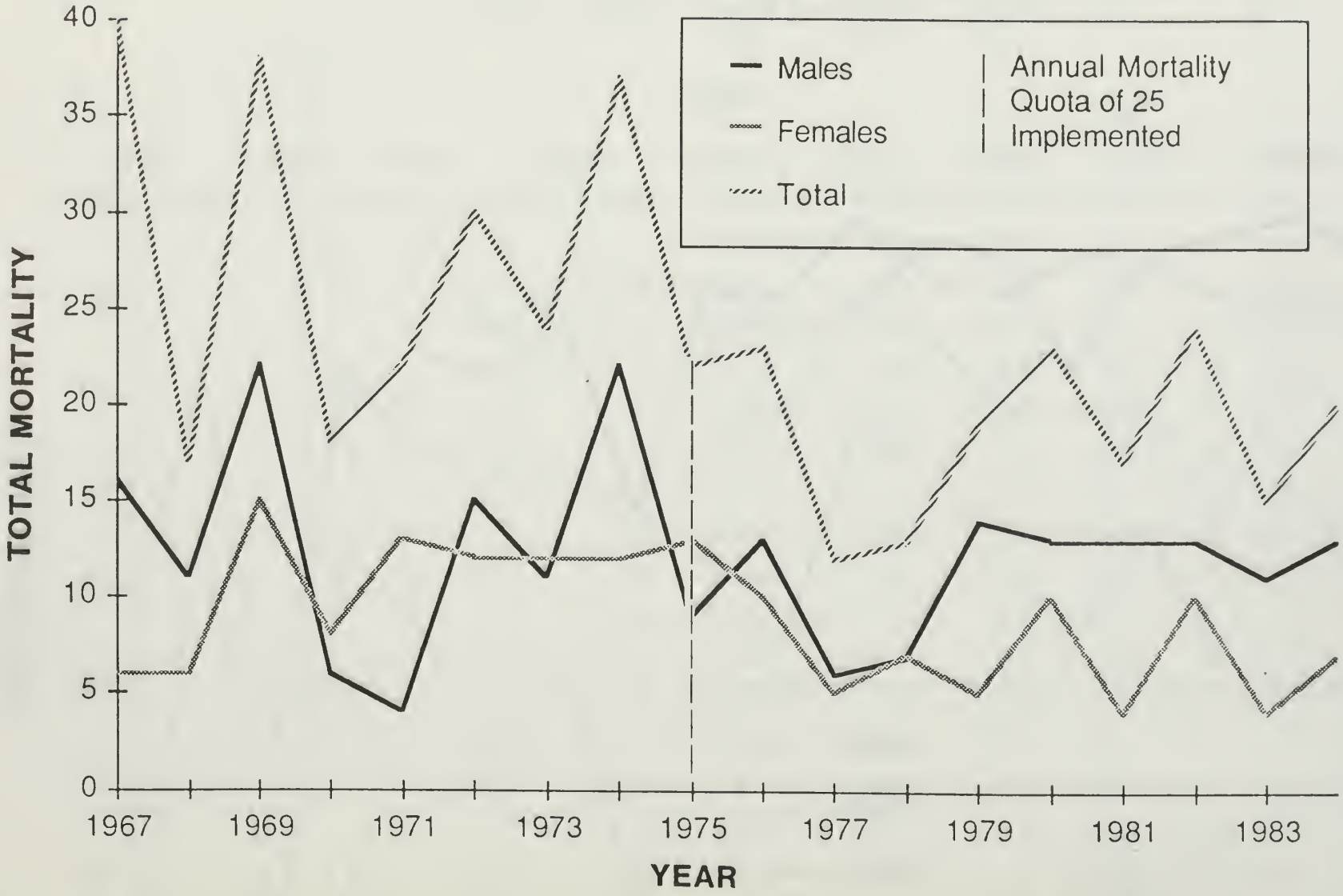


Figure 16. Total known mortality of grizzly bears by sex in the NCDE, 1967-1984.

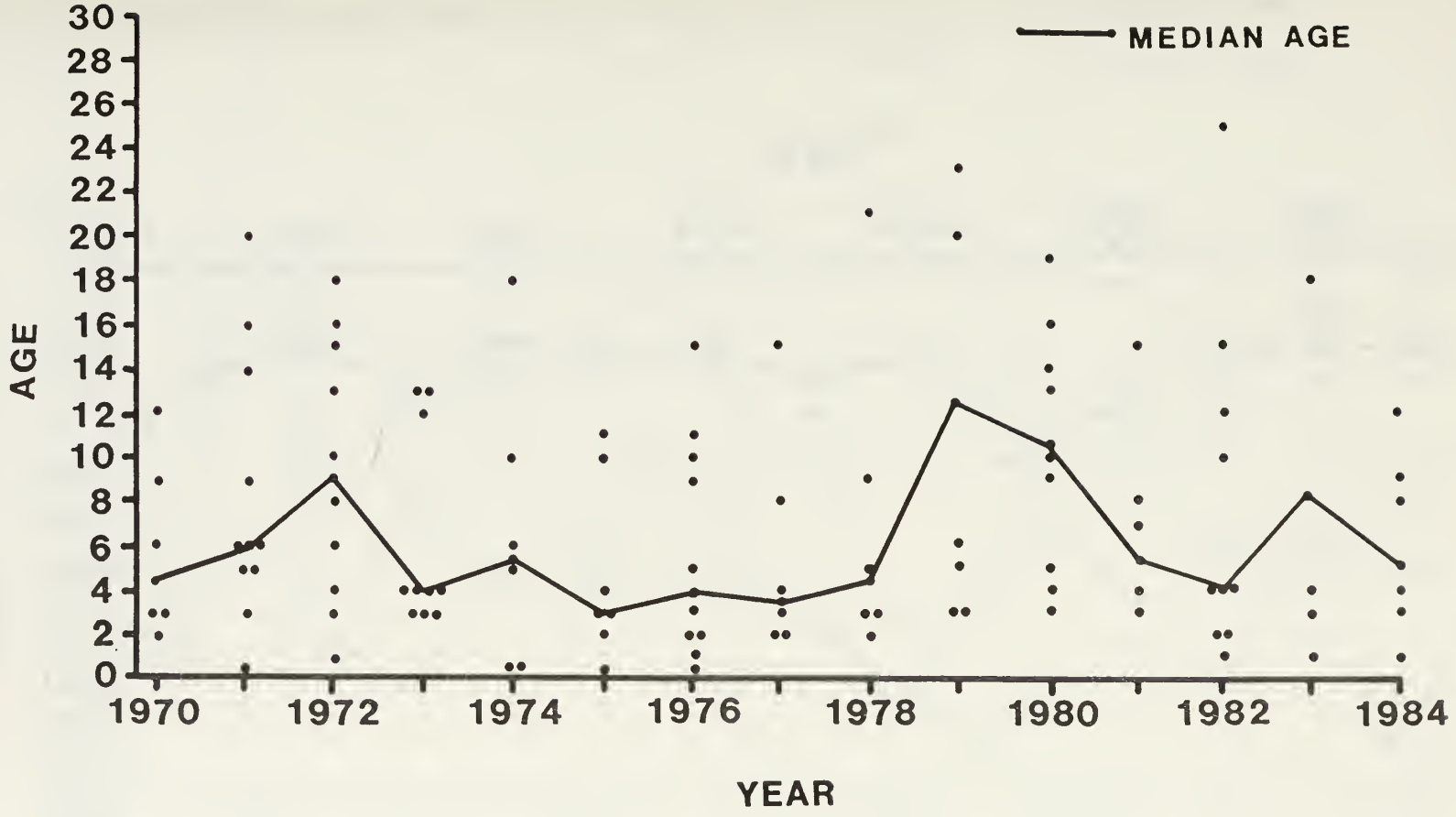


Figure 17. Distribution of age of female grizzly bears in total known mortality in the NCDE, 1970-1984.

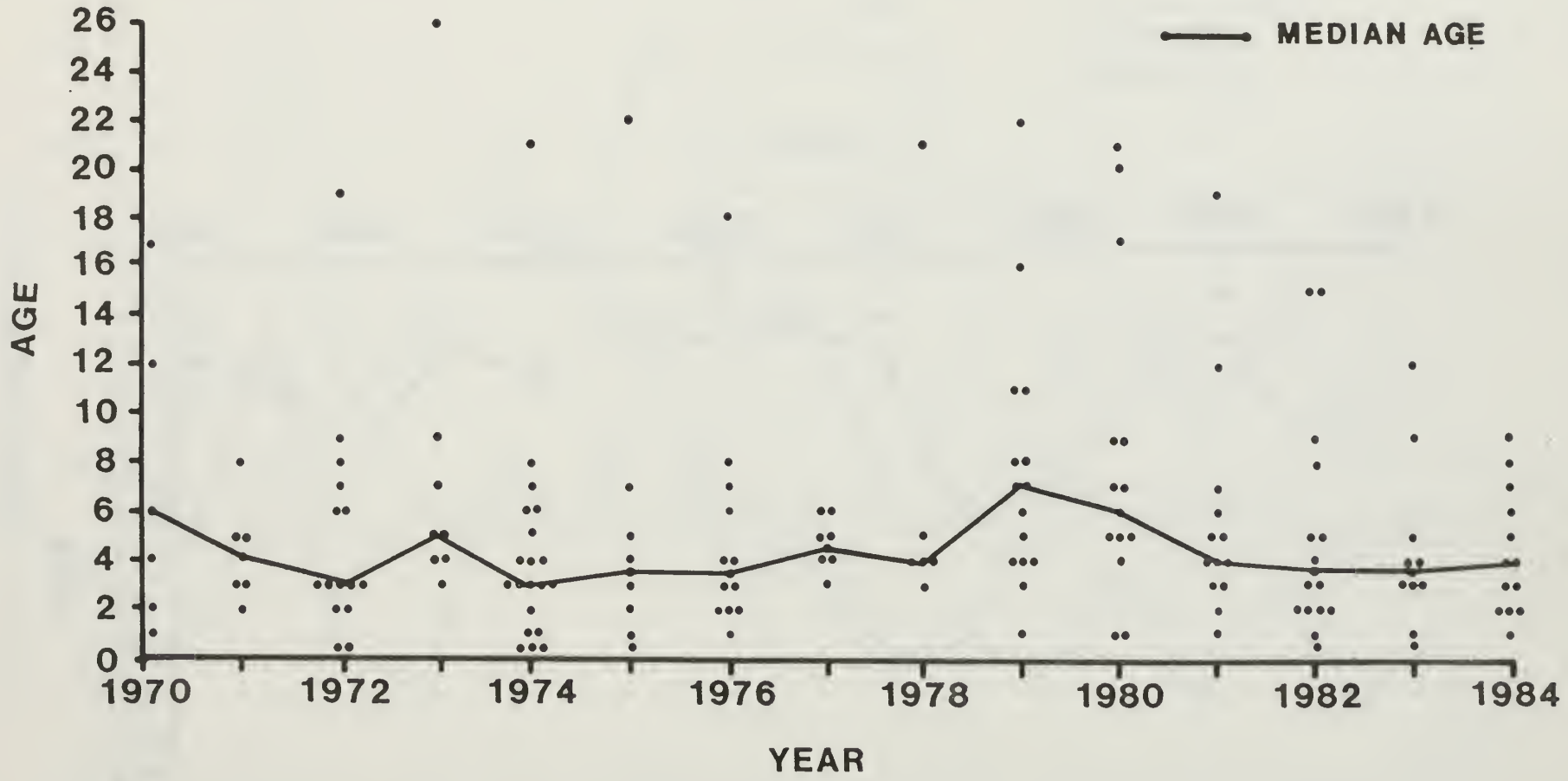


Figure 18. Distribution of male grizzly bears in total known mortality in the NCDE, 1970-1984.

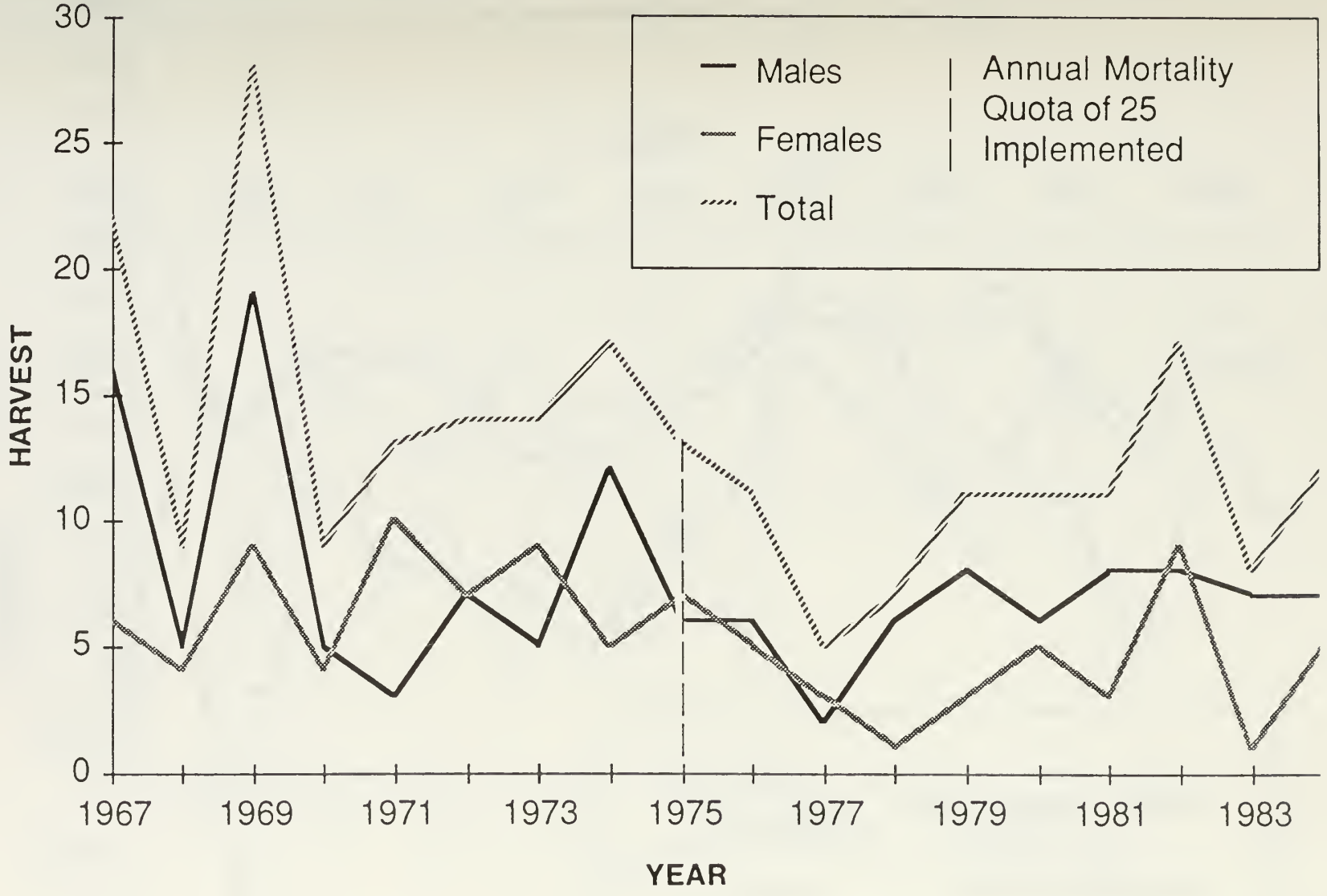


Figure 19. Hunter harvest of grizzly bears by sex in the NCDE, 1967-1984.

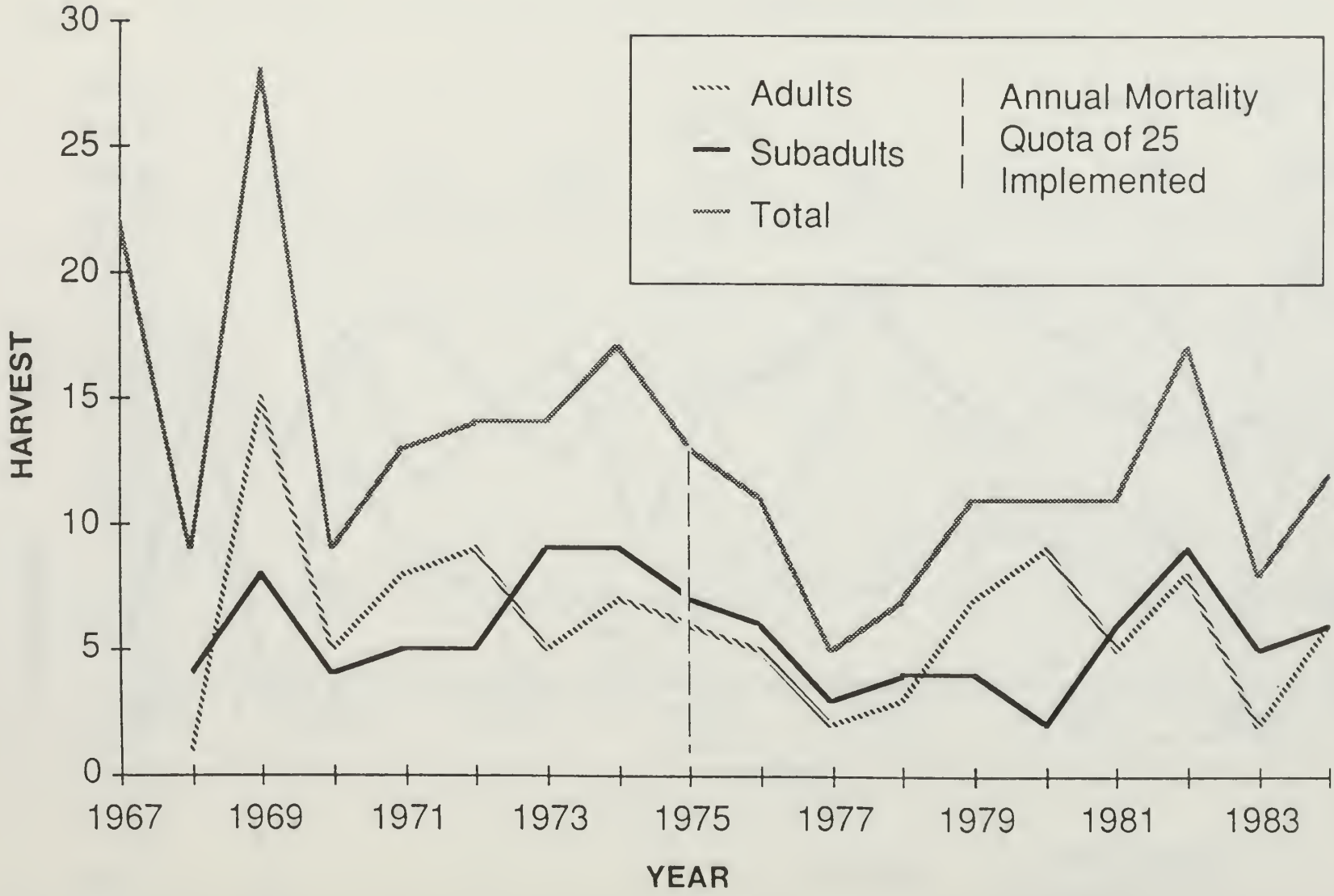


Figure 20. Hunter harvest of grizzly bears by age class in the NCDE, 1967-1984.

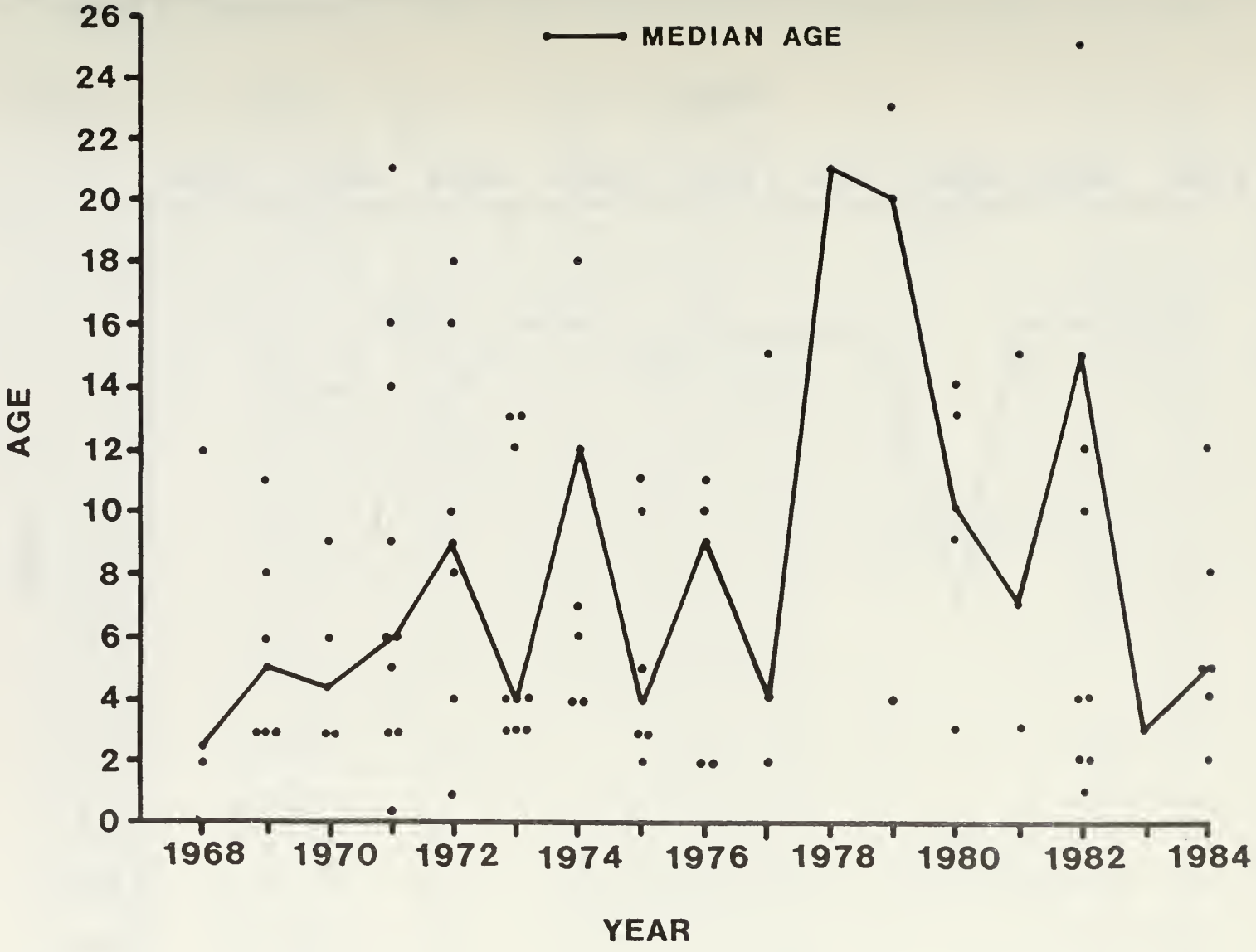


Figure 21. Distribution of age of female grizzly bears in the hunter harvest in the NCDE, 1968-1984.

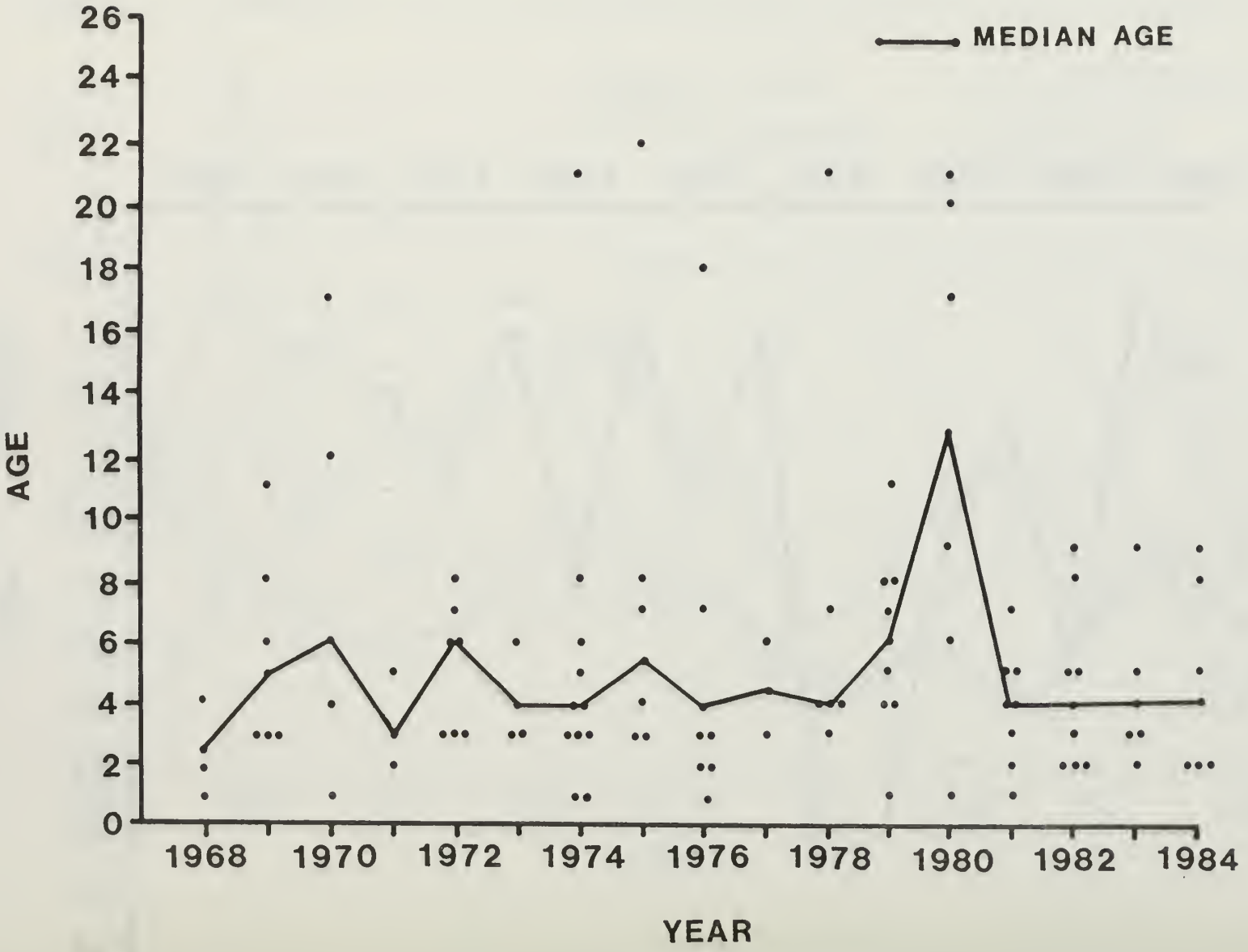


Figure 22. Distribution of age of male grizzly bears in the hunter harvest in the NCDE, 1968-1984.

1. Distribution of Hunting Mortality by Hunting District

Information on the grizzly bear harvest by hunting district since 1973 is presented in Table 26. Several districts were combined as they represent similar ecological areas (Figure 13).

Table 26. Distribution of hunting mortality by hunting district (1973-1984).

Hunting District	No. Harvested	Percentage of Total
101	5	3.6
110	16	11.6
130	10	7.2
140-141	28	20.4
150-151	53	38.6
280-281	12	8.7
400 series	13	9.4

The Bob Marshall Wilderness Area and the upper Middle Fork of the Flathead River (districts 150 and 151) have provided the greatest number of legal harvests since 1973 (39%). Approximately 20% of the legal kill has occurred in the lower South Fork of the Flathead River and much of the Great Bear Wilderness (districts 140 and 141). Sixteen of 137 (12%) legal kills since 1973 occurred in the North Fork of the Flathead River (district 110). Relatively few grizzly bears have been harvested in the Scapegoat Wilderness Area (districts 280 and 281).

2. Temporal Distribution of Legal Harvest

In the wilderness hunting districts (150, 151, and 280), the grizzly bear hunting season opens approximately four weeks before other districts in the NCDE.

Since 1973, 43% of the total legal harvest of grizzlies in the NCDE has occurred during this early season in these three districts. Only 5% of the total harvest since 1973 has occurred in these districts during the general hunting season, a result of early fall snows and difficult access.

C. Effects of Hunting

This section discusses population influences resulting from hunting. Effects on population parameters such as age structure, sex ratio, and reproductive characteristics are used in evaluating hunting (Bunnell and Tait 1980, Troyer 1961, Stirling et al. 1976, Lortie and McDonald 1977, Miller et al. 1982, Swenson 1985).

Mean litter size of the nonhunted populations of Glacier National Park and Yellowstone National Park are similar to, but somewhat lower than, hunted populations in the NCDE (Table 17). However, differences in habitat and research methods exist among these populations, complicating the interpretation of hunting influences. In the NCDE the largest unhunted area is Glacier National Park with a mean litter size of 1.7 (Martinka 1974). The hunted areas, including the East Front, North Fork Flathead River, Mission Mountains, and the Flathead River, BC, have litter sizes of 2.16, 2.66, 2.12, and 2.5, respectively (Aune et al. 1984, McClellan 1984 and data provided to the Interagency Grizzly Bear Committee Task Force on population and trends in the NCDE, 1984). These data suggest that hunting may increase survival and recruitment of young bears. Lindzey et al. (1983) considered that the resiliency of a black bear population in Pennsylvania was due to the heavy hunter harvest which stimulated productivity.

The sex ratio of the hunter harvest, if skewed toward females, may have a negative influence on population productivity by reducing the number of reproductive females. The ratio for 1967-1984 in the NCDE (59% male, 41% female) indicates this has not been the case and that hunting pressure on females has not been excessive. Bunnell and Tait (1985) suggested that the sex ratio of the harvest approaches 1 as hunting pressure increases. That hunters are selective toward males and males are more vulnerable (Miller and Ballard 1982; Bunnell and Tait 1985; Pearson 1975; Lindzey and Meslow 1980; Erickson 1962, 1963) is further evidence that an even ratio in the harvest is indicative of heavy hunting pressure.

Evidence suggests that reducing the number of adult males in a population increased survival and recruitment (see Population Regulation in Section V). Because males have constituted 59% of the harvest since 1967, subadult mortality and dispersal caused by adult males may have been reduced. If this is true, subadult survival and recruitment may be increasing.

Declining mean age in harvest data has been a suggested indicator of overharvest or underharvest (Glenn 1975, Swenson 1985, Bunnell and Tait 1985, Kolenosky In Press). The mean age of the harvest in the NCDE is compared with other populations which are known not to be over harvested (Table 27).

Age structure information from the RMEF (Table 18) indicates that this segment of the NCDE population is healthy and productive. Mean litter size for hunted portions of the NCDE presented earlier (Table 17) and the sex ratio of the harvest (59% male, 41% female) are also indicative of a stable or increasing population in the NCDE.

Table 27. Mean age of grizzly bears harvested from the NCDE, Alaska, and British Columbia, 1969-1984.

Year	NCDE		ALASKA[a] (GMU[b] 20)		BRITISH COLUMBIA[c] (Kootenay Region)	
	Number of bears	Mean age	Number of bears	Mean age	Number of bears	Mean age
1969			23	7.8		
1970	9	6.8	20	6.4		
1971	13	7.2	22	8.2		
1972	14	7.4	29	6.3		
1973	14	7.2	26	5.9		
1974	16	6.1	28	7.7		
1975	13	6.5	24	7.6	23	9.1
1976	11	5.4	23	5.3		
1977	5	6.0	21	7.6	44	7.9
1978	7	9.1	32	6.4	38	9.9
1979	11	8.6	37	6.3	36	9.1
1980	11	11.2	42	6.7	26	7.1
1981	11	5.1	56	7.3	51	8.6
1982	17	6.5	49	10.2	40	6.4
1983	7	4.4	57	7.4	38	7.2
1984	12	5.3	66	6.7		
TOTALS	171	6.9	555	7.1	296	8.1

[a]Data are from H. V. Reynolds (personal communication, Alaska Dept. Fish and Game, Fairbanks).
[b]Game Management Unit.
[c]Data are from R. Demarchi (personal communication, British Columbia Fish & Wildlife Branch, Cranbrook).

It would be expected that if a grizzly bear population were declining, hunter success would also decrease (Pearson 1975). Furthermore, hunter effort would be expected to increase. The data for grizzly bears in the NCDE (Table 28) indicate there has been no such decline in success, which has remained relatively stable, increasing only slightly with changes in license price.

Since most grizzly bear hunting in Montana is incidental to the hunting of other big-game species (Greer 1974a), it is possible to estimate the grizzly hunting effort from the big-game hunter effort. Hunter effort for elk in 4 hunting districts within the NCDE is directly correlated to the number of licensees afield and has remained stable since 1971 (Table 29). This suggests that overall grizzly hunting effort has also remained stable or has possibly declined with declining license sales.

Table 28. Grizzly bear hunter success for the NCDE, 1967-1984.

YEAR	HUNTER HARVEST	LICENSES SOLD[a]	HUNTER SUCCESS (%)
1967[b]	24	1,165	2.1
1968	12	1,286	0.9
1969	33	1,638	2.0
1970	13	1,980	0.7
1971[c]	22	965	2.3
1972	14	944	1.5
1973	15	810	1.9
1974	18	918	2.0
1975	13	986	1.3
1976[d]	11	513	2.1
1977	5	513	1.0
1978	7	616	1.1
1979	11	584	1.9
1980	11	660	1.7
1981[e]	11	799	1.4
1982[f]	17	699	2.4
1983	8	598	1.3
1984[g]	12	523	2.3
TOTAL	257	16,197	1.6

[a]Because licensees could hunt in southwestern Montana until 1975 all licensees in Montana were included, thus hunter success for the NCDE prior to 1975 may be different than indicated.
[b]Resident license $1.00, nonresident $25.00
[c]Resident license increased to $5.00, nonresident increased to $35.00
[d]Resident license increased to $25.00, nonresident increased to $125.00
[e]Resident license $25.00, nonresident increased to $150.00
[f]Resident license $25.00, nonresident increased to $175.00
[g]Resident license increased to $50.00, nonresident increased to $300.00

Hunter harvest may also reduce the need for nuisance control actions. Mysterud (1980) stated that selective hunting reduced domestic sheep losses in Norway. Troyer (1961) reported that the hunting season around the town of Kodiak, Alaska, was longer than elsewhere on Kodiak Island to aid in the control of brown bears. Greer (1976b) stated that the elimination of hunter harvest may allow for an increase in nuisance bear situations. Poelker and Parsons (1976) reported that hunting to control black bear damage in forests was effective and was preserving bears in nondamage areas. Craighead (1976) stated that grizzly bear management though aimed at preservation should include means of control, that hunting could accomplish this control, and that hunting is a sensible approach to preserving yet regulating grizzly populations.

Table 29. Number of elk hunters, days afield, and grizzly licenses sold, 1971-1983.

Year	Elk Hunters	Total Days Afield[b]	Avg. No. of Days Spent Hunting	Grizzly Lic. Sales[b]
1971	5,509	31,287	5.68	965
1972	5,356	28,304	5.28	944
1973	2,418	13,850	5.73	810
1974	3,549	21,369	6.02	918
1975	6,268	36,182	5.77	986
1976	6,220	38,115	6.13	513
1977	6,094	38,490	6.32	513
1978	6,724	39,019	5.80	616
1979	5,712	30,671	5.37	584
1980	5,716	27,062	4.73	660
1981	4,529	26,789	5.91	799
1982	4,448	27,268	6.08	699
1983	4,182	26,207	6.27	598

[a]Highly correlated to elk hunter numbers (r=.9435)
[b]Statewide figures
[c]Data from elk hunting districts 140, 141, 150, 151

No direct evidence of the effects of hunting on bear behavior is available. However, a certain amount of indirect evidence is available from studies on remnant populations (Mysterud 1977, Elgmork 1978). It indicates that bears survive because of genetic selection and learned behavior in avoiding confrontation and withdrawing from human contact. Other indirect evidence comes through experiences of researchers who indicate that hunting keeps bears wary of man (Jonkel 1975, Servheen 1981). Stokes (1970) indicated that national parks are valuable for research because their wildlife is less wary than where animals are hunted. Bunnell and Tait (1980), in population modeling, assumed that some bears are by virtue of their behavior more likely to be shot than others and continue to exhibit this behavior until they are shot. They suggested that average vulnerability of a cohort decreases with age due to learning or loss of more vulnerable animals.

Picton (per. comm., Montana State University) indicates that suppression of grizzly attacks by hunting is explained by the Reid dominance hypothesis which suggests that bears may avoid humans who "broadcast" dominance signals. If bears are trained to ignore this dominance by habituation to humans, the attack rate will increase. This theory better explains avoidance behavior than does the killing of bears alone. This hypothesis, in technical terms, is consistent with Morton's (1977) "Motivation-Structural" theory which suggests that vertebrates have common features in their sounds which allow interspecific communication.

Herrero's (1985) findings that expression of dominance diminishes the possibility of attack even under immediate threat condition, supports Picton's (pers. comm.) Reid concept. Further support comes from the finding that observability of hunted elk was 2% as compared to 32% for unhunted elk (Taylor 1979).

Additional evidence suggesting that protected grizzly bear populations are less wary than hunted ones is provided by Herrero (1985). He has shown that serious injury to humans and number of incidents are greater in national parks than elsewhere (Table 30). Some caution is necessary when interpreting these numbers because the actual rate (Number incidents/Number people) of incidents and injury is not available.

History shows that banning hunting has reduced but not eliminated mortality. Wyoming stopped grizzly bear hunting in 1975, and hunting was also discontinued in the Montana portion of the Yellowstone Ecosystem in 1975. However, this has not reduced either the number of nonhunting mortalities or the potential for bear/human conflicts. Arizona, Idaho and Washington either stopped or limited the hunting of grizzly bears in 1929, 1946, and 1969, respectively. These actions did not stop mortalities of grizzly bears nor their extermination from Arizona and near extermination from Idaho and Washington. Colorado established a nonhunting reserve for the grizzly in 1954 which was in place through 1964. This also failed to prevent the elimination of the grizzly in Colorado. In Arizona and Colorado, the bans on hunting may have occurred to late to prevent extermination. The province of Alberta stopped hunting grizzlies in their southern units adjacent to the NCDE in 1970. While bear numbers did increase, there was a concurrent increase in conflicts and illegal kills. After a human was fatally mauled in 1979, the season was reopened in 1982. Subsequently, the population has remained stable to increasing while the number of illegal kills has declined (Russell, pers. comm., Alberta Fish and Wildlife Division, Lethbridge). Inukai (1972) reported that a brown bear population in Japan remained high despite the loss of 750 bears per year and that no effective method to diminish the number of bears had been found. Johnson (1980) provided harvest data from an Alaska population estimated in 1958 to be 1800 animals and in subsequent studies was found to be stable. He stated the management goal was to provide an annual harvest of 60-80 bears not because of concerns for the population, but because of concerns for aesthetic hunting conditions. He suggested the population could sustain a greater harvest level.

D. Nonhunting Man-caused Mortality in the NCDE

Since 1975, an annual average of 8.2 grizzly bears (range = 6-12) have been lost from the population for

Table 30. Human injuries resulting from bears. (Herrero 1985).

DECADE	NO. OF PEOPLE INJURED	NO. OF INCIDENTS
MONTANA (exclusive of National Parks)		
1950-59	3	3
1960-69	4	3
1970-79	0	0
Totals	7	6
GLACIER NATIONAL PARK		
1950-59	1	1
1960-69	12	8
1970-79	10	7
Totals	23	16
YELLOWSTONE NATIONAL PARK		
1950-1959	1	1
1960-1969	24	24
1970-1979	13	11
Totals	38	36
ALBERTA AND BRITISH COLUMBIA (Exclusive of Parks)		
1960-69	6	6
1970-79	1	1
Totals	7	7
NATIONAL PARKS (Alberta and British Columbia)		
1950-59	3	1
1960-69	9	5
1970-79	20	17
Totals	32	23

reasons other than hunting (Table 25). Figure 23 presents the distribution of nonhunting mortalities in the NCDE from 1970-84. These include illegal and control deaths as well as live transplants from the NCDE.

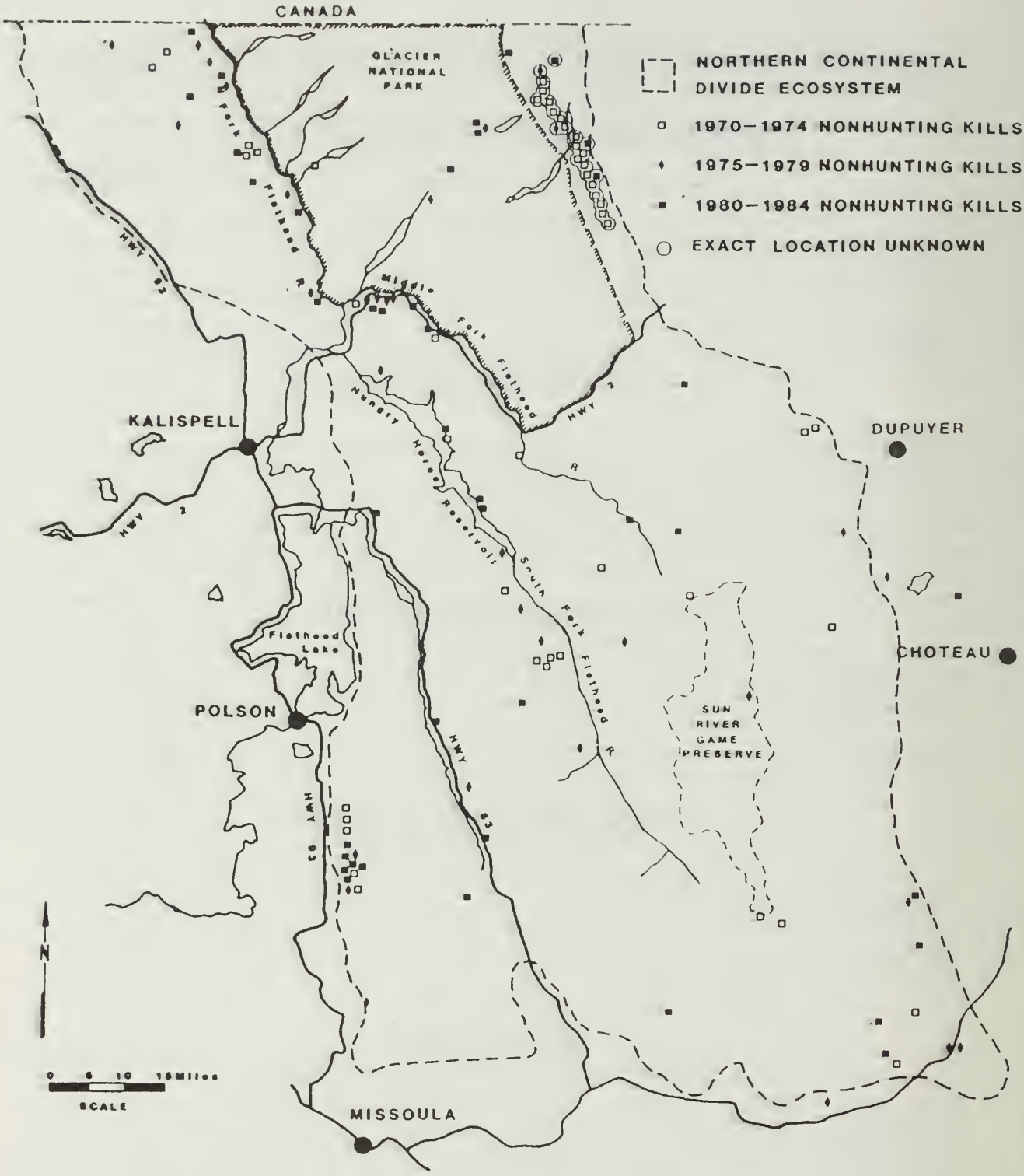


Figure 23. Location of nonhunting kills of grizzly bears in the NCDE, 1970-1984.

Male grizzly bears are more prevalent in the nonhunting mortality than females (Table 25). During the period 1968-1984, females have constituted an average of 36% of the man-caused nonhunting mortality. This percentage of females has increased to 39% in the recent decade.

When sexes are combined, subadults comprise 52% of the nonhunting mortality (Table 25). The distribution of male and female ages is given in Figures 24 and 25 respectively. There is no significant (P=0.17) difference in age of male (x=5.8 years) or female bears (x=7.5 years) in the nonhunting mortality (1975-1984).

Nonhunting mortality has been stratified into five major categories which allow accurate interpretation of nonhunting mortality patterns in the NCDE.

1. Defense of life or property:

    a. Marauding situations: a grizzly bear dispatched by a citizen for killing livestock or otherwise damaging personal property.

    b. Menacing situations: a grizzly bear dispatched by a citizen acting in self-defense.

    c. Nuisance situations: a grizzly bear dispatched when a citizen feels annoyed or uncomfortable with the bear's presence or when the bear is foraging on garbage or other human food sources.

    d. Control situations: a grizzly bear dispatched by state or government officials following a citizen complaint.

    e. Relocations: a grizzly bear removed by agency officials from the Ecosystem or to an unfamiliar part of the Ecosystem following a citizen complaint.

2. Mistaken Identity Deaths: a grizzly bear mistakenly, but illegally killed by a black bear hunter.

3. Vandal or Poaching Deaths: a grizzly bear illegally killed for maliciously or for profit.

4. Vehicle Collision Deaths: a grizzly bear accidentally killed after being struck by a motorized vehicle.

5. Handling Deaths: a grizzly bear accidentally killed by agency personnel during transplant or research operations.

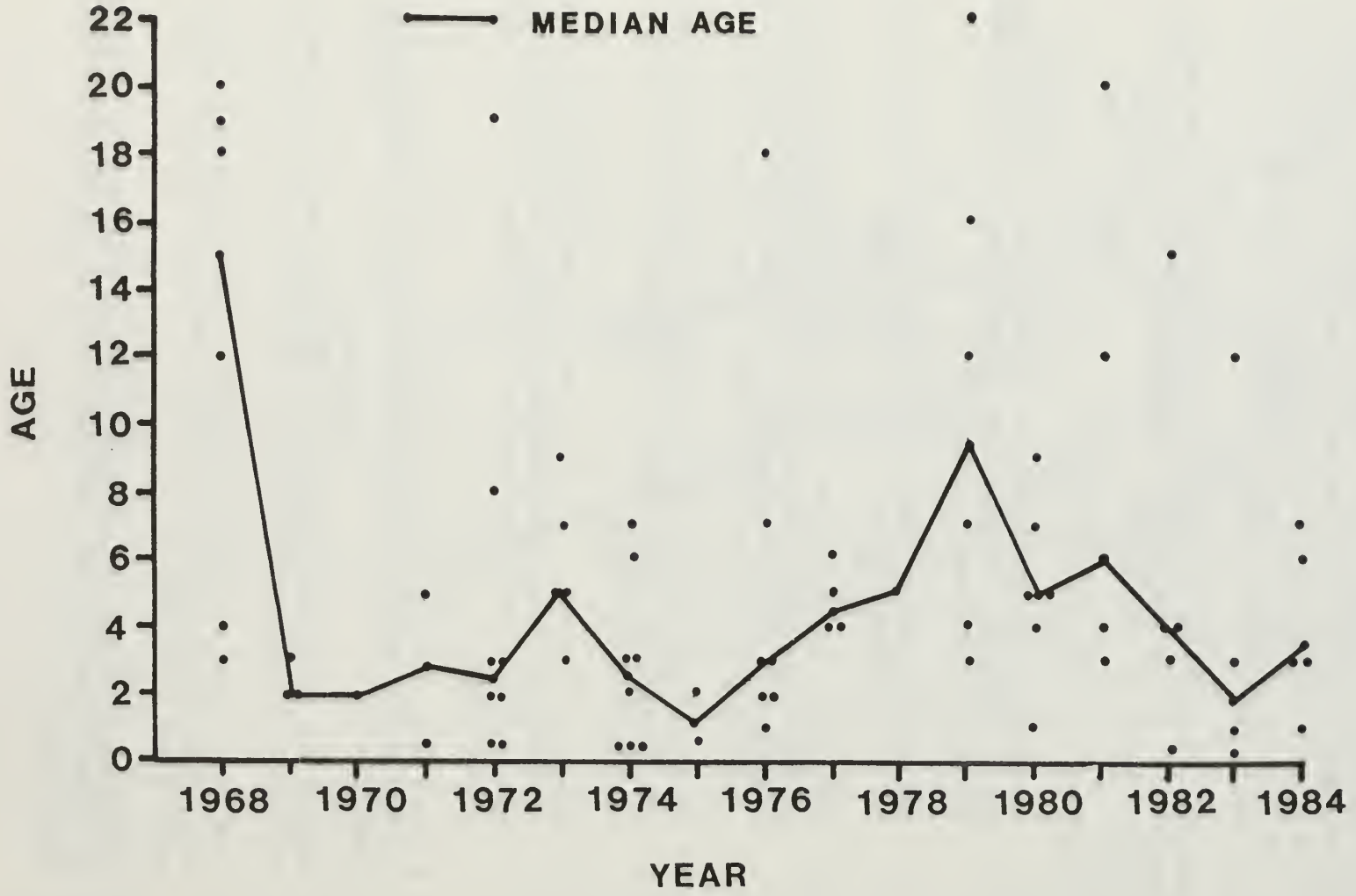


Figure 24. Distribution of age of male grizzly bears in nonhunting mortality in the NCDE, 1968-1984.

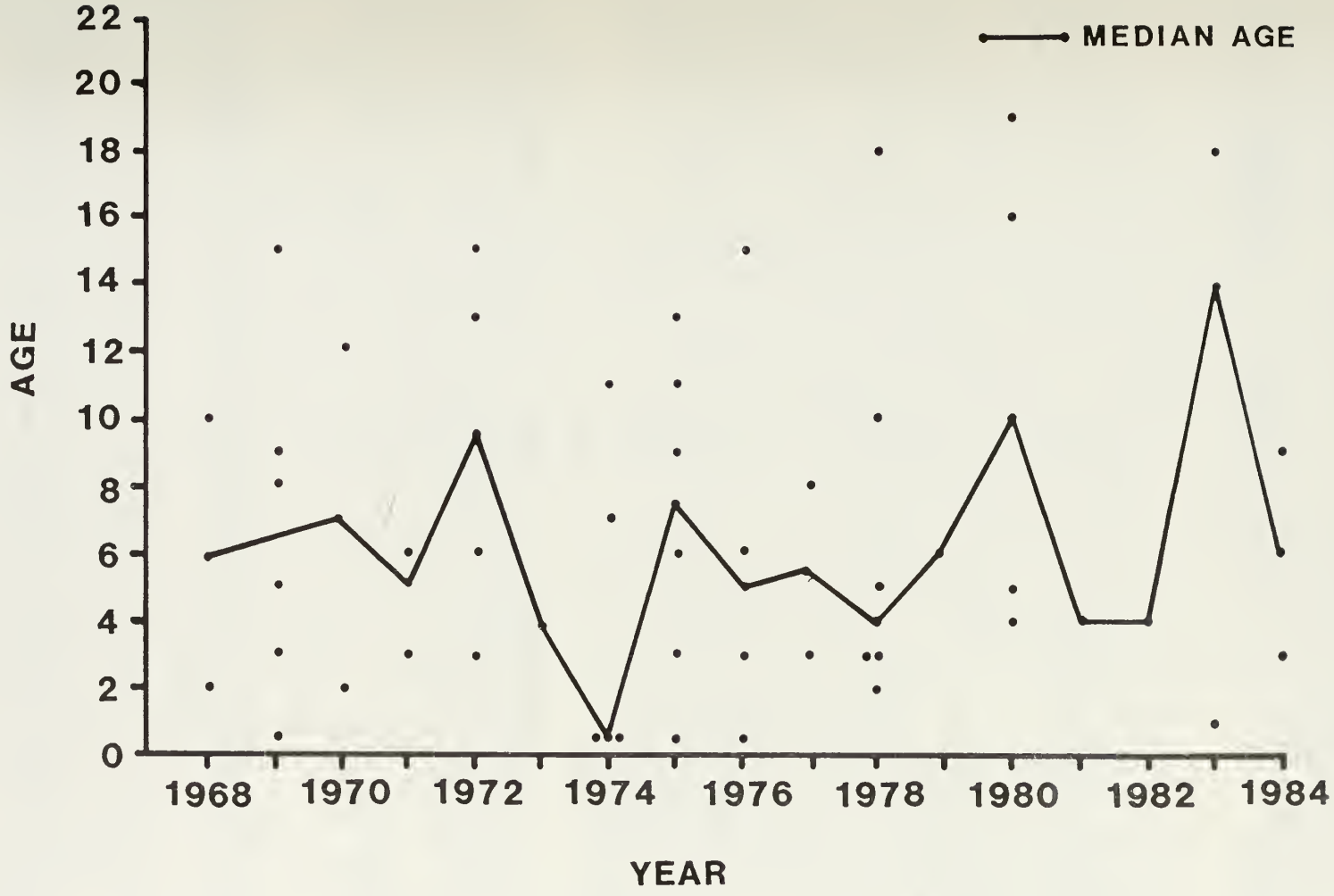


Figure 25. Distribution of age of female grizzly bears in nonhunting mortality in the NCDE, 1968-1984.

Defense of Life or Property: Fifty percent of the recorded nonhunting mortalities in the NCDE since 1975 have occurred in the defense of life or property (Table 31).

Table 31. Categories of known, man-caused nonhunting mortality in the NCDE, 1975-1984.

Category	No. of Bears	Average No. Per Year
Defense of life or property		
Marauder:	15	
Transplant (from NCDE):	7	
Control:	6	
Menace:	7	
Nuisance:	4	
Handling (occurred during transplant):	2	
Subtotal:	41	4.1
Mistaken Identity: Subtotal:	10	1.0
Poaching or Vandal Killing		
Parts taken:	12	
Carcass removed:	5	
Unclassified:	5	
Nothing taken:	4	
Subtotal:	26	2.6
Vehicle Collision		
Train:	4	
Automobile:	1	
Subtotal:	5	.5
TOTAL:	82	8.2

Only 2 handling deaths have occurred, both involving transplanting operations. There have been no research mortalities.

Marauding situations constitute the greatest number of actions in this category. Sheep depredations are the leading cause of both citizen and agency actions (89%). Aune et al. (1984) reported that over 50% of 1,379 grizzly bear radio locations in the East Front were on lands grazed by livestock. Knight and Judd (1983) found that all but one instrumented grizzly bear in the Greater Yellowstone Ecosystem that had the opportunity to kill sheep did so. Under these circumstances, agency control actions and citizen dispatches will continue to occur.

2. Mistaken Identity

During the period 1975-1984, 10 grizzly bear mortalities due to accidental killing by black bear hunters have been recorded. Of these, 7 occurred in May during spring black bear season and 4 of these occurred before May 15.

Grizzly bear mortalities caused by mistaken identity are difficult to control. This source of mortality is not usually significant. However, in 1983, 4 grizzly bear mortalities fell into this category. Wyoming has recorded 9 grizzly mortalities in this category since 1972 (Roop, pers. comm., Wyoming Department Game and Fish, Cody), with four of those occurring in 1982 over baits. As a result, Wyoming banned black bear baiting in grizzly habitat in 1982. Idaho imposed a similar ban in 1983. Both of these states contain a portion of the Yellowstone Ecosystem grizzly bear population reported to be in decline (Knight and Eberhardt, 1985). The state of Montana has prohibited the use of bait anywhere for either species of bear since 1948.

3. Documented Poaching and Malicious Deaths

Animals killed for profit or from malicious intent are difficult to document. Not all illegal grizzly bear deaths are reported to the Department, so documentation is not complete. Twenty-six records of poaching or vandal killing are present in Department records (Table 31). In most instances, either parts or the whole carcass were removed from the scene.

4. Illegal Parts

Information from the animal parts trade help evaluate the monetary value of grizzly bear parts and the incentive for poaching.

The news media has reported the value of grizzly bear parts in the following ranges: claws $150-$500, hides $5,000-$15,000, and gall bladders $100-$3,000. The Department conducted a "market analysis" in an attempt to document the true value of bear parts. The last public auction in Montana (1979) saw 11 grizzly hides (complete with feet and claws) sell for an average of $680 (range

$360-$1,175). A 1984 public fur auction in Manitoba showed that only the very best grizzly hides sold and those sold for $296-399. Information from Alaska, where hides are sold at public auction, indicated complete hides sold for $800-$1,200 in 1983. The price dropped to between $500-$600 in 1984 (J. Hechtel, Alaska Department of Fish & Game, pers. comm.). Lorne Russell (pers. comm.) indicated that between 1981-1983, 35 grizzly hides were sold on the fur market for an average price of $310.00.

Taxidermists in Butte (Atcheson Taxidermy) and Seattle (Klinburger Taxidermy) indicate the price for a grizzly bear rug is $600-$1600 (for an average of $800). A life-size mount could be worth a maximum of $5,000 for an excellent mount of an excellent bear.

The National Audubon Society has a standing reward of up to $15,000 for information leading to the conviction of anyone illegally killing a grizzly bear in the lower 48 states. Few calls have been received concerning this reward program, and only 2 rewards have been paid. Neither was in Montana. Several undercover sting operations conducted in Montana have failed to provide firm evidence of an illegal grizzly kill.

This discussion is not intended to negate past or present enforcement efforts. Only a strong ongoing enforcement effort will keep this type of activity in check. Heavy fines and prison sentences should serve as a strong deterrent to this activity in Montana.

5. Unreported Illegal Mortality

There is a second source of mortality that is not reflected in Department records. These are grizzly bears accidentally or intentionally killed that are unreported. The extent of this unreported mortality was estimated using data from radio-instrumented grizzly bears.

Information on age, sex, fate, and location of death was obtained for 71 radio-instrumented grizzly bears (Table 32). Data were not used from the Canadian Border Grizzly Project due to different levels of human encroachment and hunting activity (McLellan, pers. comm.). McLellan has observed no unreported mortality of instrumented bears in his study area. However, several individuals that travel between the U.S. and Canada were included.

Table 32. Data on the fate of radio-instrumented grizzly bears in 4 areas of the NCDE.

	Mission Mtns.	East Front	N.F. Flathead	S.F. Flathead	Total
Instrumented	13	28	18	12	71
Verified unreported deaths	1	1	2	2	6
Location of death	roaded	roaded	2 roaded	1 roaded 1 unroaded	5 roaded 1 unroaded

Six of 71 instrumented animals monitored during a 10-year period were confirmed illegal deaths that would not have been reported. Furthermore, 5 of these 6 instances occurred in roaded areas, although the animals' annual home ranges included roadless areas or designated wilderness. These data suggest that bears are more vulnerable in roaded areas than elsewhere.

An upper annual unreported mortality rate was calculated from these data. Several assumptions were made:

a. Mortality rates from instrumented animals could be extrapolated to other grizzly bears in the NCDE.

b. An upper mortality figure could be estimated by applying the rate of confirmed (unreported) deaths to the estimate of the minimum number of bears in the NCDE (excluding Glacier National Park).

c. Because this mortality would occur throughout the year, the figure developed would include crippling loss. Evidence from other areas suggest crippling loss is minimal (Demarchi, pers comm.).

d. Transplanted bears could not be used in the analysis as their vulnerability may be higher than other bears.

The mortality rates for instrumented animals are given in Table 33. The average annual mortality rate for confirmed deaths was 4%. This rate was applied to bears in the ecosystem (excluding Glacier National Park) to establish a upper limit for this type of mortality (14). Because all bears in the ecosystem are not vulnerable and even those that are are not vulnerable all the time, we feel the mean between 0-14 (7) represents a reasonable estimate of the annual average of mortality due to this source.

Table 33. Data from instrumented grizzly bears used to project the annual rate of unreported man-caused mortality.

Year	No. Bears Instrumented	Confirmed No. of Unreported Deaths	No. of Bears Alive
1975	2	0	2
1976	10	2	7
1977	15	1	13
1978	15	0	15
1979	26	3	18
1980	21	0	19
1981	9	0	8
1982	19	0	17
1983	19	0	19
1984	22	0	22
	--	--	--
Total	158.0	6.0	149
Average	15.8	0.6	14.9
Annual rate[a]		0.04	

[a]Annual Rate = $\frac{\text{Average No. of deaths}}{\text{Average No. of bears instrumented}}$

E. Wilderness and Nonwilderness Mortality Patterns

Wilderness grizzly bears may have a different age structure from those in nonwilderness areas. Although our 4 wildernesses have 50% of the total mortality since 1973, these wildernesses constitute only about 25% of the NCDE (excluding Glacier National Park). Only 8 of 75 bears killed in the wilderness (since 1973) have been nonhunting mortalities (10.6%). Conversely, 55% of the nonwilderness mortality has been nonhunting mortality.

Since 1973 hunters have harvested significantly (Mann-Whitney, P=.008) younger animals in the wilderness than in nonwilderness areas. The mean age of grizzly bears harvested in the wilderness is 4.9 years old (s.d.=4.2 years, median age=4.0), and for nonwilderness bears is 8.6 years old (s.d.=6.7 years, median age=5.0 years). Median ages from 1973 to 1984 are given in Figure 26.

Wilderness hunter harvest has been 58% subadults and nonwilderness harvest has been 56% adults. There is no significant (Mann-Whitney:p=0.23) difference in the mean age of females harvested in the wilderness (mean=6.9 years, SD=5.2, median=5.0) as opposed to nonwilderness (mean=8.7 years, SD=6.5, median=4.5). There is, however, a

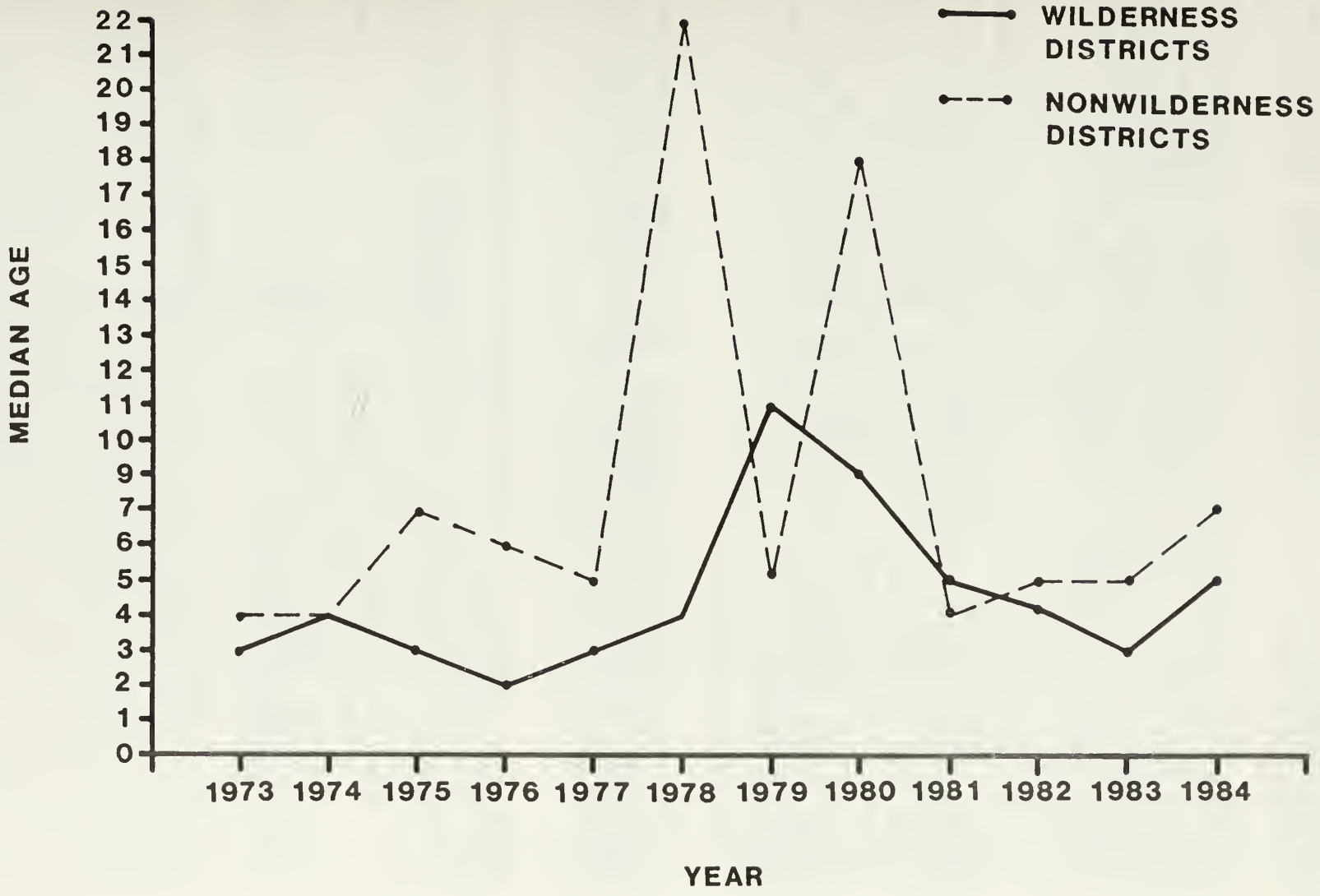


Figure 26. Median age of grizzly bears harvested in wilderness and nonwilderness hunting districts in the NCDE, 1973-1984.

significant (Masnn-Whitney: p=.007) difference in male ages between bears harvested in wilderness (mean=4.0 years, SD=2.4, median=4.0) and nonwilderness areas (mean=7.6 years, SD=6.45, median=5).

We also tested for age differences in grizzly bear harvest during the early bugle season and the general hunting season in the wilderness units. When sexes were combined there was no significant (Mann-Whitney: p=0.62) difference in age between bears harvested during the bugle season (mean=5.5 years, median=4.0), and during the general season (mean=6.4 years, median=5.0).

There was no difference (Mann-Whitney: p=0.43) in the age of females harvested during the bugle season (mean=4.1 years, median=4.0), and general season (mean=4.5 years, median=5.0). Also, there was no significant (Mann-Whitney: p=0.60) difference in male ages for the bugle season (mean=7.0 years, median=4.0), as opposed to the general season (mean=8.0 years, median=8.0). These data suggest that while there are no significant differences in male and female ages between the bugle and general season, older animals of both sexes are harvested in the later general hunting season.

F. Mortality Summary

The Department has attempted to document all sources of man-caused grizzly bear mortality in the NCDE. The analyses show that an average of 26 grizzly bears are either killed or transplanted each year (Table 34).

Table 34. Summary of average annual man-caused mortality in the NCDE, 1975-1984.

Hunting mortality:	10.6 bears
Nonhunting mortality:	
Defense of life or property	4.1
Known poaching/vandal	2.6
Unreported	6.8
Mistaken identity	1.0
Vehicle	.5
Total	25.6 bears/year

VIII. DAMAGE CONTROL

Control of nuisance grizzly bears is a necessary part of management. Grizzly bears that damage property, and threaten human life, must be removed from the area of conflict.

The authority to deal with damage control complaints rests with both the U.S. Fish and Wildlife Service (Animal Damage Control) and the Department. After legitimate complaints are verified by either agency, an operational plan for control of the animal is initiated. Regardless of which agency handles a control situation, all actions must be reported to the Department. If an animal is dispatched, its carcass must be sent to the Department Research Laboratory.

This operational plan (Appendix G) was developed through an interagency effort (USDI FWS 1982). The plan outlines the conditions under which an animal will be relocated, released on site, or destroyed.

Each situation is evaluated on the basis of conflict severity. All animals that inflict substantial human injury or loss of life will be dispatched. Bears committing lesser infractions are given a maximum of three infractions, depending on the age, sex, reproductive status, and conflict severity.

If a decision is made to relocate the animal to another area, the operational plan outlines the sequence of events and agency contacts. An interagency agreement is then made as to which of several pre-selected release sites will be used.

The operational plan does not address measures to reduce the potential for conflicts. In many instances, only the symptoms are treated. If the number of control actions are to be reduced, it may be necessary either to remove the source of the problem or to initiate effective deterrent programs.

There are three management tools to deal with property damage situations: 1) preventive measures and aversive conditioning, 2) animal removal, and 3) damage compensation.

Preventive measures are generally the preferred approach. Such measures include bear-proofing homes, corralling livestock at night, carrion removal, pasture selection, use of guard dogs, and electric fencing (Boggess et al. 1980). Hunt (1984) indicated several aversive training and deterrent techniques that may be tested in the field. Although testing in both the laboratory and the field identified promising agents, to date no effective long-term conditioning techniques have been developed.

Several agents still require further evaluation with marked bears to determine their effectiveness.

Bears have shown remarkable abilities to learn from past experiences. It is possible that if the attractions (e.g. food) are strong enough, then deterrents may become less effective with frequent use. If conditioned to flee from humans, treated grizzly bears may lose the parts of their home range where humans are present. Over time, aversive conditioning may cause reduction in overall habitat.

Long-term field studies are necessary to test aversive condition techniques. It will be important to differentiate between habituated and unhabituated bears. These studies cannot be incorporated into other ecological grizzly bear research because behavior will be altered, and other data sets will be compromised.

Animal removal may include agency dispatch, live transplants from the area, or legal hunting to reduce grizzly bear densities in recurrent problem areas. The success rate of relocated grizzly bears has not been adequately documented for the NCDE, although preliminary analyses were completed by Thier and Sizemore (1981). Mace and Riley (In prep) analyzed data on grizzly bear relocations in the NCDE from 1975 to 1984 to evaluate their success. Successful relocations were those where the individual was not known to resume conflict activity for 2 years. Forty-two individuals were moved 45 times. Of these relocations, 31% were adults, 49% were subadults, and 20% were cubs. Twenty-five (56%) of the 45 relocations resulted in success. Brannon et al. (In prep.) reported that relocation was 51% successful in preventing an individual from causing another nuisance.

Relocations of males in the NCDE were 43% successful whereas those of females were 65% successful. However, this difference was not significant ($X^2=1.99$, $p=0.15$). Brannon et al. (In prep.) reported that relocation was 42% and 47% successful for males and females, respectively. In the NCDE relocations were 57, 59 and 54% successful in preventing further nuisances for adults, subadults and cubs respectively. The mean distance bears were moved in successful attempts was 74 miles. For unsuccessful attempts, the mean distance was 56 miles, but this difference was not significant ($P=0.16$). Brannon et al. (In prep.) reported that there was no difference in distance transplanted between relocations preventing further nuisance and those not, but that returning bears were transplanted a shorter distance than nonreturners.

Haroldson and Mace (1984) provided a literature review and identified those population segments least likely to cause further problems. If relocations are to continue, measures should be taken to radio-instrument and monitor relocation attempts.

Damage compensation may be provided in several forms. Livestock indemnity programs compensate producers for all or part of predator losses. Beehive damage compensation has also been instituted in several states and Canadian provinces. The states of Minnesota and Pennsylvania and the province of Alberta all have livestock indemnity programs which appear to be unsuccessful in reducing damage caused by bears or wolves (Joselyn, pers. comm., Minn. Dept. of Nat. Res., St. Paul,; Warner, pers. comm., Penn. Game Commission, Harrisburg; Gunson, pers. comm., Alb. Fish & Wildlife Div., Edmonton). However, each program does have at least limited success in preventing landowners from handling damage situations themselves (Gunson, Warner & Joselyn, pers. comm.) Warner (pers. comm.) stated that 1985 has shown approximately a 1/3 reduction over 1984 in damage claims by beekeepers. He attributes this success primarily to fencing provided to beekeepers by the Game Commission. Joselyn (pers. comm.) stated that there may be a noticeable reduction in the number of instances in which landowners resolve wolf-livestock damage situations themselves. He stated this was due to an active U.S.F.W.S. program in which complaints are acted on quickly (within 12-24 hours). Sorenson (pers. comm.) stated that although the government of Norway's compensation program pays as much as twice the value for livestock losses, even if only suspected of being lost to wolves or bears, livestock owners still want the nuisance animal(s) controlled.

It appears that the best approaches to grizzly bear-livestock damage situations are first, to provide rapid response (preferably within 12 hours) and action, provide fencing to beekeepers to prevent beehive damage, and use animal husbandry practices which reduce the potential for livestock-grizzly bear interactions.

At this time, Montana has no compensation program for grizzly bear damage. A compensation bill introduced to the Legislature in 1983 was not passed. At present, private organizations are raising funds for this cause.

IX. HUMAN INTERACTIONS

A. Habitat Encroachment

The immediate and long-term effects of human activities and habitation within grizzly bear habitat have been well documented. In Europe, for example, deforestation, road building, illegal harvest, and housing have displaced brown bears from all but the most remote habitats in the Pyrenees of France and Spain (Roben 1980), in Norway (Elgmork 1978), and in the Estonian Soviet Republic (Kaal 1976). Improved access and development activities serve to reduce the acreage of secure habitat. Thus, these factors increase vulnerability and probability of conflict (Bunnell and Tait 1980, Nagy and Russell 1978, Claar et al. 1983, Jonkel and Demarchi 1984).

As Pearson (1975) points out, the grizzly is capable of living in proximity to human development and can only be eliminated by human predation. Pearson further suggests that where economic and social demands justify human occupation, grizzly bears can still be maintained at lower densities. However, the control of nuisance animals becomes a management necessity in these situations.

Land development along the periphery of Glacier National Park has accelerated rapidly in recent decades, and over time poses the possibility of turning the Park into an ecological island (Martinka 1982). Similar patterns of habitat isolation can be seen in segments of the grizzly population living in the Cabinet and Mission mountains of Montana. Furthermore, because the NCDE is a peninsular population, habitat encroachment in southern British Columbia and Alberta could ultimately influence interchange within the ecosystem.

High levels of direct human/bear interaction have led to a modification of bear behavior in the national parks (Herrero 1985). Grizzly bears in some areas of Glacier National Park have become habituated to hikers, and the number of direct confrontations has increased in recent years (McArthur Jope, 1983). While historical confrontations normally involved females with young, recent observations show single adult and subadult grizzlies are charging and approaching humans with greater frequency. This behavior modification of park bears suggests that frequent interaction between bears and people can result in nuisance bears even in the absence of food reinforcement (McCullough 1982). Conversely, Blanchard (1978) found that most grizzly bears in the Hilgard Mountains of Montana (4 miles from Yellowstone National Park) fled from hikers. Comparisons of bear attacks in and outside of United States and Canadian parks are given in Table 30.

B. Fire Suppression

Fire is a natural ecological element in the northern Rocky Mountains (Howe 1976). Fire creates openings in the forest canopy and maintains a mosaic of habitats important to many wildlife species. Fire-induced shrubfields are primary summer and fall foraging habitats for the grizzly bear (Martin 1979). However, in the early 1900s it was recognized that fire reduced the commercial timber base and posed a threat to human safety and developments. Thus fire suppression programs were aggressively instituted during the 1930s (Arno 1980). Since the early 1900s, 647 natural and man-caused fires have occurred on the Flathead National Forest; all but three were suppressed (U.S. Forest Service files, Flathead National Forest). Although policies to let fires burn have been developed in recent years, and fire management plans have been drafted, most fires are still suppressed. As succession moves shrubfields towards a climax stage, prime grizzly bear habitat decreases. As human developments increase in grizzly habitat so will the need to protect these habitats from fire. Because grizzly bear reproductive success is tied to nutrition (Harestad and Bunnell 1979), loss of seral shrubfields may reduce the number of grizzly bears in the ecosystem (Zager et al. 1983).

C. Vegetation Manipulations

Certain logging practices may create environmental conditions similar to those after a fire, and may partially offset the effect of fire suppression (Zager et al. 1983). However, documented grizzly bear use of logged sites has been minimal (Zager 1980, McLellan and Mace 1985). Archibald (1983) suggests that hunted grizzly bear populations are less likely to use logged and other open sites than nonhunted populations. Holland (In press) has described U.S. Forest Service habitat improvement activities in the South and Middle forks of the Flathead River. Between 1978 and 1984 the Spotted Bear and Hungry Horse ranger districts have conducted prescribed burns on over 1.230 acres of winter ranges on which grizzly bears obtain carrion. Holland (In Press) also described clover (Trifolium spp.) seedings along closed roads and cutting units, aspen (Populus spp.) and browse plantings, and lodgepole conversions.

Hillis (In Press) has suggested strategies for creating forbfields and shrubfields on the Lolo National Forest. Grizzly bear foods produced in the processes described are considered "transitional", yet could be sustained over time by long term harvest planning. Holland (In Press) described habitat improvement techniques in the South Fork of the Flathead River. These techniques include road closures, enhancement of ungulate habitat, prescribed fires, and mechanical food planting. Other than these studies, there

has been little research conducted on grizzly bear habitat improvement. Such investigations are encouraged and should include habitat features such as space and isolation in addition to food production.

D. Disturbance from Motorized Activities

Lyon et al. (1985) clearly demonstrated that elk lose a portion of effective habitat near roads, and suggest mitigative strategies to reduce such loss. Similarly, Zager (1980) found loss of grizzly bear habitat adjacent to open roads. McLellan and Mace (1985) found that grizzly bears were only minimally displaced by vehicular activities in British Columbia, Canada, and that displacement was restricted to daylight hours. The relationship between vehicular traffic and grizzlies in the East Front is as yet unclear (Aune et al. 1984). Mace and Jonkel (In Press) have shown that timber harvests displaced grizzly bears from a portion of their home range, at least during the period of logging activity. Brannon (1984) reported that bears avoid areas close to roads, but habitat preference is a confounding factor in this relationship.

Road access has also been suggested to influence mortality. In an attempt to evaluate this possibility we plotted all hunting and nonhunting mortalities (Figs. 27, 24) for which the location was known. Locations were recorded by legal descriptions. Unless the specific location was recorded we plotted each kill at the center of the Section designated. The shortest distance from each location to the closest road was determined and tabulated for analysis. Each kill location was then categorized by this distance (Table 35).

The influence of road access on grizzly bear mortality is shown by the fact that 32% of hunting mortality and 48% of total mortality, for which locations were known, occurs within 1 mile of roads. Clearly, road access management is an important part of grizzly bear management and restrictions can reduce mortality.

The effects of oil and gas exploration and development activities on grizzly bears has been investigated by Aune and Stivers (1983) and Aune et al. (1984). Bears appear to be displaced from areas adjacent to wells. A 1/2-mile radius may be excluded from a bear's use during drilling and development. Individual bears may be displaced further where topographic or vegetative screening is scarce. Grizzlies monitored by Aune et al. (1984) avoided seismic activity. Although older bears appeared more tolerant, most bears were either displaced from key foraging areas or altered their activity patterns. Conversely, McLellan and Mace (1985) observed minimal reaction to seismic activity in southern British Columbia.

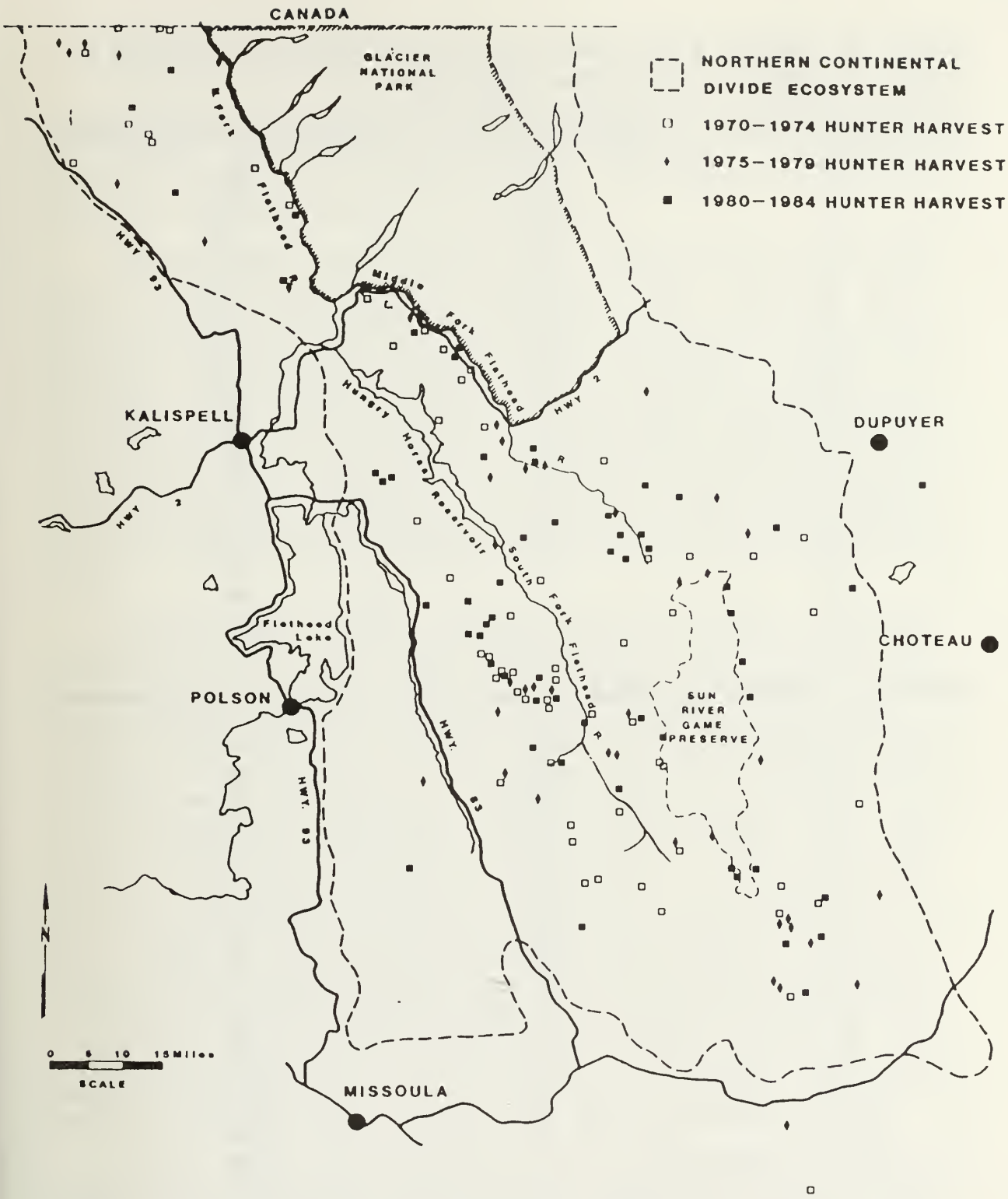


Figure 27. Location of hunter kills of grizzly bears in the NCDE, 1970-1984.

Table 35. Hunter kills and total known mortality within 18 miles of roads in the NCDF, 1970-1984.

Distance in Miles	Hunter Harvest[a]	Cumulative Percentage
0.5	38	22
1	16	32
2	13	39
3	16	49
4	6	52
5	15	61
6	14	69
7	12	77
8	8	81
9	10	87
10	6	91
11	3	92
12	2	94
13	1	94
14	3	96
15	4	98
16	2	99
17		99
18	1	100

Distance inMiles	Total Mortality[b]	Cumulative Percentage
0.5	100	39
1	22	48
2	19	55
3	16	61
4	7	64
5	17	71
6	18	77
7	13	82
8	10	86
9	12	91
10	7	93
11	4	95
12	2	96
13	1	96
14	3	97
15	4	98
16	2	99
17		99
18	1	100

[a]The correlation of hunter harvest with distance to road is r=-0.80

[b]The correlation of total mortality with distance to road is r=-0.61

E. Public Perceptions

Public attitudes and perceptions of the grizzly bear and its management are probably the most critical factors for successful management of the grizzly bear. The Department is seeking public comment on this document, because it believes grizzly bear management will benefit from the opinions and experiences of Montanans.

Research has been conducted to determine the attitudes and opinions of the public toward wildlife. Kellert (1976) and Mihalic (1973) indicate that city dwellers have protectionist attitudes toward wildlife and that rural people have non-protectionist (or utilitarian) attitudes. Kellert (1979) found that 60% of the people polled in a national survey disagreed with the statement that wildlife would be better off if government officials did not attempt to control their populations. Of the people polled from the Rocky Mountains, 59% agreed to the protection of the grizzly bear even if it resulted in the loss of some timber-related jobs and building material. Sixty-five to 85% of those surveyed nationally, supported hunting for recreation and meat.

Locally, Frost (1985) surveyed the attitudes of Mission Valley residents toward the grizzly bear. She reported that residents were aware of the differences between grizzly and black bears, but not that the grizzly was classified as "threatened" in Montana. She also reported that only 18% of those polled knew the correct number of grizzlies presumed to live in the Missions. Fifty-four percent of the people surveyed were uncertain or disagreed that the grizzly bear was in danger of disappearing from the Missions, while 46% agreed with this statement. When asked what should be done with grizzly bear numbers in the lower 48 states and the Mission mountains, 47% and 45% respectively, responded that populations should be left as they are. When asked about bear research, hunting of grizzlies, relocation of problem bears and killing of problem bears, 58%, 38%, 68%, and 65%, respectively, responded that these activities should remain the same or increase. Thirty-seven percent of the respondents felt hunting should be decreased. Asked if they would be comfortable with grizzlies on their property, respondents indicated they would be all of the time (13%), most of the time (24%), sometimes (21%), and never (34%).

Frost (1985) also found that 76% of respondents would be encouraged to protect habitat on private property if they received rapid response to grizzly problems. Ninety-eight percent would kill a grizzly if it was threatening them or a family member, 51% if it was killing livestock. A majority of respondents wanted to "get rid of" or "decrease numbers" of grizzlies when their nuisance problem hadn't been solved and wanted to "leave as is" or "increase numbers" when their problem had been solved.

A petition expressing sentiment against grizzly bears, circulated in communities along the East Front by East Front residents, received public support. A petition opposing augmentation of grizzlies in the Cabinet Mountains, circulated by N.E.E.D. (Northwest Energy, Employment, and Development) in Libby, Montana, received overwhelming support.

X. RESEARCH PROGRAM

Intensive grizzly research was begun by the Department in 1975. Reasons for the research included the grizzly's pending classification as "threatened" (ESA 1973), and anticipated grizzly habitat and population impacts from land development. Prior to 1975, morphological studies of mortalities were conducted by the Department. The program primarily to provided information for the annual season-setting process beginning in January of each year.

In 1974 the Department and the University of Montana signed an agreement initiating the Border Grizzly Project (BGP). During the subsequent 10 years this project has researched grizzly bear habitat use and distribution, bear repellents and deterrents and black/grizzly bear interrelationships. Much of this research was done by graduate students. Results of this project include dissertations (Zager 1980, Servheen 1981), theses (Jorgensen 1979, Lloyd 1979, Martin 1979, Cushing 1980, Miller 1980, Sizemore 1980, and Sherwood 1981), and published papers (Schallenberger 1977, Cushing 1980, Jorgensen 1980, Martin 1980, Servheen 1980, and Zager 1980). Many other aspects of the project have been reported in BGP Annual Reports, BGP Special Reports, and other published reports.

At present the Department is conducting grizzly bear research along the RMEF and in the Cabinet Mountains. Both these studies are conducting impact evaluations on oil, gas, and mineral development. Both studies have collected grizzly population information and habitat use and distribution data. The RMEF investigation has compiled the most extensive information concerning population status and trends yet gathered for an area in the NCDE.

On a statewide basis, grizzly management and research has been ranked 13 of the 19 species or groups of species priorities in Montana by the Department (Appendix H). Emphasis in the past for management and research has thus been directed toward other big game species such as deer, elk and antelope. Even with this emphasis, in fiscal year 1985 the Department will spend about $198,000 (includes only expenditures from state hunting license sales income) on grizzly bear management and research. This compares with grizzly license receipts totaling approximately $32,000 in 1983 and $39,700 in 1984 (Table 36). The Department currently is spending over five times the amount of license dollars currently received from hunters on the grizzly bear management and research program.

In addition to state license revenue, Department grizzly bear research has been supported by private organizations, public land management agencies, and the U.S. Fish and Wildlife Service. Due to a federal solicitor's opinion, Montana has been ineligible to receive federal Section 6

Table 36. Montana grizzly bear license receipts, 1983 and 1984.

Year	Resident Grizzly	Nonresident Grizzly	Grizzly Trophy	Total
1983[1]	12,100 (484)	19,775 (113)	200 (8)	$32,075
1984[2]	$23,500 (470)[3]	$15,900 (53)	$325(13)	$39,725

[1]Resident Grizzly = $25; Non-resident Grizzly = $175; Grizzly Trophy = $25
[2]Resident Grizzly = $50; Non-resident Grizzly = $300; Grizzly Trophy = $25
[3]Dollars Received (Number of Licenses Sold)

funding under the Endangered Species Act. The opinion indicates that Montana's current law allowing a person to kill a grizzly bear in defense of human life or protection of property is in conflict with the Endangered Species Act. The Act prevents killing a grizzly bear to protect property except by a state or federal government agent. This conflicts with an individual's right to protect life and property guaranteed by Montana's Constitution.

A secure and substantial funding source is required to initiate an active and progressive program for grizzly research. The Section 6 funding source under the Endangered Species Act was established to serve this purpose. The Department has, therefore, annually requested a reversal of the solicitor's opinion. The U.S. Fish and Wildlife Service has chosen not to contest that opinion. At present, these requests have proved fruitless and a secure funding source is not available. The Department has actively solicited funding from other sources including private conservation groups, the oil and gas industry, mining companies and other federal land management agencies such as the U.S. Forest Service and Bureau of Land Management. These sources are not secure and, therefore, funding is limited and highly variable.

For the Department to comply with the Grizzly Bear Recovery Plan (USDI 1982) regarding determination of population viability and recovery, it is necessary to document attainment of population goals and/or monitor reproductive parameters and mortality patterns for a minimum of six years. Such monitoring efforts require a secure source of research funds. Clarification in the recovery plan is also needed to establish the number of areas within the NCDE from which these population data are needed to document recovery.

Department priorities for future grizzly research have been identified as follows:

1. RMEF Monitoring Study (continuation through fiscal year 87). A study to develop population trend monitoring techniques and guidelines for oil and gas development activities.

2. Cabinet Mountains Grizzly Study (continuation through fiscal year 88). A study to validate Forest Service cumulative effects analysis and to develop guidelines for mining activities in the Cabinet Mountains of Montana.

3. Northwest Grizzly Study (population trend and status study to be initiated in FY86).

The Northwest Grizzly Study will emphasize population trend and status information. Habitat use and distribution will receive secondary emphasis. Methods to monitor population trends in west side habitats will be a major objective. Correlation of hunting and nonhunting mortalities to population levels will also be attempted. The study will require a long-term commitment (possibly ten years) of funding and personnel.

It has been suggested that the Department develop differential harvest strategies (involving several mortality rates) in several of the Bear Management Units to test and then contrast the effects of these strategies on grizzly bear demographics. Because harvest data may give somewhat ambiguous results (Harris 1984a), experimental designs of this type would also require a long-term, intrusive research program. Such research must be conducted within the legal constraints of the Endangered Species Act.

One frequently discussed aspect of research is the possible negative influence from frequent handling of wildlife to obtain biological information. Little information is available on this subject. Current Department research studies have detected no major influence (i.e., altered home ranges, etc.), but these studies were not designed to determine such impacts. The handling of wildlife for research purposes should be limited to only necessary projects. With this assumption in mind, the Department opposed requests to gather research information on grizzly bears in <u>all</u> occupied areas. Instead, reliance on extrapolation from intensively studied areas to areas of similar habitat has been used. This technique is widely applied in wildlife management and eliminates the need to study and handle <u>all</u> population segments. There are also ethical questions raised concerning the value of tagging and instrumenting wilderness animals.

A. Confidence Limit Requirements

Commentary on the preliminary draft of the EIS has suggested that population estimates should have 95% confidence. To illustrate the requirements of such a confidence limit we present scenarios of the requirements for estimating two populations one of 50 (a typical study area population)and another of 356 grizzly bears (our current estimate of the minimum for the NCDE exclusive of Glacier National Park).

We approximate these confidence limits as ±2SE, where SE is the standard error of our population estimates. The formula for this SE is given in Caughley (1977, p. 143) for the population estimator using direct sampling (where the number of marked individuals to be recaptured is not decided prior to recapturing). To use the unbiased estimator would require predetermining the number of marked individuals before recapturing, and recapturing would continue until this number of marked individuals is caught. As difficult as bear trapping is, predetermining and then capturing the number of marked bears to be recaptured would be unfeasible.

If we have a study area population estimate of 50 grizzly bears of which 30% are marked (15) and 25% of the population is subsequently captured (13), including 25% (4) of the marked bears being recaptured, then our population estimate is 50 ± 27 (a confidence interval of only 54%). If 90% (45) of this estimated population is marked and 90% (45) of the population is subsequently captured, including 90% (41) of the marked bears being recaptured, then the confidence interval is still only 80% (50 ± 10).

A 90% confidence interval on our current estimate of the minimum (356) for the NCDE (exclusive of Glacier National Park) would require marking 60% (214) and subsequently capturing all 356 and recapturing all (214) of the marked bears. A somewhat more practical approach of marking 30% (107) and subsequently capturing 25% (89), including 25% (27) of the marked bears being recaptured, produces a 30% confidence interval (356 ± 106).

These exercises indicate that deriving statistically confident grizzly bear population estimates are not practical for study areas let alone entire ecosystems. Nevertheless, we believe that we can have reasonable confidence as managers. This confidence is based on the manner in which the estimate of the NCDE minimum population was derived (Appendix E).

XI. ENFORCEMENT

Department enforcement efforts concerning grizzly bears are focused in three areas including patrols of both wilderness and nonwilderness areas, damage control, and poaching investigations.

Wilderness and nonwilderness areas are patrolled during the general hunting season and at other times. Hunter camps are checked for harvested game and compliance with outfitter regulations.

Response to nuisance bear complaints involves all Department personnel in some capacity, although enforcement division personnel are frequently the first on the scene.

Department enforcement personnel investigate and prosecute all violations involving illegal mortality. Cases are processed through the county attorney's office or turned over to the U.S. Fish and Wildlife Service when they appear to involve interstate movement of grizzly bear parts. The Department also coordinates with federal officials in undercover operations.

The Enforcement and Wildlife divisions also respond to specific problem situations. For example, in 1985 the Department temporarily closed a portion of Hunting District 141 to black bear hunting. Closure of this district is designed to prevent mistaken identity kills of grizzly bears feeding on spilled grain along a railroad right-of-way.

XII. PUBLIC INFORMATION AND EDUCATION

A comprehensive public information campaign regarding the grizzly bear was initiated in the spring of 1984. The purpose of this effort was to assist hunters in distinguishing between black and grizzly bears. The goal of this effort was to reduce or eliminate mistaken-identity killings. The following is an account of the Department's public information and education effort. Examples of publications, releases, public service announcements, scripts, etc., are included as attachments in this EIS.

A. Statewide Activities

1. Special Publications

Bear identification posters (Attachment 1) and a brochure (Attachment 2) were sent to all license agents and sportsmen's clubs in Montana. Purchasers of bear licenses also received the brochure.

A "Bear Us in Mind" brochure was produced in cooperation with the federal Forest and Park Services, and the Idaho and Wyoming Departments of Fish and Game (Attachment 3).

Special bear-hunting regulations were produced by the Department. Black/grizzly bear identification characteristics were included (Attachment 4). Identification information on the two species was included in the Department's in-house newsletter.

The Department's magazine, Montana Outdoors is distributed to approximately 35,000 subscribers. It is estimated that approximately 100,000 people see each issue of the magazine. Specifics on grizzly/black bear identification were included in the March-April, September-October, and November-December 1984 issues (Aderhold 1984, O'Gara 1984, Anonymous 1984).

A bear identification information bulletin (Attachment 1) was also distributed to all of Montana's approximately 600 outfitters.

2. Media Effort

A news packet distributed to 272 media outlets in early spring of 1984 included information on black and grizzly bear characteristics and the need for hunters to pay special attention to the mistaken identity problem. The Department received excellent response to the packet. The state's two largest newspapers, The Great Falls Tribune and The Billings Gazette, carried front page pictures of black and grizzly bears, mentioned the mistaken identity problem, and provided further detail on their outdoor pages.

Public service announcements describing black and grizzly bear identification characteristics (Attachment 5) were sent to 43 radio stations in the state in both spring and fall. At the same time, two television public service announcements were released to 11 television stations in Montana.

Video footage, including pictures of black and grizzly bears and identification characteristics, was supplied to the Montana Television Network (the state's only statewide network), just prior to the spring bear season, for use on the evening news.

3. Signs and Posters

The National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, and Wyoming and Idaho Departments of Fish and Game cooperated with the Department in producing and placing identification posters at trailheads in grizzly country prior to the spring and fall black bear seasons.

A poster was also produced in an attempt to heighten the public's awareness of the grizzly (Attachment 6).

Roadside signs were placed at four locations in areas with previous problems of mistaken identity (Attachment 7 is a copy of the sign requisition detailing the type of sign erected).

The Audubon Society initiated a reward program in 1982 (Attachment 8). The Department was also involved in publicity and information gathering.

4. Additional Statewide Efforts

A 30-minute, 16-mm film documentary titled "Room to Live", previously produced by the Department, discusses the grizzly, its needs, and characteristics. It was booked by 100 different groups in 1984, and viewed by an estimated 50,000 people.

An exhibit displayed at the 1984 State Fair in Great Falls included life-size mounts of black and grizzly bears, and identification posters and brochures. This exhibit reached over 35,000 visitors.

Hunter Education classes were expanded to include a big-game identification slide series, including pictures of black and grizzly bears. In addition, the Hunter Education text included identifying characteristics of the black and grizzly bears, and the need for special attention when hunting bears. Approximately 6,000 students received instruction in 1984.

Two slide series were produced by the Department. One targeted northwestern Montana, where the mistaken identity problem had been worst. The second was produced in conjunction with the Forest Service, Park Service, and Wyoming and Idaho Departments of Fish and Game, for use regionwide.

Each spring the MFGC sets tentative season and bag limits for that fall's big game seasons. Sportsmen from throughout the state participate. The 1984 session included a presentation outlining plans for our public information effort pertinent to the mistaken identity problem.

B. Regional Efforts

In addition to the efforts undertaken to distribute information statewide, the seven Department regions throughout the state were involved in a variety of other activities targeting the need for increased awareness of the mistaken identity problem and publicizing the different characteristics of the two species.

The following is an accounting of the specific activities undertaken in our regions during 1984.

Region One

Programs given:

Public meeting - grizzly bear
LDS Church Youth Group - grizzlies
Flathead Chapter Montana Bowhunters Association - grizzly bear management
Northwest Energy & Employment Development Inc. - grizzlies
Wilderness Drug and Alcohol Rehabilitation Ranch - grizzly identification
ArcheryHunter SafetyClass- grizzly identification
League of Women Voters - grizzly forum and answering questions

Conrad Lutheran Father/Son Banquet - grizzlies
Wildlife Society - black bear seasons
Northwest Energy & Employment Development Inc. - grizzly recovery

Media Contacts:

1 radio spot on grizzly update
2 radio spots on black bear season
1 radio spot on Libby grizzly meeting
1 radio spot on grizzly bear recovery
3 television public service announcements on grizzly identification

1 news release on adding grizzlies to the Cabinet population

Region Two

Programs given:

Western Montana Fish & Game Association - program on bear identification
Archery Club - program on bear identification
Anaconda Hunter Education Instructors - program on bear identification
Ravalli County Hunter Education Instructors - bear identification

Media Contacts:

1 radio spot on bear identification
1 radio spot on bear identification
2 radio spots on bear identification
2 radio spots on bear identification and bear season
1 television program - statewide (MTN) on bear identification
1 television spot on bear identification
1 press release to all media on bear identification
1 article on bear identification
1 article on bear i.d. for Hunting and Fishing News

Region Three

Programs given:

4-H Camp - program on bears

Media Contacts:

1 radio spot to 8 stations on black bear season
1 radio spot to 8 stations on black bear hunting season to open
1 press release on black bear hunting
1 press release on black bear hunting season to open

Region Four

Programs given:

Lewistown Lewis & Clark School - program on grizzly bear
Department of Fish, Wildlife and Parks personnel - bear trapping and tranquilizing session

Great Falls Lewis & Clark School - program on grizzly and black bears
Teton County Sportsmens Club - program on grizzly & black bears
Upper Missouri Break Audubon Club - program on grizzly & black bears
Conrad Sportsmans Club - program on grizzly & black bears
Sun River Game Range Tour - program on grizzly & black bears
SimmsHigh School Wildlife Biology Class - program on grizzly & black bears
Chouteau Kiwanis Club - program on grizzly & black bears

Media Contacts:

1 radio spot on grizzly bears
1 radio spot on black and grizzly bear characteristics
1 television spot on grizzly bears and Audubon reward

Region Five

Media Contacts:

1 news release on black bear season starts in mid-April

Region Eight (LOCAL)

Programs given:

Mountain Bell - program on bears
Helena Outdoors Club - program on bears and man
Mountain Bell - program on bears
Kalispell Flathead Wildlife - program on bears
Cascade County Medical Society - program on grizzlies
Valier Sportsmen Club - program on bears

Media Contacts:

1 radio spot on bears
1 radio spot on bears
1 television program on bears

Our regional efforts totaled:

24 programs given at meetings, banquets or workshops

17 radio programs

6 news releases and informational materials distributed to local newspapers

7 television interviews/programs

In addition, numerous radio, television and newspaper interviews were given which resulted in additional media coverage.

C. Results and Plans

In 1984 there were no grizzly mortalities due to mistaken identity, and so far in 1985 there has been only 1. Because the Department's information effort has been effective in keeping this mortality source at a minimum, a similar effort will be continued in the future.

XIII. RECREATION MANAGEMENT

Many recreational activities take place in grizzly bear habitat. Some activities, such as hiking, berry picking, or cross-country skiing, receive little direct management. Others are more closely managed. These include public campgrounds, groomed snowmobile trails, and outfitted fishing, hunting, and backcountry trips.

Approximately 44 primitive campgrounds developed by the Forest Service, and four Department recreation sites exist in grizzly bear habitat. These sites usually provide picnic tables, parking spurs, and vault latrines. Each site is "bear-proofed" according to its location in grizzly habitat and its history of bear use. Most sites located several miles off main highways are posted as pack-in-pack-out for garbage. Garbage cans are not present and miscellaneous litter is picked up. If appropriate, a poster is displayed explaining techniques to avoid attracting bears into the sites.

More highly developed campgrounds provide garbage cans. If a site has a history of bear use, the cans are fitted with bear-proof lids and the garbage is collected frequently. Regulations prohibit dumping waste on the ground, leaving food out of hard containers, allowing pets to be unleashed and leaving campsites unattended. Visitors are also informed of the presence of bears at many trailheads.

Four snowmobile trail-grooming projects are in grizzly bear habitat. Cooperative agreements are signed between the Department and the land management agency (usually the U.S. Forest Service) to groom the trails from mid-December through March. The grooming season and trail routes are approved by Department biologists to avoid conflicts with grizzly bear dens, hibernation periods, and spring emergence. Section 23-2-633, MCA, prohibits using a snowmobile to drive, rally or harass any game animal, including grizzly bears. Snowmobile laws are enforced by Department wardens.

Approximately 12 hunting or fishing outfitting businesses are operating in the CYE, and 40 in the NCDE. These businesses are required to have a license, and are responsible for fish and game law violations that their clients commit. Outfitters must pass a standard examination which tests their knowledge and ability to perform the services efficiently and safely. The exams also test the applicant's knowledge of related subjects including information about grizzly bears. Outfitter compliance is monitored by the land management agencies and Department wardens.

XIV. LAND MANAGEMENT

A. Department Lands

Department lands where grizzly bear management programs are in place include the Sun River, Ear Mountain, and Blackleaf Wildlife Management Areas, and the DeRosier Unit of the Kootenai Wildlife Management Area.

On the DeRosier Unit, roads are closed in the spring to exclude traffic when elk, deer, and grizzly bears are using the area.

The Sun River, Ear Mountain, and Blackleaf Wildlife Management Areas are all along the RMEF. Grizzly bears use all three areas to some extent.

Management of the grizzly bear on these three wildlife management areas follows the Interagency Rocky Mountain Front Management Guidelines (Appendix I). These guidelines regulate human activities to avoid or minimize adverse impacts to grizzly bears.

The grizzly bear guidelines have been developed in conjunction with an ongoing bear research project along the Rocky Mountain Front.

B. Established Department Policies

Study results documented to date along the RMEF are the basis for the development of management guidelines for the grizzly bear and its habitat. During the period from 1977-1979, research was carried out by the Border Grizzly Project under contract with the Bureau of Land Management. Since 1980 the Department has assumed the intensive grizzly bear monitoring work with funding continuing from the Interagency Monitoring Group, private industry (American Petrofina, Williams Exploration, Sun Exploration), and the Nature Conservancy. These guidelines (Appendix J) are considered tentative and subject to revision. When followed, they will mitigate, but not eliminate influences of human activities on grizzly bears and their habitat.

C. Coordination With Other Landowners

Because the vast majority of grizzly habitat is on public land, it is crucial that any activity planned for these areas be designed, permitted, and implemented in a manner that will have minimal impact on the bear and its habitat. Therefore, the Department makes a major effort to influence activities proposed for occupied bear habitat.

These efforts vary from attempting to influence national policy and land allocation issues to making recommendations on specific activities. The 1985-2030 Resources Planning

Act Program provides the nationwide foundation for the forest planning process that is now being completed. The Department thoroughly reviewed this program and submitted comments through the Governor's office. A number of these comments described roadless or "minimum level management" as being the most appropriate course of action for our threatened and endangered species.

The Roadless Area Review and Evaluation (RARE II) process and subsequent Montana Wilderness Bill are other examples of land allocation issues in which the Department invested major efforts. Wilderness, both classified and de facto, is a critical component of grizzly bear habitat. Attempts to protect unclassified areas from encroachments proposed by federal agencies and industry is a never-ending effort.

Closely tied to the wilderness allocation process are the forest plans which are now being developed for all national forests in Montana. Commentary on these plans included efforts to keep occupied wildlands wild, and to develop and implement standards and guidelines for the protection of bears in habitat that has roads.

The Department responds to local land management actions which may have an impact on grizzly bears. These include grazing, timber sales and associated roads, oil and gas exploration, hard-rock mining and exploration, small-scale hydro-electric developments, ski resorts, land exchanges, and off-road vehicles (snowmobiles, ATVs, and motorbikes). There are opportunities to influence the extent and timing of these activities on federal lands, although the federal agencies are somewhat reluctant to do so. On private and industry lands, these opportunities are available only when landowners are cooperative.

In some instances, Department personnel are invited to participate on "Interdisciplinary Teams" which are formed by federal agencies to consider and analyze certain land-use proposals. When not provided with these opportunities, Department personnel respond to environmental impact statements, environmental assessments, land reports, allotment management plans, travel plans, and other documents prepared by federal and state agencies.

In summary, management of the grizzly bear is vested in the state of Montana under guidelines established by the Fish and Wildlife Service under the Endangered Species Act. This arrangement is complicated because little occupied bear habitat is under the management of either agency. Therefore, an important aspect of the Department's bear management program is the effort to influence land-use activities permitted and promoted by other land managers.

D. Northwest Power Act--Grizzly Bear Mitigation

In 1980 Congress passed the Pacific Northwest Power Planning and Conservation Act. Its purpose is: (1) to restore the region's fish and wildlife resources through appropriate mitigation, protection, and enhancement actions, and (2) to develop the region's electric power and conservation plan. The act also specified that the Bonneville Power Authority must uses all its funding and legal resources to implement the purposes of the act.

The Department, in conjunction with other entities and agencies, assessed wildlife losses and developed mitigation and enhancement plans for five hydroelectric projects in northwestern Montana. These projects were in Libby, Hungry Horse, Noxon Rapids, Cabinet Gorge, and Thompson Falls. Impacts to the grizzly bear were identified for all five facilities with the greatest documented for the Hungry Horse project (Casey and Yde 1984, Mundinger and Yde 1984, Wood and Olsen 1984).

For each of the five dams, specific projects for wildlife mitigation (including those to benefit grizzly bear) have been recommended. However, before these projects can be implemented, they must be approved and funded by the appropriate federal or private entity or both.

XV. INTERAGENCY COORDINATION

Montana is currently a member of the Interagency Grizzly Bear Committee (IGBC) (Appendix K). The committee meets at least twice a year to coordinate all the grizzly bear management and research activities of agencies involved with the grizzly bear. Three management subcommittees (Yellowstone, Northern Continental Divide, and Northwest) and one research subcommittee were formed to implement the actions outlined by the IGBC. These subcommittees also meet at least twice each year. Department personnel spend 20-30 man-days per year attending these various committee and subcommittee meetings. Additional time is spent responding to proposals for action presented to the committees.

In addition to the IGBC, the Department meets at least once annually with the U.S. Forest Service (USFS) and Bureau of Land Management (BLM) to coordinate activities and resolve management problems. The Department has 3 wildlife biologists participating in the interagency cumulative effects process.

The Department also coordinates with the U.S. Fish and Wildlife Service (USFWS) through their local Endangered Species office and grizzly bear recovery coordinator. This coordination primarily involves Section 7 (Endangered Species Act) consulting on development activities for public land, and responding to nuisance grizzly complaints.

Section 7 consulting procedures begin with a federal determination that a particular activity may affect the grizzly bear. The federal agency then requests an opinion from the USFWS.

The Endangered Species office formally requests information from the Department pertaining to the particular development activity and bear population. The Department provides the pertinent information and the Endangered Species office develops the recommendation. This recommendation indicates whether the project will likely jeopardize the grizzly bear. If a jeopardy opinion is rendered, the recommendation must include a list of measures that can allow the project to continue if implemented. The federal agency initiating the consultation then denies the project unless the measures listed are met by the developer. Because no legal authority is granted the Department in these consultations, our role is primarily to provide information and suggest action.

Since 1978 there have been 104 Section 7 consultations on threatened or endangered species in Montana, resulting in 16 jeopardy and 86 no jeopardy decisions, and 2 decisions that the action would promote conservation of the species. Seventy (67%) of these consultations have involved the grizzly bear. Thirteen (19%) of which resulted in jeopardy

decisions, 55 (79%) resulted in no jeopardy and 2 (3%) resulted in a determination that the action would promote conservation of the grizzly bear. Of the 16 jeopardy decisions for all species, 13 of which were for the grizzly bear, 13 (81%) and 10 (77%), respectively, were subsequently determined as no jeopardy either because the developers decided not to proceed with the activity or mitigative measures were met by the developers. In summary then, only 3 (3%) of 104 Section 7 consultations ultimately resulted in USFWS jeopardy decisions.

Nuisance grizzly complaints are coordinated with the USFWS through their grizzly bear recovery coordinator. Nuisance grizzly guidelines have been developed for use in the NCDE and CYE (Appendix G). Current procedures require a conference call between involved agency contacts prior to any action. The Department has authority to determine the fate of the bear if agreement cannot be reached between the agencies. Department personnel or USFWS Animal Damage Control agents implement all relocation of or control of grizzly bears outside national parks and Indian reservations. Relocation of a grizzly bear requires prior approval of the appropriate landowner (usually USFS).

As discussed earlier in Land Management, Section XIV, cooperative management guidelines have been developed for the RMEF. Guidelines for hardrock mining activities are also being developed in the Cabinet Mountains through a coordinated research study in that area.

XVI. MANAGEMENT ALTERNATIVES

Management alternatives for the NCDE and CYE are discussed in this section. Two major alternatives are possible. One uses hunting as a management tool, the other excludes the use of hunting. Within each of these alternatives, five management options are presented. These options vary depending on population density. Management direction under each option is the same whether using the hunting or nonhunting alternative. Management techniques, though, do vary between these alternatives. In this manner, present and future Department management direction can be identified and evaluated.

Many of the factors which directly affect grizzly population status and trends are not under Department control. Some examples include habitat acquisition, levels of recreational visitor use in grizzly habitat, road access, resource exploration/development activities, timber harvest activities, recreational development activities, domestic livestock grazing, natural fire policies, and the harvest of grizzly bears by Native Americans for religious purposes.

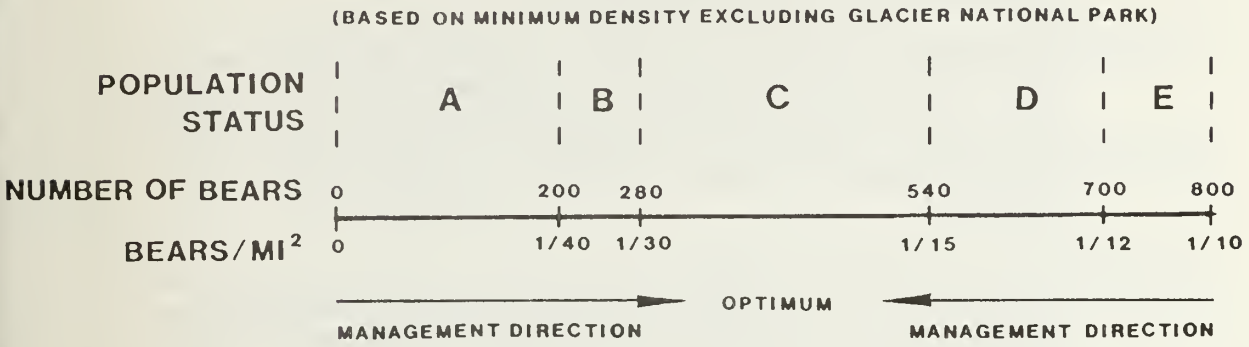
The Department recognizes that unlimited grizzly bear population growth is socially unacceptable in both the CYE and NCDE. The optimum goals for both ecosystems were based on both biological and social parameters. Because the optimum goals are ecosystem-wide, there may be localized areas of high or low densities. The optimum for both the CYE and NCDE, established by the Department, are at or above the recovery goals listed in the Grizzly Bear Recovery Plan (USDI 1982).

In the discussion of options to follow, it should be recognized in interpreting the following charts that as the population status moves from the optimum, more or less restrictions as appropriate will be required to bring the status back to the optimum. Population status C then, is the status the Department recommends managing for in both ecosystems whether using the hunting or nonhunting alternative.

The Department's management goals in the NCDE are, first, to manage for a recovered grizzly bear population, second, to maintain distribution in the management area as defined in Fig. 3 and third, seek to maintain the habitat in a condition suitable to sustain the grizzly population (excluding Glacier National Park) at an average density of 1 bear/30 mi^2 to 1 bear/15 mi^2. (The bears in Glacier National Park have been excluded from the Department's management program. The Department has no management jurisdiction within the Park and without more sufficient information on dispersal considers it inappropriate to consider dispersal from the Park in justifying a management

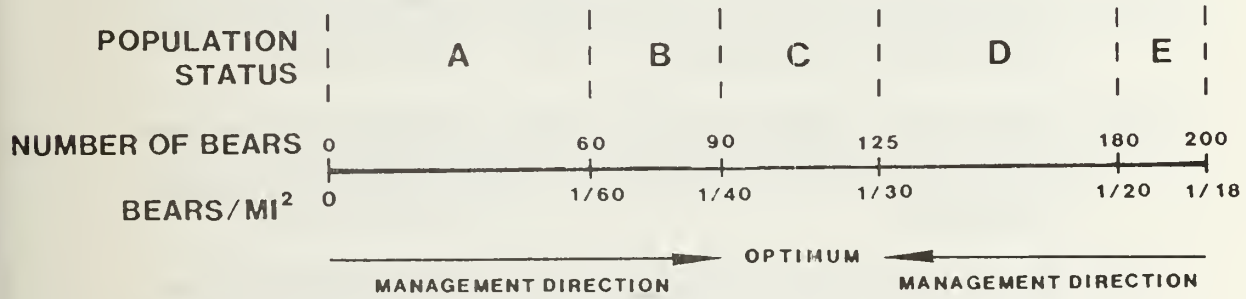
program.) This density range is represented as the "Optimum" in the following chart.

NORTHERN CONTINENTAL DIVIDE ECOSYSTEM (NCDE)



The goals in the CYE are to manage for a recovered grizzly bear population, to maintain distribution in the management area defined in Fig. 4, and seek to maintain the habitat in a condition suitable to sustain grizzly populations at an average density of 1 bear/40 mi^2 to 1 bear/30 mi^2. This density range is represented as the "Optimum" in the chart below.

CABINET YAAK ECOSYSTEM (CYE)



A. Management Alternative 1: No Grizzly Bear Hunting

This section presents the options available under the nonhunting alternative with respect to each population status. Management under each status would use management tools excluding hunting to move the population towards status C.

1. Population Status A:

   a. The Department would seek to eliminate all man-caused mortality. This would serve to increase the number of grizzly bears in the ecosystems.

b. An aggressive aversive conditioning/deterrent program would be necessary before eliminating control action mortality. A reevaluation of the most current "control action guidelines" would be necessary to reduce control dispatches. Transplant of nuisance bears out of the ecosystems would be eliminated.

c. Black bear hunting in grizzly bear management areas may be modified if appropriate. Black bear hunters would be required to complete a hunter education course detailing the identification and habits of the two bear species.

d. To eliminate the loss of grizzly bears in defense of personal property, it would be necessary to implement severe penalties for mortalities due to this cause. However, this policy is inconsistent with Montana's constitution permitting defense of life and property. It may be necessary to evaluate this constitutional right in regard to the level of mortality from this cause.

   In addition, a compensation program would be required to reimburse those suffering damages due to grizzlies.

e. An active public relations program would be initiated to inform people of ways to eliminate man-caused mortality.

f. An active augmentation/reintroduction program would be recommended. All bears lost to man-caused mortality would be replaced as soon as possible.

g. The Department would seek through coordination with state, federal, private, and corporate organizations to minimize or eliminate human activities destructive to the bear in remaining habitat.

h. The Department would substantially increase enforcement activities and seek increased penalties to eliminate illegal mortalities.

2. Population Status B:

a. The Department would seek to substantially reduce all man-caused mortality. This might allow an increase in grizzly bear numbers in the ecosystems.

b. An aversive conditioning/deterrent program would be necessary before reducing control action mortality. In addition, current "control action guidelines" would be re-evaluated to reduce control dispatches. Transplant of nuisance bears out of the ecosystems would be minimized.

c. Some modification of black bear hunting in grizzly bear management areas may be required to reduce mistaken identity kills.

d. To reduce the loss of grizzly bears in defense of personal property, a compensation program may be initiated.

e. A public relations program would be initiated to suggest measures to minimize man-caused mortalities.

f. The Department would seek to minimize habitat impacts through coordination with state, federal, private and corporate organizations.

g. The Department would increase enforcement activities directed at bears to assist in reducing illegal mortalities.

3. Population Status C:

a. The Department would seek to minimize man-caused mortality. This would allow the population to stabilize or increase.

b. An aversive conditioning/deterrent program would be applied in selected cases. Transplant of nuisance bears from the ecosystems would be acceptable.

c. Few, if any, modifications would be placed on black bear hunting.

d. Damage compensation by private conservation groups would be encouraged.

e. A public relations program of moderate intensity would be initiated suggesting measures to minimize man-caused mortality.

f. The Department would seek through coordination with other agencies to modify human activities in bear habitat in such a manner as to minimize impacts on bears.

g. Enforcement activities would continue at a moderate level.

h. The Department would evaluate implementing the hunting alternative.

4. Population Status D:

   a. The Department would not seek to minimize all man-caused mortality. This may serve to reduce the number of bears in the ecosystems.

   b. A reevaluation of "control action guidelines" would be necessary to increase control dispatches.

   c. Transplant of nuisance bears from the ecosystems would be encouraged.

   d. A public relations program would be initiated to inform people on how to live with higher bear populations.

   e. A compensation program by private groups would be encouraged for limited areas, as costs become increasingly higher.

   f. The Department would develop methods to deal with higher grizzly numbers through coordination with other agencies. Restrictions on human intrusions would be less severe.

   g. Enforcement activities would be at a low level.

   h. The Department would evaluate implementing the hunting alternative.

5. Population Status E:

   a. The Department would encourage man-caused mortalities (other than sport hunting). This may serve to substantially reduce grizzly bear numbers in the ecosystems. Encouraged man-caused mortalities would include primarily the shooting of depredating grizzlies.

   b. The Department would need to dispatch nuisance or depredating bears in all management areas.

   c. An active public relations program would be necessary to suggest measures to reduce loss of life and personal property.

   d. The cost of a compensation program would probably be too high to justify its continuation.

e. Restrictions on human activities in management areas would be minimized.

f. The Department would develop methods to deal with higher numbers through coordination with other agencies. Restrictions on human intrusions would be less severe.

g. Enforcement efforts would be at a very low level.

h. The Department would evaluate implementing the hunting alternative.

B. Management Alternative 2: Grizzly Bear Hunting

This section presents the management options available under the hunting alternative with respect to each population status. Management under each status would use management tools including hunting to move the population towards status C.

1. Population Status A:

a. Grizzly bear hunting season closed.

1) It is likely that prohibition of hunting would reduce total annual mortality. Average annual mortality reported from 1970-1984 in the Greater Yellowstone Ecosystem (Knight, unpublished data) decreased from 29.8/year prior to 1975 to 10.1/year since 1975 when hunting was prohibited in Wyoming and Montana.

2) If hunting mortality is additive, its elimination may allow an increase in the populations.

3) In addition, what little potential exists for mortality due to crippling by hunters, would be eliminated.

b. The Department will evaluate implementing the nonhunting alternative.

c. Black bear hunting in grizzly bear management areas may be modified if appropriate. Black bear hunters would be required to complete a hunter education course specifically designed for bear hunting and the identification and habits of the two bear species.

d. The Department would seek to eliminate all man-caused mortality. This may serve to increase the number of grizzly bears in the ecosystems.

e. An aggressive aversive conditioning/deterrent program would be necessary before eliminating control action mortality. A reevaluation of the most current "control action guidelines" would be necessary to reduce control dispatches. Transplant of nuisance bears out of the ecosystems would be eliminated.

f. To eliminate the loss of grizzlies in defense of personal property it would be necessary to implement severe penalties for mortalities due to this cause. However, this policy is inconsistent with Montana's constitution permitting defense of life and property. It may be necessary to evaluate this constitutional right in regard to the level of mortality from this cause.

In addition, a compensation program may be required to reimburse those suffering damages due to grizzlies.

g. An active public relations program would be initiated to inform people of ways to eliminate man-caused mortality.

h. An active augmentation/reintroduction program would be recommended. All bears lost to man-caused mortality would be replaced as soon as possible.

i. The Department would seek through coordination with state, federal, private, and corporate organizations to minimize and/or eliminate human activities negative to the bear in remaining habitat.

j. The Department would substantially increase enforcement activities and seek increased penalties to eliminate illegal mortalities.

2. Population Status B:

a. Limited grizzly bear hunting season.

Option 1: Spring season (limited entry, limited harvest):

1) A limited entry hunt would reduce hunting mortality if the number of permits issued

served to restrict the number of hunters in the field.

2) A spring season would concentrate hunters and hunter harvest in small areas because weather conditions and snow accumulations during the spring restrict accessibility.

3) Hunting success would be high because of vulnerability of bears. Troyer (1961) and Cooney (1953) reported a higher success rate for spring brown bear seasons than for fall seasons. Also, without the option available during the fall of taking a bear incidental to deer or elk hunting, only those hunters actually hunting a grizzly bear would be licensed. With hunting efforts concentrated on bears, success would likely be high.

4) Female mortality would be low. Troyer (1961), Pearson (1975), and Stirling et al. (1976) reported spring seasons produced a low percentage of females in the harvest. Protection of females with cubs or other young by regulations would also serve to keep female mortality low.

5) Population segments inhabiting wilderness areas may increase. A large portion of the total hunter harvest in the NCDE since 1967 has come from wilderness areas (Fig. 27) during the early fall season. Access to wilderness areas is very restricted in the spring due to weather conditions and snow accumulations.

6) Hunter opportunity would be reduced with a "limited-entry" permit because the opportunity to hunt would be reduced to successful applicants.

Option 2: Hunt in alternate years (limited harvest):

1) It is likely that prohibition of hunting in alternate years would reduce total annual mortality at least temporarily. Average annual mortality reported from 1970-1984 in the Greater Yellowstone Ecosystem (Knight, unpublished data) decreased from 29.8/year prior to 1975 to 10.1/year since 1975 when hunting was prohibited in Wyoming and Montana. Reynolds (pers. comm.) reports that Alaska uses the regulation of hunting in alternate years in areas of high hunting

pressure to reduce harvest without going to permit hunts.

2) If hunting mortality is additive, its elimination in alternate years may allow an increase in the populations.

3) Eliminating the hunting season in alternative years would erase the potential for mortality due to crippling by hunters.

b. The Department would seek to substantially reduce all illegal man-caused mortality.

c. The Department would evaluate implementing the nonhunting alternative.

d. An aversive conditioning/deterrent program would be necessary before reducing control action mortality. In addition, current "control action guidelines" would be re-evaluated to reduce control dispatches. Transplant of nuisance bears out of the ecosystems would be minimized.

e. Some modification of black bear hunting in grizzly bear habitat may be required to reduce mistaken identity kills.

f. A compensation program may be required to reduce the loss of personal property caused by grizzly bears.

g. A public relations program would be initiated to suggest measures to minimize man-caused mortalities.

h. The Department would seek to minimize habitat impacts through coordination with state, federal, private and corporate organizations.

i. The Department would increase enforcement activities directed at bears to assist in reducing illegal mortalities.

3. Population Status C:

a. Grizzly bear hunting season open.

Option 1: Spring Season (unlimited entry, limited harvest):

1) Hunting success may be high because of vulnerability of bears in the spring. Troyer (1961) and Cooney (1953) reported a higher success rate for spring brown bear

seasons than for fall seasons. Also, without a fall season concurrent with the ungulate season only those hunters actually hunting a grizzly bear would be licensed. With the hunting effort concentrated on bears, success would likely be high relative to a fall season. Greer (1972, 1974) reported that 90% in 1971 and 93% in 1973 of successful grizzly hunters were primarily hunting elk. Pearson (1975) reported that most grizzlies in the Yukon are taken incidental to hunting other big game.

2) Female mortality would be low. Troyer (1961), Pearson (1975), and Stirling et al. (1976) reported spring seasons produced a lower percentage of females in the harvest than fall seasons. Protection of females with cubs or other young by regulations would serve to keep female mortality low. Females which wean their young in the spring are protected during spring seasons, but are vulnerable the following fall.

3) Population segments inhabiting wilderness areas may increase. A large portion of the total hunter harvest in the NCDE since 1967 has come from wilderness areas (Figure 27) during the early fall season. Access to wilderness areas is very restricted in the spring due to weather conditions and snow accumulations.

4) Eliminates the opportunity to legally harvest problem bears in the backcountry during general hunting seasons. From the hunting season in 1971, 2 grizzlies were shot in hunter camps (Greer 1972). In 1973, one grizzly bear was killed in a hunter camp (Greer 1974). Knight and Eberhardt (1984) also discuss grizzly bear/ outfitter problems.

5) A spring season would concentrate hunters and hunter harvest because weather conditions and snow accumulations during the spring restrict accessibility.

Option 2: Fall Season

1) A fall hunting season provides an opportunity to legally harvest grizzly bears depredating hunter camps or harvested game, and bears involved in other bear/human incidents. From the hunting season in 1971,

2 grizzlies were shot in hunter camps (Greer 1972). In 1973, one grizzly bear was killed in a hunter camp (Greer 1974). Knight and Eberhardt (1984) also discuss grizzly bear/ outfitter problems.

2) Female mortality may be high unless restricted through regulations. Troyer (1961), Pearson (1975), and Stirling et al. (1976) reported fall seasons produced a higher percentage of females in the harvest than spring seasons. Females which wean their young in spring, but may have been protected during a spring season would be vulnerable during the fall when unaccompanied by young.

3) Hunting success may be lower than a comparable spring season. Troyer (1961) and Cooney (1953) reported a lower success rate for fall brown bear seasons than for spring seasons. In the NCDE most grizzly hunting has been done incidental to elk hunting (Greer 1972, 1974a) and has resulted in low success.

b. The Department will seek to minimize non-hunting man-caused mortality. This may allow the population to stabilize or increase.

c. An aversive conditioning/deterrent program may be applied in selected cases. Transplant of nuisance bears from the ecosystems would be acceptable.

d. Few, if any, modifications would be placed on black bear hunting.

e. Damage compensation by private conservation groups would be encouraged.

f. A public relations program of moderate intensity will be initiated suggesting measures to minimize man-caused mortality.

g. The Department would seek through coordination with other agencies to modify human activities in bear habitat in such a manner as to minimize impacts on bears.

h. Enforcement activities would continue at a moderate level.

4. Population Status D:

a. Liberal grizzly bear hunting season.

1. Split season (spring and fall, limited harvest):

a) When compared to any single season option or to the historic hunting program in Montana, this option would provide a greater opportunity for hunters in Montana to harvest a grizzly bear.

b) With greater hunting opportunity this option would allow a high mortality. High success in the spring and high female vulnerability in the fall (relative to spring) would be operative (Troyer 1961, Cooney 1953, Stirling et al. 1976, Pearson 1975).

b. The Department would not seek to minimize all man-caused mortality. This may serve to reduce the number of bears in the ecosystems.

c. No aversive conditioning/deterrent program would be necessary. A reevaluation of "control action guidelines" would be necessary to increase control dispatches.

d. Transplant of nuisance bears from the ecosystems would be encouraged.

e. A public relations program would be initiated to inform people on how to live with increased bear populations.

f. The value of a compensation program may be questioned as costs become increasingly higher.

g. The Department would develop methods to deal with higher numbers through coordination with other agencies. Restrictions on human intrusions would be less severe.

h. Enforcement activities would be at a low level.

5. Population Status E:

a. Liberal grizzly bear hunting season.

1) Full year season (unlimited entry, limited harvest):

a) This alternative would provide maximum hunter opportunity.

b) High hunting success would occur because of hunter opportunity and the vulnerability of bears in all seasons. Troyer (1961), Cooney (1953), Pearson (1975), and Stirling et al. (1976) discuss the differential in hunter success between seasons and the vulnerabilities by sex for various hunting seasons.

c) The high hunter success and increased vulnerability of all bears, especially females, would result in high mortality by hunters and would lead to the desired decline in the populations.

b. The Department would encourage man-caused mortalities. This may serve to substantially reduce grizzly bear numbers in the ecosystems. Encouraged man-caused mortalities would include primarily the shooting of depredating grizzlies.

c. Aggressive agency control action dispatches would be necessary throughout the ecosystem.

d. An aggressive public relations program would be necessary to suggest measures to reduce loss of life and personal property.

e. The cost of a compensation program would probably be too high to justify its continuation.

f. Restrictions on human activities in management areas would be minimized.

g. The Department would develop methods to deal with higher bear numbers through coordination with other agencies. Restrictions on human intrusions would be less severe.

h. Enforcement efforts would be at a very low level.

C. REGULATIONS

It should be recognized that as the status of the populations move away from the optimum the following regulations will need to be evaluated and modified.

1. Bag limit of one grizzly bear in a lifetime.

a. The regulation would have the effect of distributing hunter opportunity more evenly among Montana's hunting public.

b. Hunters might be more selective if they were limited to one in a lifetime (Pearson 1975). This selectivity would probably have the following consequences:

1) Total mortality may be reduced if hunters don't shoot the first bear they see. Greer (1972) reported that 14 of 19 successful hunters in 1971 killed the first bear they saw. In 1973, 13 of 13 successful bear hunters shot a bear from the first group of bears they saw (i.e. 10 shot single bears and 3 saw 2 bears at the time of shooting) (Greer 1974a).

2) High hunter selectivity for large bears (males) would keep the female proportion of the harvest low (Bunnell and Tait 1985; Miller and Ballard 1982; Lindzey and Meslow 1980; Pearson 1975; Erickson 1962, 1963).

2. Prohibit the taking of young and females accompanied by young. Young are defined as two-year-olds or younger.

a. This would result in low female mortality as a high proportion of females would be protected each year.

3. Base the trophy fee on sex of harvested bears.

a. A differential trophy fee may provide greater protection to females. The Yukon Territory requires successful hunters to purchase a $750 trophy fee for females and $500 for males, and the managers there are pleased with the program (B. Smith, pers. comm., Yukon Territory Wildlife Branch, Whitehorse). To further protect females, managers in the Yukon are experimenting with a point system for outfitters in which they are allotted a number of points which serves as their bag limit. A female counts three points toward their total and a male scores one point (Smith, pers. comm.).

b. It is possible that some female mortalities may go unreported. However, this potential has not been discussed in the literature.

4. Require all bear (either species) hunters to participate in a bear education program before hunting.

a. Improves awareness of hunters as to species identification, bear habits, and shot location.

b. May reduce mortality due to mistaken identity and crippling loss.

5. Limit daylight hours during which hunters may shoot bears.

   a. This may reduce mortality due to mistaken identity and cripple loss because visibility would be better.

6. Limit black bear hunting along roads or request road closures.

   a. This regulation might help reduce mistaken identity mortality. Most mortality of this source has occurred near roads.

7. Permit the use of baiting and dogs to hunt grizzly bears.

   a. This may cause high hunter harvest. Roop (pers. comm.) stated that four grizzly bears were shot over black bear baits in 1982 leading to a ban on black bear baiting in grizzly habitat. Kohn (1982) and LeCount (1982) reported that a large proportion of black bears harvested in Wisconsin and Arizona, respectively, were taken with the use of baits. Kohn (1982) stated black bears in Wisconsin were harvested primarily by the use of hounds or bait.

   b. The use of dogs may result in a high proportion of females in the hunter harvest. LeCount (1982) reported the use of hounds to be a very successful hunting technique for black bears and that females were more vulnerable to this technique than males. Kohn (1982) and Poelker and Hartwell (1973) also reported dog hunting to be selective toward females.

   c. Baiting may result in a high proportion of males in the harvest. LeCount (1982) reported that the use of baiting in Arizona was very selective toward male black bears.

8. Close black bear hunting in grizzly bear habitat.

   a. This may reduce mortality of grizzly bears from mistaken identity for black bears. In 1983 four grizzly bear mortalities in the NCDE were caused by mistaken identity. Wyoming has recorded nine mortalities in this category since 1972 (Roop, pers. comm).

9. Prohibit the taking of other than male bears.

    a. Total and female mortality would be reduced. This regulation may be enforceable, but it is unrealistic. Even the most experienced observers find it difficult, if not impossible, to distinguish the sex of a free-ranging bear.

10. The grizzly bear hunting season will close on 48 hours notice when the total mortality quota is reached, or it will be closed in areas where female subquotas have been met.

    a. This provides control over the allowable mortality.

11. Hunters must retain the hide and head from each grizzly bear taken. Evidence of sex must remain intact on the skin or carcass.

12. Prohibit all persons from removing any portion of a grizzly bear from the state of Montana without first purchasing a trophy license.

13. Hunters taking a grizzly bear must report the kill within 48 hours to an officer of the Department and must personally present the hide and skull within 10 days to an officer of the Department for purposes of inspection, tagging and recording of kill.

    a. This regulation as well as (11) and (12) provide the Department with information from hunter kills which is required for management purposes.

14. If appropriate, adjust the total or female mortality quota the year following any year they are exceeded.

    a. This provides a greater opportunity to regulate total mortality with added caution.

15. Increase resident and nonresident license fees.

    a. This provides additional revenues for grizzly bear management.

    b. This may reduce the number of grizzlies shot by hunters incidental to the hunting of other species.

    c. This may cause hunters to be more selective with the possible result of a low proportion of females in the harvest.

16. Require successful hunters to take a warden to the kill site, if requested.

a. This may improve law enforcement capabilities.

b. This may also serve to reduce illegal hunting mortalities.

17. Request that hunters not shoot any bear in a group.

a. This may reduce female mortality as most groups are family groups.

D. Grizzly Bear Management Units

1. Base management units on deer/elk hunting districts (Fig. 13).

a. This presents the problem of requiring management information that is not feasible to obtain for small areas.

b. There is risk of overharvest in small units because of the inability to collect population information for these units.

c. If population data were available for these small areas, management could be more tightly controlled.

2. Divide the NCDE into two management units separated by the Continental Divide (Fig. 28).

a. This is an arbitrary division of the ecosystem which does not consider available information.

b. The harvest may be concentrated in a few easily accessible areas, thereby overharvesting some areas and underharvesting others.

3. Base management units on large areas of similarity in habitat quality, habitat use, mortality patterns, home-range size and overlap and other ecological factors (Fig. 29).

a. This provides more management flexibility because precise information for small areas is not required.

b. Population information currently available (Martinka 1974, Mace and Jonkel 1980, Servheen 1981, McClellan 1984, Aune et al. 1984) may be applied to such areas (Zunino and Herrero 1972, Pearson 1975, Lortie 1978, Reynolds and Hechtel 1980, Miller and Ballard 1982, Tompa 1984, van Drimmelen 1984).

c. Because these unit boundaries cross wilderness

and non-wilderness boundaries it may not be possible to open the grizzly bear hunting season in wilderness areas at the same time as the deer and elk season. If the wilderness areas open as late as the general deer and elk season, the grizzly bear harvest in wilderness areas may be very low. The limited accessibility of wilderness areas, because of the later opening date, may limit hunter opportunity in wilderness areas. A later opening date will eliminate opportunity during the early deer and elk season.

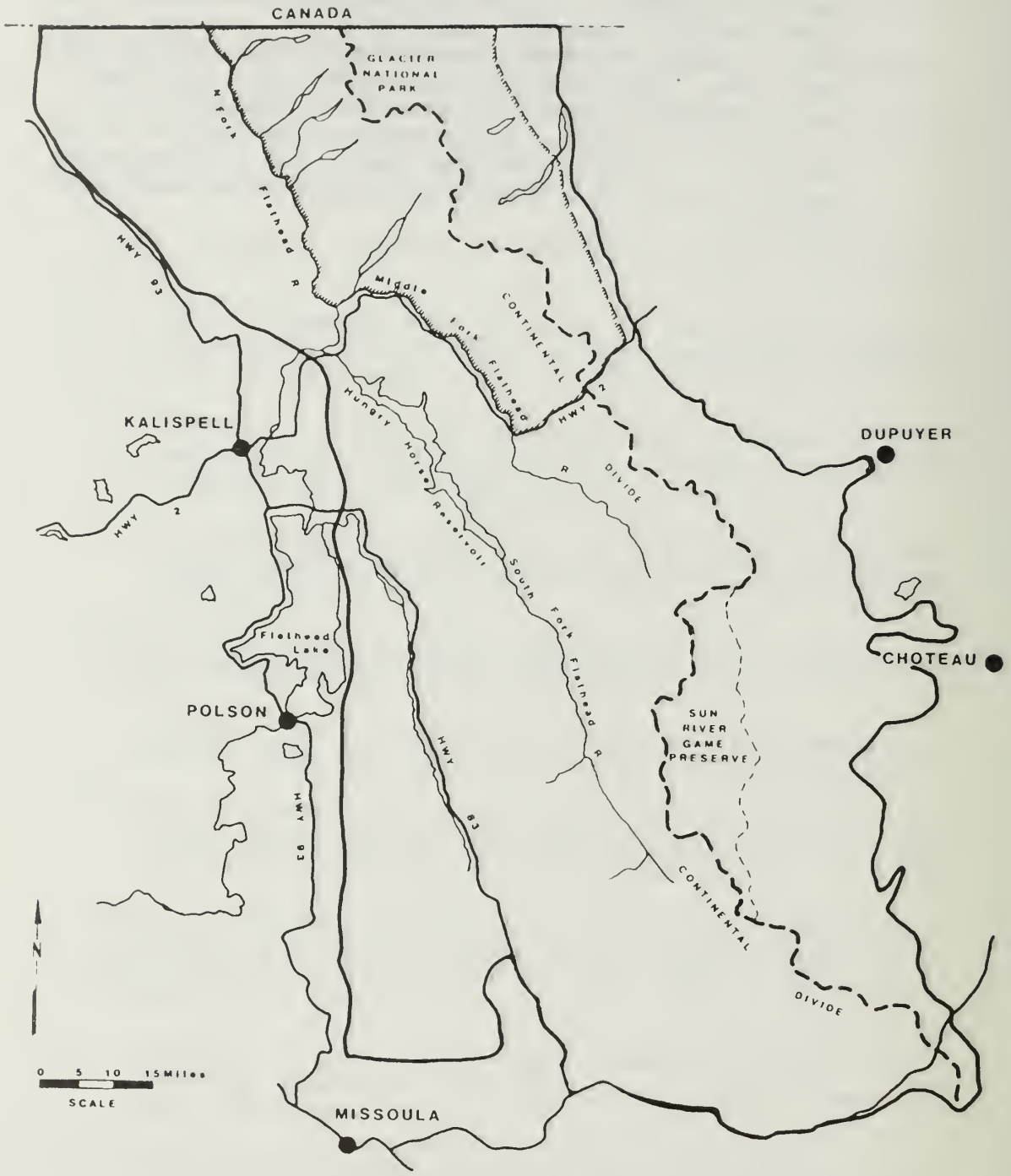


Figure 28. Two grizzly bear management units in the NCDE divided by the Continental Divide.

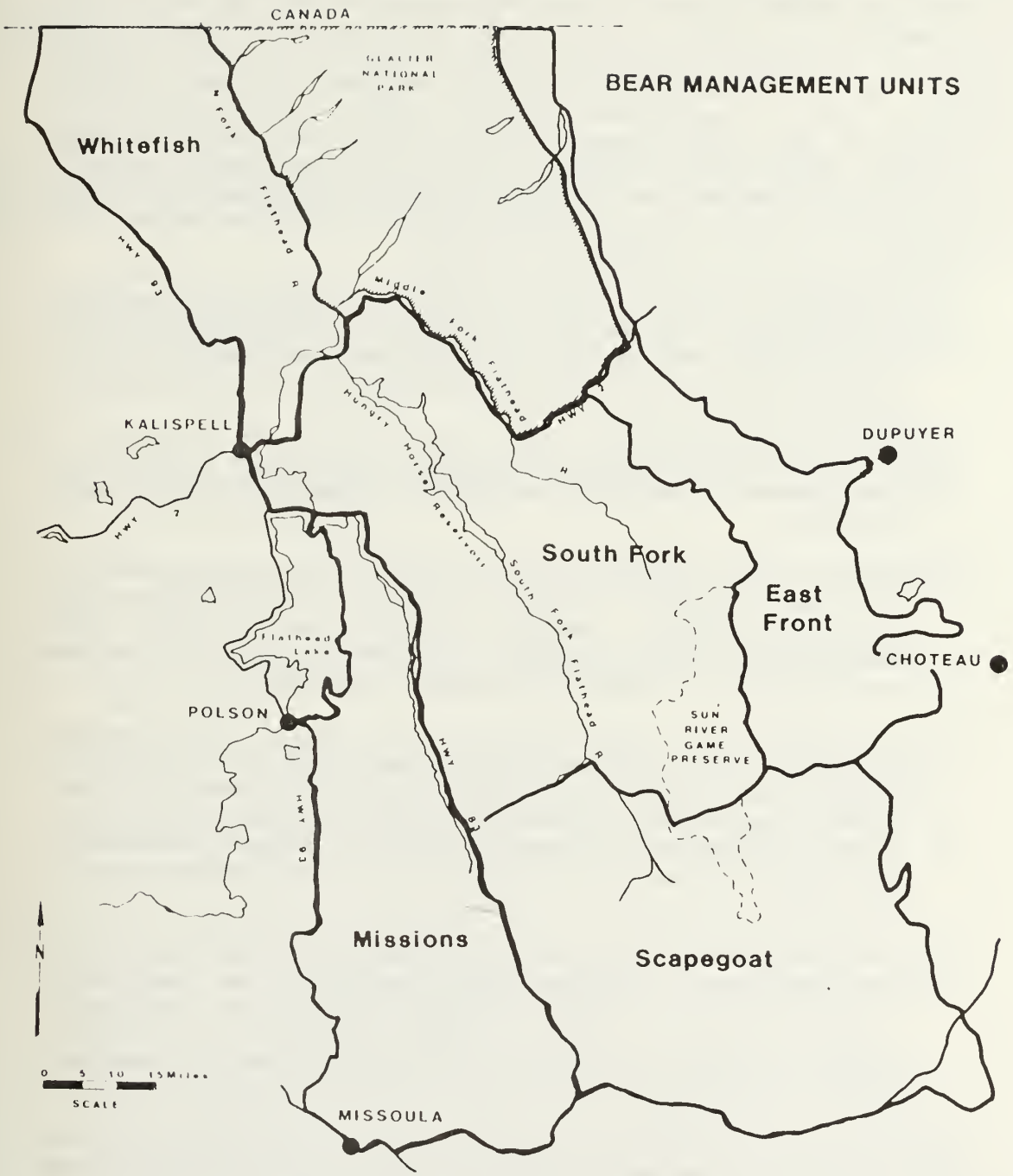


Figure 29. Grizzly bear management units divided into ecologically similar units.

XVII. PREFERRED ALTERNATIVE

The management program preferred by the Department is the hunting alternative (Alternative 2). This is the preferred alternative for both the NCDE and the CYE. However, the difference in population status in the two ecosystems demands a different management option for each. The preceding portions of this EIS indicate that the present status of the NCDE is stable to increasing at an estimated minimum of 356 (excluding Glacier National Park). This indicates that a regulated hunting season under Population Status C should be recommended. Further, the Department recommends that this hunting season be conducted under a total mortality quota and a female mortality subquota, both of which would apply only to the NCDE. A hunting season is recommended for the following reasons:

1. An average of 11 grizzly bears are legally harvested annually in the NCDE. There is no evidence in the population structure or population trend data to suggest this level of legal harvest is detrimental to the population.

2. Hunters might legally harvest problem bears and bear/human conflicts could be reduced through such harvest.

3. Hunting may reduce the need for agency control of problem bears. Troyer (1961), Greer (1976b), Mysterud (1980), Poelker and Parsons (1980), and Waddell and Brown (1984) all indicated that hunting can reduce the need for control actions.

4. Hunting may cause bears to be wary of humans. Evidence is provided by Mysterud (1977) and Elgmork (1978) who reported wariness in brown bear populations long exposed to human exploitation. Herrero (1985) provides evidence that bear/human incidents are more frequent in unhunted than hunted bear populations.

5. Hunting grizzlies may increase cub survival and recruitment providing for population increase (Lindzey et al. 1983, Inukai 1972, Young and Ruff 1982, Troyer and Hensel 1964, Glenn et al. 1976, Pearson 1976, Reynolds and Hechtel 1980, Stringham 1983).

The status in the CYE indicates that the recommended management action there should be listed under Population Status A (i.e. grizzly hunting season closed).

The Department recommends that future management actions in each ecosystem be based on the status of each of the populations as determined by reviewing the following

criteria. It should be recognized that population status will be determined not by any one of these criteria, rather, a collection of the best available information from these criteria will be used. Very few of these criteria allow for determination of population status in the short term (i.e. 1-5 years). They are more appropriate for determination of long term (i.e. 10 years) changes in status.

A. Criteria for Determining Population Status.

Several important factors have been identified in this EIS that will be evaluated by the Department when determining population status. These criteria and a brief description of each are given below.

1. Federal Restrictions: Federal laws and regulations may have major influence on Department regulations. Specifically, the Endangered Species Act, the Code of Federal Regulations, and the Grizzly Bear Recovery Plan will be consulted.

2. Results of population trend surveys: A systematic method to survey public and professional sectors will be developed. Results of the most recent survey will be consulted.

3. Professional opinions will be gathered at an annual meeting.

4. Public opinions and perceptions from annual tentative season meetings will be solicited and evaluated.

5. Results of population and habitat research will be consulted. Specific changes in age structure, illegal mortality from marked bears, population densities, habitat use, and habitat quality will be considered.

6. Major changes in human use of management areas will be evaluated. Because Montana's grizzly bears are linked to those in Canada, Canadian land-use changes will be tracked as well.

7. Changes in the population status in Canada and U.S. and Canadian parks will be gathered through discussions with the appropriate management agency.

8. Changes in federal road closure policies will be evaluated because they influence the number of grizzly bears susceptible to mortality.

9. The realized or perceived changes in the price of grizzly bear parts will be evaluated. Such changes

may affect the level of profiteering.

10. An attempt will be made to document grizzly bear range expansions or contractions through data gathering. This data will help evaluate changes in the population status.

11. Based on all available evidence, changes in management areas or management unit boundaries will be evaluated.

12. The number of control actions will be determined annually. If a trend is apparent in 4 or 5 years of analysis, then the program will be re-evaluated. The number of transplants from or into the ecosystems will be documented.

13. Grizzly bear management policies in Glacier National Park, the Flathead Indian Reservation, and the Blackfeet Indian Reservation will be evaluated in relation to Department policies.

14. As further information is accumulated on transplant success, the opportunities and limitations of the technique will be evaluated. Scrutiny of population augmentation as an effective management tool will also be conducted.

15. Evaluation of hunter harvest statistics will be conducted. The following mortality statistics are of particular importance:

    a. Male/female sex ratio.

    b. Mean age of harvest: mean ages should be calculated separately for males and females.

    c. Determine total mortality: trends in total number of bears should be evaluated in conjunction with other population statistics to determine if changes in mortality quotas are needed.

16. Monitor litter sizes: litter sizes throughout the ecosystems will be recorded and evaluated annually.

17. Evaluate hunter effort: the annual hunter questionnaire recommended later in this EIS will be evaluated. Changes in hunter effort, number of shots fired, location of hunt, etc. will substantially aid interpretation of population statistics.

B. Regulations

Because the recommended management of the CYE population

comes under Population Status A, with a closed hunting season, no hunting regulations will be recommended for the CYE at this time. However, because the NCDE population is judged as being under Status C with the grizzly bear hunting season open, some hunting regulations should be recommended. The regulations recommended include:

1. Bag limit of 1 grizzly in a lifetime.

2. Prohibit the taking of young and females accompanied by young. (Young are defined as two-year-olds or younger.)

3. The grizzly bear hunting season will close on 48-hours notice when the total mortality quota is reached, or it will be closed in areas where female subquotas have been met.

4. Hunters must retain the hide and head from each grizzly bear taken. Evidence of sex must remain intact on the skin or carcass.

5. Prohibit all persons from removing any portion of a grizzly from the state of Montana without first purchasing a trophy license.

6. Hunters taking a grizzly bear must report the kill within 48 hours to an officer of the Department. Furthermore, the hunter must personally present the hide and skull within 10 days to an officer of the Department for inspection, tagging, and recording of kill.

7. If appropriate, adjust the total or female mortality quota the year following any year it is exceeded.

8. Request that hunters not shoot any bear in a group.

The justifications for these regulations were discussed previously (see Regulations under MANAGEMENT ALTERNATIVES). It should be noted that regulations 3-6 are already in place.

C. Grizzly Bear Management Units (BMUs)

The Department prefers to treat the entire CYE as one management unit. Little population or habitat information is available to recommend any other alternative. Research currently in progress (Kasworm 1985) may provide information that would change this recommendation.

Within the NCDE the Department recommends establishing the 5 BMUs presented in Fig. 29 and described in Appendix L. These will provide the areas within which the Preferred

Alternative for the NCDE may be applied. If necessary, adjustments to the unit boundaries will be made as information accumulates.

D. Recommended Mortality Rate for the NCDE

The annual known total mortality in the NCDE since 1975 has averaged 19 bears, or a rate of 5% based on the current estimate (356) of the minimum population exclusive of Glacier National Park. Estimated unreported man-caused mortality averages 7 bears a year, based on this population estimate, for a total mortality of 26 bears or 7% of our estimate of the minimum population. Considering the park population in our estimate would reduce this rate considerably (to 5%).

In other areas, recommended or reported hunter harvest, total known man-caused, and total known man-caused and natural mortality is 3-7%, 3-8.2%, and 10.5-14.4%, respectively (Table 21). Hunter harvest, total known man-caused mortality, and total known man-caused and estimated unreported man-caused mortality have averaged 3%, 5%, and 7%, respectively, in the NCDE since 1975.

The mortality rates of 8.2 and 14.4% reported by Craighead et al. (1974) for recorded and total mortality are from a population they reported to be increasing at an annual rate of 2.4%. McCullough (1981) re-evaluated Craighead et al.'s (1974) findings, deriving a population estimate of 312. Using this estimate and the annual known mortality of 18.9 bears per year reported by Craighead et al. (1974) yields an annual mortality rate of 6.1%. Sidorowicz and Gilberts' (1981) mortality recommendations are based on modeling efforts with very conservative assumptions. Some of these assumptions include, but are not limited to: 1) age at first reproduction of 7 years, 2) 2 litters per female (4 cubs per female lifetime), 3) fertility of females is from 7-15 years old, 4) all animals die at age 18. Slightly relaxing some of the assumptions in the modeling effort might increase sustainable mortality rates. Individual age class mortality rates for grizzly bear populations in North America (Table 18) are 5-23% for adults, 8-35% for subadults, 16-22% for yearlings and 22-40% for cubs.

Harris (unpublished data) has indicated that an annual mortality rate of 6.5% is sustatinable based on efforts designed to model the NCDE population. The assumptions, methods, results, and interpretations of this stochastic, density-dependent model are presented in Appendix M.

The current population status in the NCDE, the apparent trend of this population in relation to past mortality rates, and the recommended and reported mortality in the literature indicate that a proposed total man-caused

mortality rate (known and unreported) of 6.0% (21 bears) will not be excessive for the NCDE population and should allow for a continuing increase in numbers.

Because the model presented by Harris (Appendix M) is a trackable method for determining the sustainable mortality rate for the NCDE population, the Department recommends using this model for future mortality rate determinations. Furthermore, the Department recognizes the use and limitations of this model given the data available at present. As more data accumulate on grizzly bear demography, it will be possible to refine this mortality rate determination.

It is also recommended that the proportion of females in the total known man-caused mortality not exceed 40%. This ratio is based on recommended or reported male:female ratios from 60:40 to 76:24 in the literature (van Drimmelen 1984, B.C. Fish and Wildlife Branch 1979; Lortie and McDonald 1977; Harris (Appendix M); DeMarchi, pers. comm.), as well as the past ratios in the NCDE. While it is important to keep female mortality at a minimum, and the Department is taking action to keep it at a minimum, it does not need to be entirely eliminated. Proposed harvest restrictions on females and relocation guidelines regarding females should reduce female mortality from that of previous years.

XVIII. ENVIRONMENTAL IMPACTS

A. Unavoidable Environmental Effects

1. Air

The dust and exhaust from vehicles involved in hunting activity cannot be avoided. These effects will be short-term in nature and are not considered major consequences in view of present levels of hunter participation. Hunter campfires in narrow mountainous valleys will create a local source of air pollution that will be difficult to remedy. If it becomes a problem of major order, it can be minimized or avoided by stringent regulation. It will not be possible to avoid all accidental fires. Records do indicate these are a minor factor at present.

2. Soil and Vegetation

The major impacts associated with soil and vegetation can be avoided or minimized through education and enforcement programs. Local damage will occur due to the negligence of careless or uninformed people. The major effects will include destruction or disturbance of the resources by vehicles, riding, and pack animals. Fires which denude vegetation, could create a significant adverse impact in some areas. The spread of noxious weeds by vehicles and pack animals would occur in some areas.

3. Water

It is anticipated that the adverse environmental effects of hunting seasons on rivers and streams will be short-term and insignificant. A possible exception could be stream siltation from soil and vegetation disturbance, if such disturbance is severe and has long-lasting effects.

4. Appearances

The presence of hunters, their vehicles, camping equipment, animal carcasses, and gut piles are not considered a significant adverse impact because they are gone in a short time. Disturbance to soil and vegetation by hunter activity could present some long-term visual effects. Littering by hunters cannot be completely eliminated and could be an eyesore. Some litter will be visible for long periods, but most can be removed if it is disturbing enough.

5. Sounds and Smells

The sounds and smells of vehicles, firearms, and other activity associated with hunting cannot be avoided. Smells from improper garbage disposal cannot be totally eliminated but can be minimized to acceptable levels through adequate enforcement of litter laws.

6. Human Health

Gun accidents, death due to excessive physical exertion, and other accidents are an adverse effect that is inherent in hunting. Education efforts such as the Hunter Safety Program are showing success in reducing the gun accident rate. The other forms of death or injury can be influenced by education programs but will not be eliminated. The benefits of hunting are far greater than the adverse effects.

B. Irreversible and Irretrievable Resource Commitment

The level of recommended mortality, outlined in this EIS, will not result in any irreversible commitment of the resource. Because these levels of removal can be regulated or eliminated on an annual or even shorter time basis (should data indicate that to be prudent), the management program poses no threat to the species. In fact, more precise active management should be of benefit to the species.

Conversely, subdivision, energy development, and other "land development" programs are slowly but steadily altering grizzly habitat. For example, logging, clear-cutting in key areas, and the associated road-building, hauling, and clean-up can make bears more vulnerable or may disrupt the ranges and social hierarchies of bears (Kemp 1976).

Recreational developments in grizzly habitat can also threaten the bear with loss of habitat (Jonkel 1975). Such action may in fact set in motion irreversible destruction of habitat that will be detrimental to the bears.

C. Short-Term and Long-Term Impacts

A short term impact of grizzly bear hunting is that bears will be temporarily displaced from some habitat, due to hunter activity (hunting, camping). However, the area open to hunting is large and the number of hunters is relatively low. Therefore, the displacement of grizzlies by hunters will not be of much magnitude nor for more than a short time.

As human populations in grizzly habitat increase, so will the number of conflicts between man and bears. Unless human use of grizzly habitat is restricted in the short-term, present conflicts may become chronic problems to the detriment of bears.

D. Worst Case Scenario

Several comments on the preliminary draft of this EIS suggested that the Department discuss the "worst case

scenario" of what might become of the NCDE grizzly bear population. In consideration of comments, we have included the following discussion.

Because it has been suggested by some commentors on the preliminary draft of the EIS that the current population may be as low as 200, we chose to use this population as the worst case.

The mortality data since 1975 indicate that an average of 19 known mortalities have occurred each year and that this mortality has been 58% male and 42% female. It has also been suggested in comments on the EIS that unreported mortality is 4-5 times the level of legal mortality. From the mortality summary in Table 34, legal mortality has averaged 15.1/year since 1975. For purposes of the worst case, we chose to use a level of unreported mortality that is three times (45) the legal mortality. In total, then, the worst case indicates that 65 bears die each year out of a population of 200.

Because the Department has decided to use Harris' model (Appendix M) to track future mortality in the NCDE, we also used this model to project the results of the "worst case scenario." The parameters of this model remained the same as those in Appendix M except where altered to reflect the worst case as discussed above.

Ten simulated initial age structures were produced for each of 6 population sizes: 200, 300, 400, 500, 600, and 900. These 60 populations were then subjected to an annual harvest of 65 individuals. In this way, it was possible to simulate the expected annual change in bear numbers for each population size given a fixed number of annual deaths.

When simulated populations of 200 were subjected to an annual mortality of 65 bears, the populations decreased rapidly at an average annual loss of 45.9%. The initial population of 200 grizzly bears decreased to an average of 30 bears by year 3.

Populations of 300 grizzly bears harvested at an annual rate of 21.6% showed an average annual loss of 35.4%. These simulated populations had decreased to an average of 76 bears by year 5.

Simulated populations of 400, 500, and 600, harvested at an annual rate of 16.2%, 13.0%, and 10.8% respectively, each declinced in numbers. The populations of 900 all increased to an average of 1214 individuals by year 10.

If there were currently only 200 grizzly bears in the NCDE population (exclusive of Glacier National Park), then according to this "worst case scenario" the population would have been somewhere between 600 and 900 ten years ago. It

is our judgement that a decline of this magnitude would have been detectable. At present, we have no indication of a decline. In fact, the IGBC task force on the NCDE grizzly bear population trend found no indication of decline, increase, or stability. This IGBC task force also reported that there was no indication that current management threatened the population. The present status of the NCDE population, as discussed in this EIS, indicates that the projection from the "worst case scenario" is not realistic but is representative of what could be expected if the "worst case" were fact. Because the projection from the worst case is not realistic at present, there is no reason to believe that these projections will be realized in the future, given the grizzly bear management program as proposed in this EIS.

E. Current Management Program

In order to assist us in evaluating the program as recommended in this EIS, the Department used Harris' (Appendix M) grizzly bear population model to assess the effects of different annual mortality rates on simulated populations of approxiamtely 356 animals (although we recognize that biologically the population in the NCDE excluding Glacier National Park is not an isolated population).

Specific model parameters and assumptions are given by Harris (Appendix M). Nine unique simulated age structures of 350-360 animals (at time 0) were each subjected to annual mortalities of 2 to 26 individuals in increments of 2. The populations were then run for 20 years after which annual percent change in numbers were calculated. The difference between this simulation effort and Harris' (Appendix M) is that he ran the model for 20 years (to obtain a stable age distribution) before doing any simulations. His results were based on years 20 through 60. The results from our effort were based on years 0 through 19.

All simulated age structures, annually harvested between 2 and 18 animals, increased in numbers during the initial 20 years. Annual mortalities of 20 and 22 both showed the possibility of slight declines in some years. However, these populations did increase over the 20 year projection. Simulations exceeding 22 mortalities per year all showed a population decline. The mean annual percent change at various mortality levels are presented in Table 37.

These results indicate that, according to Harris' model, an annual harvest of 22 (6.2%) from a population of 356 grizzly bears will allow for an increasing population but a harvest of 24 (6.7%) will cause a decline. These figures (2 animals difference or 0.5% difference) indicate the extreme sensitivity of population models. In practice, we have no evidence that grizzly bear populations respond with this

level of sensitivity to minute changes in mortality. However, the model does provide a framework to illustrate and evaluate the mortality rate recommended in this EIS.

Table 37. Observed changes in simulated grizzly bear populatons subjected to variable annual mortality (base population of 350-360 bears).

Annual Mortality	Mean Annual Percent Change	Standard Error
2	+0.73	0.13
4	+0.79	0.09
6	+0.64	0.09
8	+0.67	0.11
10	+0.59	0.10
12	+0.60	0.13
14	+0.58	0.15
16	+0.37	0.21
18	+0.24	0.17
20	+0.21	0.22
22	+0.03	0.22
24	-0.52	0.11
26	-1.05	0.22

XIX. DISCUSSION OF EXTRAORDINARY CASE

Conservation as defined in the ESA includes the following, "and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved may include regulated taking."

Because the grizzly bear is listed as a threatened species under the Endangered Species Act, the Department must demonstrate that the extraordinary case does exist before authorizing the taking of grizzly bears. Based on the review for this EIS, it is our judgement that the extraordinary case does in fact exist in the NCDE at this time. However, it is extremely important that the public realize that not only are biological considerations involved with the extraordinary case, but social concerns as well. Grizzly bears are extraordinary in that they do come into direct conflict with people (i.e. they do kill people and livestock). Therefore, it would be inappropriate to manage them in the same way, as for example, a peregrine falcon (also listed under the ESA), or under the same definition of extraordinary case applied to other species under the ESA. People will tolerate falcons in close proximity (in fact they nest on sky scrapers). However, the same cannot be said for grizzly bears. Most people are very uncomfortable in close proximity to grizzly bears, or become very antagonistic where livestock depredation occurs. It is this underlying social difference that dictates different management strategies for different species listed under the ESA. A program which utilizes the best available biological and social information, allows for the species to exist into the forseeable future, allows for a continuing increase in numbers, and is designed to achieve recovery goals, does in fact meet the requirement of the Endangered Species Act and the test of the extraordinary case. With these thoughts in mind, some of the important specifics are addressed below:

A. Carrying Capacity

It has been suggested that to demonstrate that the NCDE is experiencing excessive population pressure it is necessary to document that the carrying capacity of the land has been met or exceeded. Carrying capacity is a theoretical concept that has not been clearly demonstrated for any wildlife population (Moen 1973). To measure carrying capacity requires extensive data on the bioenergetics of all age and sex classes (e.g. Kcal expended per day) and an indepth measurement of habitat quality (e.g. Kcal available in the environment). In an area as large and rugged as the NCDE and with an animal as elusive as the grizzly bear, it is not possible in the foreseeable future to measure carrying capacity with any reasonable accuracy. Picton (1983) has developed an index to ecological carrying capacity utilizing climate. However, it does not include

human influences. Obviously, humans are part of the NCDE and influence carrying capacity.

Also there is some indication that a population slightly below carrying capacity may be in a better situation biologically than one at carrying capacity (Caughley 1977). A population at carrying capacity must be reduced before a maximum sustainable yield (MSY) is possible without causing a population decline (Caughley 1977). Managing a grizzly bear population for MSY provides for increased productivity as well as flexibility to remove bears for control purposes, augmentation, and hunter harvest.

Populations

In addition to knowing carrying capacity it has been suggested that it would be necessary to precisely determine existing population numbers. Wildlife management does not rely solely on precise determinations of populations but instead commonly utilizes professional judgments based on the best data available. Some critics are asking for a high level of statistical confidence on population estimates that is in fact unattainable. Although it appears that statistical confidence is not possible in grizzly bear research, it is possible to have reasonable confidence as managers using the approach described in Appendix E.

It does not appear that grizzly bear population pressure (or lack of pressure) can be biologically demonstrated at present or in the immediate future. The management and research tools necessary to document this are simply not available. Excessive population pressure depends on definitions and is basically a social consideration, not a biological one (some people feel 1 bear is excessive while others feel 100 bears are not). Therefore,the problem is really a social one in that we must balance bear numbers with what society (especially those living with the bears) will accept, at the same time attaining recovery levels to meet the requirements of the ESA (see Public Perceptions Section IX). Newspaper articles, meetings, and individual letters have expressed concerns about grizzly bear population pressures along the East Front.

Although the value of carrying capacity enumerations are recognized, the Department does not expect carrying capacity or population numbers will be precisely determined in the foreseeable future.

B. An annual increase in the number of control actions, as has occurred in parts of the NCDE, also indicates population pressure. This potential index may be confounded by an increase in the number of people occupying grizzly bear habitat. An unmeasurable change in grizzly bear behavior (e.g. habituations) may also serve to increase conflict situations without a change in bear numbers. Also, changes

in management strategies for controlling conflict situations tend to mask real changes in grizzly bear population status. As long as bears and people coexist there will always be a potential for conflicts. Therefore, management flexibility is needed to successfully deal with these conflicts.

C. An increasing distribution of a species is also indicative of population pressures. General distribution of grizzly bears in the NCDE appears to be increasing. Bears have been observed in areas where they have not been seen for literally decades. The interpretation that this represents an increase in grizzly bear distribution could be confounded if the number of potential observers has increased or the area they are observing has increased.

Most of the bears that have made unusual movements have been subadult males (Aune, pers. comm.). This could indicate that population pressures in the ecosystem are such that subadults can't establish home ranges near their natal home range.

D. When population pressure or environmental conditions are such that bears begin to move into socially unacceptable areas (i.e. farmland and back yards) the extraordinary case applies. A limited harvest may moderate this dispersal.

E. The limited sport harvest applies only to a portion of the ecosystem (approximately 55%). The remainder is closed to any sport harvest (Glacier National Park, Sun River Game Preserve, Mission Mountains, Blackfeet Indian Reservation, and portions of the Scapegoat and Swan Front density units).

F. The limited harvest and regulatory changes suggested in this EIS, when implemented, will deal with the social and biological concerns for the grizzly bear. These changes include the protection of females with young, female mortality subquotas, a bag limit of one grizzly in a lifetime, reducing the mortality quota the year following any year it is exceeded, the request not to shoot any bear in a group, and not dispatching females involved in control actions. Further, the recommendations in this EIS place the species at minimal risk and should allow for a continuing population increase.

G. The Department is committed to utilizing some or all of the surplus bears in the NCDE to augment populations in other areas or to reintroduce this species where recovery areas have been identified. The Department is firmly committed to recovering this species.

XX. RECOMMENDATIONS

Several recommendations are presented that should make the Department's management program more effective in the future.

A. Habitat Preservation, Improvement, and Land Acquisition

The key to the continued survival of grizzlies in Montana lies in the amount and quality of habitat which remains available to this species. Therefore, it is recommended that the Department, first, take the lead in designating areas that will be required for grizzly bear survival; second, monitor changes in these habitats; third, pursue habitat acquisition, easement, and improvement in key areas; and fourth, work with federal, state, and local agencies to preserve key habitats.

The Department supports an interagency program whose personnel would work routinely with federal land management agencies to integrate Department goals into federal programs. Although such coordination currently exists for all wildlife species, the Department supports an increase in priority for this program.

Identified areas of key importance are:

1. CYE (primarily along the Bull River Valley).
2. Rocky Mountain East Front.
3. North Fork of the Flathead River.
4. Swan River Valley.
5. Area between the towns of East Glacier and West Glacier along Highway 2.
6. The Mission Front.

The Department will also encourage private conservation groups to acquire habitat and obtain conservation easements in these areas.

B. Management Area Changes

The Department recognizes that grizzly bears can and do live outside the boundary of management areas defined in this EIS. The presence of bears outside these boundaries will be encouraged as long as conflicts with humans do not develop. If a conflict occurs, the bear responsible will either be transplanted to another area or dispatched. If sufficient numbers of grizzlies begin to occupy land outside current management area boundaries, without conflict with humans, then the Department will evaluate modifying the boundary to include the newly occupied area(s). If new areas are incorporated, the Department would seek the necessary changes from federal agencies which would allow implementing the management program.

C. Intensive Research

Research on grizzlies is difficult and requires a long-term commitment of funds. Therefore, the Department is committed to long-term (10 years or more) efforts in grizzly research. However, the Department will need a stable funding source such as Section 6 funding from the U.S. Fish and Wildlife Service.

D. Population Trends

An important aspect of grizzly bear management is the ability to document long-term population trends. The Department will assist in the development and evaluation of new trend monitoring techniques, including systematic subjective surveys of professionals' and various user groups' judgements of population status. Surveys should be developed by professional surveyors to ensure statistical validity.

E. Damage Control

Inevitably, there will be marauding or dangerous bears that will have to be dispatched. Therefore, we recommend that there be a minimum of 2 Department employees available in each region to deal with damage control. These personnel would be specially trained to deal with damage situations and bear handling. Response to any grizzly bear damage complaint should be rapid. Grizzly bear complaints and conflicts must be recorded accurately. The Department also recommends that other agencies expand the area into which relocation of bears may be permitted. The Department further recommends that if aversive conditioning of grizzly bears proves effective in preventing conflicts, then it should be adopted as a management tool.

In addition to these recommendations the Department recommends establishing a limited entry damage hunt for problem grizzlies. This hunt would be conducted anytime of year a damage situation occurred. In the event of a damage situation hunters successful in drawing a permit would be escorted by Department personnel to the nuisance site for the purpose of shooting the nuisance bear(s).

F. Mortality Reporting

It is important that all known mortalities be reported and records maintained at one source. The Department should remain the sole mortality coordinator to which all mortalities for the state from any agency or cause are reported. The Department further recommends that the same form (Appendix N) for recording mortalities be used by all agencies.

G. Enforcement Efforts

Enforcement efforts by all agencies should be concentrated in those areas with the greatest potential for problems. These areas include the Mission Mountains, Badger-Two Medicine, and the North Fork of the Flathead River. In addition, enforcement efforts should be directed toward roaded areas in the spring and summer, and to backcountry areas during the fall. Continued enforcement is important to keep bear parts market profiteers at a minimum. Further, the Department recommends that a civil penalty for the illegal taking of grizzly bears be evaluated. This penalty would serve as an additional deterrent to potential poachers.

H. Unreported Mortality

The importance of this factor dictates that this source of mortality be periodically evaluated. Information from research projects, grizzly parts values, rumored problem areas, etc. will be reviewed in these evaluations. Major changes in the level of unreported mortality would dictate changes in the management program.

I. Hunter Surveys

The Department recommends that all hunters obtaining a grizzly bear hunting license be surveyed on an annual basis. Information obtained from these surveys should include primarily hunter effort but also the number of bears or bear sign observed, dates hunted, areas hunted, hunter comments on regulations and seasons, etc. Evaluation of these surveys will substantially aid in setting seasons and interpreting population data.

J. Bear Relocations

All relocated grizzly bears should be collared and monitored for 2 years to determine transplant success. A thorough review of this technique will improve our understanding of its viability. The U.S. Fish and Wildlife Service should support this effort until all grizzly bear populations are recovered.

As with mortalities it is important that all nuisance complaints as well as relocations or other control actions be reported and records maintained at one source. The Department should be the coordinator to which all such actions in the state by any agency and for any cause are reported. Further, the Department recommends that all agencies use the same form (Appendix O) for recording such actions.

K. Augmentation

Two approaches to population augmentation are available. The first involves the transplanting of individuals from areas with a population surplus. In the past, transplants have proven unsuccessful largely because they have involved problem bears (Brannon et al. In Prep., Thier and Sizemore 1981, Cole 1976, Craighead and Craighead 1976). To increase success, transplants should involve bears in particular sex and age groups that have no history of conflicts (i.e. not nuisance bears) and are from remote areas.

A second approach involves cross-fostering of grizzly cubs with black bear sows. Grizzly cubs, obtained either from areas with a population surplus or from zoos, could be placed in the maternal dens of black bear females in March or April. Other approaches for this technique are also available (Alt and Beecham 1984, Alt 1984). Successful fostering of orphaned black bear cubs to surrogate black bear females has been reported (Alt and Beecham 1984, Alt 1984).

The Department recommends that augmentation, through the use of transplanting or cross-fostering, be used to speed grizzly bear recovery in other identified ecosystems. Further, these bears should be radio-instrumented and monitored for an extended period. Bears removed from the NCDE for augmentation could constitute a portion of the NCDE annual mortality quota. Augmentation will require close coordination with land management agencies and extensive public review before implementation.

L. Sale of Grizzly Bear Parts

The Department should have the option of selling grizzly bear hides at public auction. This action is currently prevented by Federal regulation. Hides are obtained each year from bears lost to control actions, illegal mortality, accidents, etc. By selling these hides when appropriate (after the needs of schools, museums, etc. are met), the illegal market could be reduced.

M. Fires from Natural Causes

The Department will encourage land management agencies to allow fires to burn in wilderness and other appropriate areas within our management areas to maintain the habitat in a condition best suited for grizzly bears.

N. Legal Management Boundaries

There is a clear need to modify the boundary, established in the Federal Register, within which the Department may conduct grizzly bear hunting (i.e. Flathead National Forest, Bob Marshall, and Mission Mountains Wilder-

ness Areas). The Department requires flexibility to implement seasons when and where appropriate within and adjacent to the present boundary. It is therefore recommended that the Department petition the USFWS to change these boundary restrictions to conform with the management areas defined in this EIS and that the mortality quota apply only to the area within this boundary.

O. Focus Concern for the Grizzly Bear to Other Ecosystems

It is the Department's position that an effort be made to focus concern for the grizzly to other ecosystems identified in the grizzly bear recovery plan. To accomplish this will require the cooperation of all agencies dealing with grizzly bear management as well as the public. The Department feels this is important because biologically the grizzlies in the NCDE are least vulnerable due to the size of the current population and its proximity to the rest of the population in Canada. In addition, the status of bear habitat is much more secure in the NCDE due to the land already established as National Park and Wilderness.

The same situation is not true of other ecosystems or bears in those areas. Populations in other areas are much lower and tend to be more isolated from areas with healthy populations and habitat in a much less secure status.

If agencies continue to focus so extensively on the NCDE (largely a result of the limited sport harvest allowed), then the opportunities to recover the bear in in some of the other ecosystems may be lost. The record is clear that once grizzlies are totally eradicated from an area the support for their re-establishment is minimal. Also, the more progress made toward recovery in other ecosystems the greater will be the flexibility for management and the greater will be the public's support.

It is very important that the public recognize that continued focus on grizzly bears (a species that is not biologically threatened with extinction) increases the risk to other species which are in fact endangered with extinction. The time, money and resources which are expended on grizzly bears removes the same from those species which are truly endangered. In order for the public to make valid decisions on grizzly management, they need to be aware of this biological risk.

P. Management Plans by Area

In order to fine tune the management of grizzly bears the Department recommends that management plans be developed for each of the bear management units (BMU) established under the preferred alternative. These management plans will identify specific problems and problem areas on a local level and develop strategies to deal with them. In this way

the program for the ecosystem can be more responsive to changing local conditions and needs while still maintaining the overall direction recommended in this EIS.

These plans should address such things as land ownership patterns within the area, percentage of the area which is roaded, general habitat maps, problem areas, management zones for dealing with conflict situations, density goals, and local enforcement problem areas. These plans should then be subjected to local review and comments in order to generate support for bear management at the local level.

Ultimately these plans will enable us to monitor changes in habitat and local problems more efficiently.

O. Framework for Evaluation

It is recommended that any new information be evaluated annually and incorporated into the management program. A limited review of the EIS every 5 years should serve to incorporate new information. At these 5 year intervals indications of a change in population status for either the CYE or NCDE will be evaluated to determine if management should be based on a different population status. Every 10 years the EIS will be completely reviewed and updated and a determination of population status in both the CYE and NCDE will be made. In this way the document will be as current as is practical and the management program based on it, as effective as possible.

The Department, after reviewing input from the public, wildlife professionals, etc., has the option to amend this EIS at any time in the future as is appropriate to better manage grizzly bears.

XXI. LITERATURE CITED

Aderhold, M. 1984. Know your bears. Montana Outdoors 15(2):36-37.

Alt, G.L. 1984. Cub adoption in the black bear. J. Mammal. 65:511-512.

Alt, G.L. and J.J. Beecham. 1984. Reintroduction of orphaned black bear cubs into the wild. Wildl. Soc. Bull. 12:169-174.

Anonymous. 1984. Black or grizzly bear? Montana Outdoors 15(5):12.

Archibald, W.R. 1983. Problem analysis: grizzly bears and coastal development with particular reference to intensive forestry. Fish and Wildlife Bull. B-26. Wildlife Habitat Research Publ. WHR-5.

Arno, S. 1979. Forest regions of Montana. USDA For. Serv. Inter. Mtn. For. and Range Exp. Sta. Ogden, Utah. 39 pp.

_____. 1980. Forest fire history in the northern Rockies. J. For. (78):460-465.

Aune, K., and T. Stivers. 1982. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Dept. Fish, Wildl. and Parks, Helena. 143 pp.

_____. 1983. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Dept. Fish, Wildl. and Parks, Helena. 180 pp.

_____. T. Stivers, and M. Madel. 1984. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Dept. Fish, Wildl. and Parks, Helena. 239 pp.

_____. 1985. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Dept. Fish, Wildl. and Parks, Helena. 138 pp.

Ball, R.F. 1980. Time-lapse cameras as an aid in studying grizzly bears in northwest Wyoming. Int. Conf. Bear Res. and Manage. 4:331-335.

Beecham, J. 1980. Some population characteristics of two black bear populations in Idaho. Int. Conf. Bear Res. and Manage. 4:201-204.

_____. 1983. Population characteristics of black bears in west central Idaho. J. Wildl. Manage. 47(2):405-412.

Begon, M. 1983. Abuses of mathematical techniques in ecology: applications of Jolly's capture-recapture method. Oikos 40:155-158.

Bjarvall, A. 1980. The brown bear in Sweden - distribution, abundance, and management. Int. Conf. Bear Res. and Manage. 4:255-257.

Blanchard, B. 1978. Grizzly bear distribution in relation to habitat areas and recreational use-Hilgard Mountains. M.S. Thesis. Montana State Univ., Bozeman. 74 pp.

Brannon, R.D., K.R. Greer, and A.R. Dood. 1985. Nuisance grizzly bear relocations in the Greater Yellowstone Area. Montana Dept. of Fish, Wildl. and Parks. In Prep.

Brannon, R.D. 1984. Influence of roads and developments on grizzly bears in Yellowstone National Park. Interagency Grizzly Bear Study, Montana State University, Bozeman. 52 pp.

British Columbia Fish and Wildlife Branch. 1979. Preliminary grizzly bear management plan for British Columbia. Ministry of Environment, Victoria. 25 pp.

Buchalcyzk, T. 1980. The brown bear in Poland. Int. Conf. Bear Res. and Manage. 4:229-232.

Bunnell, F.L., and D.E.N. Tait.1980. Bears in models and in reality-implications to management. Int. Conf. Bear Res. and Manage. 4:15-24.

_____. 1981. Population dynamics of bears-implications. Pages 75-98 in Smith, T. D. and C. Fowler (eds.). Dynamics of large mammal populations. New York: John Wiley & Sons Inc.

_____. 1985. Mortality rates of North American bears. Journal Arctic (In press).

Bureau of Business and Economic Research, University of Montana. Montana's forest products industry: a descriptive analysis- 1981, Keegan, Jackson, Johnson.

Cahalane, V.H., 1952. Wildlife resources of the National Park system . . . 1951. U.S. Department of the Interior, National Park Service, 135 pp.

Carlock, D., D. Conley, J. Collins, K. Johnson, S. Johnson, and M. Pelton. 1983. The tri-state black bear study final report. Unpubl.

Caughley, G. 1977. Analysis of vertebrate populations. Wiley: London. 654 pp.

Claar, J., R. Klaver, and C. Servheen. 1983. Grizzly bear management on the Flathead Indian Reservation, Montana. Paper presented at the Sixth International Conf. on Bear Research and Management. Grand Canyon, AZ.

Cole, G.F. 1972. Preservation and management of grizzly bears in Yellowstone National Park. Intern. Conf. Bear Res. and Manage. 2:274-288.

Conner, M., R. F. Labisky, and D. R. Progulske, Jr., 1983. Scent-station indices as measures of population abundance for bobcats, raccoons, gray foxes, and opossums. Wildl. Soc. Bull. 11(2):146-150.

Cooney, R.F. 1941. Grizzly bear study progress report. Pittman-Robertson job completion report. Mt. Department of Fish, Wildlife and Parks, Helena. 23 pp.

_____. 1953. Thars bar in them thar hills. Montana Wildlife 3:3:15-18.

_____. 1956. Wilderness monarch. Montana Wildlife 6(1):14-17.

Cowan, I. M. 1972. The status and conservation of bears (Ursidae) of the world-1970. Int. Conf. Bear Res. and Manage. 2:343-367.

Craighead, F.C and J.J. Craighead. 1972. Data on grizzly bear denning activities and behavior obtained by using wildlife telemetry. In the. Conf. Bear Res. and Manage. 2:84-106.

Craighead, F.C. 1976. Grizzly bear ranges and movement as determined by radiotracking. Int. Conf. Bear Res. and Manage. 3:97-109.

Craighead, J.J., and F.C. Craighead. 1972. Grizzly bear-man relationships in Yellowstone National Park. Intern. Conf. Bear Res. and Manage. 2:304-332.

_____, J.R. Varney, and F.C. Craighead, Jr. 1974. A population analysis of the Yellowstone grizzly bears. Montana Forest and Conservation Experiment Station, School of Forestry. Bulletin 40. 20 pp.

_____, F.C. Craighead, Jr., and J. Sumner. 1976. Reproductive cycles and rates in the grizzly bear, Ursus arctos horribilis, of the Yellowstone Ecosystem. Int. Conf. Bear Res. and Manage. 3:337-356.

_____, J. Sumner, and G. Scaggs. 1982. A definitive system for analysis of grizzly bear habitat and other wilderness resources. Wildlife-Wildlands Inst. Monogr. 1. Univ. Mont., Missoula, 279 pp.

Crook, J.L. 1972. Grizzly bear survey and inventory. Unpubl. report. Alaska Dept. Fish and Game. 38 pp.

Curatolo, J.A., and G. D. Moore. 1975. Home range and population dynamics of grizzly bear in the eastern Brooks Range, Alaska. In: R.D. Jakimchuk, ed., Studies of large mammals along the proposed MacKenzie Valley gas pipeline route from Alaska to British Columbia. Arctic Gas Biol. Rept. Ser. Vol. 32. 79 pp.

Cushing, B.S. 1980. The effects of human menstrual odors, other scents, and ringed seal vocalizations on the polar bear M.S. Thesis, Univ. of Montana, Missoula. vi + 49 pp.

_____. 1983. Responses of polar bears to human menstrual odors. Int. Conf. Bear Res. and Manage. 5:270-74.

Dailey, Richard. 1984. The Montana Travel Industry, 1983. Unpublished report prepared for Montana Promotion Division, Department of Commerce and Governor's Council on Economic Development, University of Montana.

Daubenmire, R. 1969. Structure and ecology of coniferous forests of the northern Rocky Mountains. Pages 25-41 in: R. Taber, ed., Coniferous forests of the northern Rocky Mountains. Center for Nat. Resour., Univ. Montana, Missoula.

Dean, F.C. 1976. Aspects of grizzly bear population ecology in Mount McKinley National Park. Int. Conf. Bear Res. and Manage. 3:111-119.

Deiss, C. 1958. Geology of the Bob Marshall Wilderness in Guide to the Bob Marshall Wilderness. U.S. Dept. Agric. For. Serv. Missoula, MT. 36pp.

DeMaster, D.P., M.C.S Kingsley, and I. Stirling. 1980. A multiple mark and recapture estimate applied to polar bears. Can. J. Zool. 58:633-638.

Eberhardt, L.L. and D.B. Siniff. 1977. Population dynamics and marine mammal management policies. J. Fish. Res. Board Canada. 34:183-190.

Egbert, A.L., and M.H. Luque. 1975. Among Alaska's brown bears. Natl. Geogr. Mag. 148:428-442.

_____, and A. L. Stokes. 1976. The social behavior of brown bears on an Alaskan salmon stream. Int. Conf. Bear. Res. and Manage. 3:41-56.

Elgmork, K. 1976. A remnant brown bear population in southern Norway and problems of its conservation. Int. Conf. Bear Res. and Manage. 3:281-291.

_____. 1978. Human impact on a brown bear population (Ursus arctos L.). Biol. Conserv. 13:81-88.

Erickson, A.W. 1962 Alaska wildlife investigations, bear investigations, characteristics of the brown and grizzly bear harvest. Federal aid in Wild. Restor. Job Completion Rept. Proj. No. W-6-R-3, Work Plan F, Job No. 2. Alaska Dept. Fish and Game, Juneau. 19 pp.

_____. 1963. Bear Report. Annual Project Segment Report Fed. aid in Wildl. Restor. Proj. Rept. W-6-R-4, Work Plan F. Alaska Dept. Fish and Game, Juneau. 32 pp.

Fowler, C.W., W.T. Bunderseon, M.B. Cherry, R.J. Ryel, and R.B. Steele. 1980. Comparative population dynamics of large mammals: a search for management criteria. Report no., MMC-77-20 to the U.S. Marine Mammal Commission. NTIS PB80-178627, Springfield, VA.

Franklin, S.R. 1980. Evolutionary change in small populations. Pages 135-149 in M.E. Soule and B.A. Wilcox, eds., Conservation biology: An evolutionary-ecological perspective. Sinaur Assoc., Sunderland, MA. 395 pp.

Fraser, D., J. Gardner, G. Kolenosky, and S. Strathearn. 1982. Estimation of harvest rate of black bears from age and sex data. Wildl. Soc. Bull. 10(1):53-57.

Frost, J.R. 1985. Living with the grizzly: Perceptions of Mission Valley residents. M.S. Thesis, University of Montana, Missoula. 96 pp.

Furnell, D.J. and R.E. Schweinsburg. 1984. Population dynamics of central Canadian arctic island polar bears. J. Wildl. Manage. 48:722-728.

Gilbert, J.R., W.S. Kordek, J. Collins, and R. Conley. 1978. Interpreting sex and age data from legal kills of bears. Pages 253-262 in Hugie, R. D. ed., 4th Eastern black bear workshop. Greenville, ME. 409pp.

Glenn, L. P., 1975. Report on 1974 brown bear studies. Fed. aid in Wildl. Rest. Proj. Rept. W-17-6 and W-17-7. Alaska Department of Fish and Game, Juneau, 10 pp. + App.

_____, J.W. Lentfer, J.B. Faro, and L.H. Miller, 1976. Reproductive biology of female brown bears (Ursus arctos), McNeil River, Alaska. Int. Conf. Bear Res. and Manage. 3:381-390.

Greer, K. 1971. Grizzly bear mortality and management programs in Montana during 1970. Job progress report W-120-R-2, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1972. Grizzly bear mortality and management programs in Montana during 1971. Job progress report W-120-R-3, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1973. Grizzly bear mortality and management programs in Montana during 1972. Job progress report W-120-R-4, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1974a. Grizzly bear mortality and management programs in Montana during 1973. Job progress report W-120-R-5, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1974b. Montana grizzly bear management and public harmony. Montana Department of Fish and Game, Helena. 46 pp.

_____. 1975. Grizzly bear mortality and management programs in Montana during 1974. Job progress report W-120-R-6, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1976a. Grizzly bear mortality and management programs in Montana during 1975. Job progress report W-120-R-7, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1976b. Managing Montana's grizzlies for the grizzlies! Int. Conf. Bear Res. and Manage. 3:177-189.

_____. 1977. Grizzly bear mortality and management programs in Montana during 1976. Job progress report W-120-R-8, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1978. Grizzly bear mortality and management programs in Montana during 1977. Job progress report W-120-R-9, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1979. Grizzly bear studies, statewide wildlife research. Job progress report W-120-R-10, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1980. Grizzly bear studies, statewide wildlife research. Job progress report W-120-R-11, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1981. Grizzly bear studies, statewide wildlife research. Job progress report W-120-R-12, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

_____. 1982. Grizzly bear studies, statewide wildlife research. Job progress report W-120-R-13, Work plan IV, Job L-1.1, Mont. Dept. Fish Game, Helena.

Habeck, J. and R.W. Mutch. 1973. Fire-dependent forests in the northern Rocky Mountains. Quat. Res. 3(3):408-424.

Hamlin, K. and M. Frisina, 1975. Special Grizzly Bear Survey. Job Progress Report W-130-R-6, Job I-1, I-4. Montana Dept. Fish, Wildl. and Parks, Helena.

Hamer, D., and S. Herrero. 1983. Ecological studies of the grizzly bear in Banff National Park--final report 1983. Univ. Calgary, Calgary, Alberta, Canada. 303 pp.

Harestad, A.S. and F.L. Bunnell. 1979. Home range size and body weight. Ecology 60(2):389-404.

Haroldson, M., and R.D. Mace. 1984. Grizzly bear population augmentation: scope of work. U.S. Fish and Wildlife Service. Montana Coop. Wildlife Research Unit. Univ. Montana, Missoula. 25 pp.

Harris, R.B. 1984a. Harvest age-structure as an indicator of grizzly bear population status. M.S. thesis, University of Montana, Missoula, MT. 204 pp.

_____. 1984b. Preliminary experiments on a scent-station index for grizzly bears. Final report, U.S. Fish and Wildlife Service. 30 pp.

_____. B. 1984c. Grizzly bear population trend monitoring - a resource for decision makers. U.S.F.W.S. Tech. Note. Unpublished Report.

Hensel, R.J., W.A. Troyer, and A.W. Erickson. 1969. Reproduction in the female brown bear. J. Wildl. Manage. 33(2):357-365.

Herrero, S. 1972. Aspects of evolution and adaptation in American black bears (Ursus americanus Pallas) and brown and grizzly bears (ursus arctos L.) of North America. Int. Conf. Bear Res. and Manage. 2:221-230.

_____. 1985. Bear attacks--their causes and avoidance. Nick Winchester Press, New Century Pub., Inc. Piscataway, NJ 287.

Hickie, P. 1952. Inventory of big-game animals of the United States. U.S. Dept. of the Interior, U.S. Fish and Wildlife Service, Wildlife Leaflet No. 348. 2 pp.

Hillis, M. 1985. Strategies for creating drainage for field and shrubfield/cutting unit habitat components with timber harvest. Grizzly Bear Habitat Symposium. April 30 and May 1-2. Univ. Montana. Missoula. In press.

Hoak, J.H., T.W. Clark, and J.L. Weaver. 1983. Of grizzly bears and commercial outfitters in Bridger-Teton National Forest, Wyoming. Int. Conf. Bear Res. and Manage. 5:110-117.

Holland, T. 1985. South and Middle fork Flathead River habitat improvement projects. Grizzly Bear Habitat Symposium. April 30 and May 1-2. Univ. Montana, Missoula. In press.

Howe, G. 1976. The evolutionary role of wildfire in the northern Rockies and implications for resource managers. Pages 257-265 in: Proceedings: Tall Timbers Fire Ecology Conference and Fire and Land Management Symposium. Univ. Montana, Missoula. 675 pp.

Hugie, R.D. 1983. Black bear ecology and management in the northern conifer-deciduous forests of Maine. Paper presented at the Sixth Int. Conf. Bear Res. and Manage., Grand Canyon, AZ. In Press.

Hunt, C. 1985. Descriptions of five promising deterrent and repellent products for use on bears. Office of the Grizzly Bear Recover Coordinator. Montana Coop Wildlife Research Unit. Univ. Montana, Missoula. 55 pp.

Inukai, T. 1972. Bear damage and bear control in Japan. Int. Conf. Bear Res. and Manage. 2:333

Johnson, L. 1980. Brown bear management in southeastern Alaska. Int. Conf. Bear Res. and Manage. 4:263-270.

Johnson, D. H. 1980. The comparison of usage and availability measurements for evaluating resource preference. Ecol. 61(6):65-71.

Jonkel, C. 1983a. Five-year report. Border Grizzly Project. Univ. Montana, Missoula, Montana.

_____. 1983b. Grizzly bear critical sites. Border Grizzly Project, Spec. Rept. 69. Univ. Montana, Missoula.

_____. 1975. Opinion of bears and people. Western Wildlands 2(1):30-37.

_____, and I.M. Cowan. 1971. The black bear in the spruce-fir forest. Wildl. Monogr. 27:1-57.

_____, and R. Demarchi. 1984. Subdivisions and grizzly bears: a matter of jurisdiction. Western Wildlands. Univ. Montana.

Jorgensen, C.J. 1979. Bear-livestock interactions, Targhee National Forest M.S. Thesis, University of Montana, Missoula. 162 pp.

Kaal, M. 1976. Ecology, protection and prospect of utilization of the brown bear in the Estonian S.S.R. Int. Conf. Bear Res. and Manage. 3:303-306.

Kasworm, W. 1985. Cabinet Mountains grizzly bear study annual report. Mt. Dept. of Fish, Wildlife and Parks, Helena.

Keating, K.A. 1985. Historical grizzly bear trends in Glacier National Park, Montana. Wildl. Soc. Bull. In Press.

Kellert, Stephen R. 1976. Perceptions of animals in American society. In: Proceedings of the 41st North American Wildlife and Natural Resources Conference. Washington, D.C.: Wildlife Management Institute.

_____. 1979. Public attitudes toward critical wildlife and natural habitat issues, Phase 1. U.S. Department of Interior Fish and Wildlife Service. U.S. Government Printing.

Kemp, G.A. 1972. Black bear population dynamics at Cold Lake, Alberta, 1968-1970. Int. Conf. Bear Res. and Manage. 2:26-31.

_____. 1976. The dynamics and regulation of black bear (Ursus americanus) populations in northern Alberta. In the. Conf. Bear Res. and Manage. 3:191-197.

Kendall, K.C. 1985. Grizzly bear population trend studies Apgar Mountains, Glacier National Park. National Park Service Progress Report.

Kistchinski, A.A. 1972. Life history of the brown bear (Ursus arctos L.) in northeast Siberia. Int. Conf. Bear Res. and Manage. 2:67-73.

Klaver, R.W., and J. Claar. 1985. Grizzly bears, insects and people: Bear management in the McDonald Peak region. Paper presented at the Grizzly Bear Habitat Symposium, Missoula, MT. In Press.

Knight, R.R., and L.L. Eberhardt.1984. Projected future abundance of the Yellowstone grizzly bear. J. Wildl Manage. 49(4):1434-1438.

_____, D. Mattson, and B. Blanchard. 1984. Movements and habitat use of the Yellowstone Grizzly Bear. Unpubl. Rep.

_____, and S. Judd. 1983. Grizzly bears that kill livestock. Int. Conf. Bear Research and Manage. 5:186-190.

_____, and L.L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecol. 66(2):323-334.

Kohn, B.E. 1982. Status and management of black bears in Wisconsin. Department of Natural Resources, Madison, Wisconsin, Technical Bulletin No. 129.

Kolenosky, G.B. 1983. Hunting Ontario black bear. Paper presented at the Sixth Int. Conf. Bear Res. and Manage, Grand Canyon, AZ. In Press.

Lake County Land Services Department. 1985. Letter to R. Mace from N. Thormahlen concerning land use in Swan Valley.

Layser, E.F. 1978. Grizzly bears in the southern Selkirk Mountains. Northwest Sci. 52(2):77-91.

LeCount, A. 1982. An analysis of the black bear harvest in Arizona 1968-1978. Arizona Game and Fish Department, Special Report Number 12.

Linhart, S.B. and F.F. Knowlton. 1975. Determining relative abundance of coyotes by scent station lines. Wildl. Soc. Bull. 3:119-124.

Lindzey, F.G., S.K. Thompson, and J.I. Hodges. 1977. Scent station index of black bear abundance. J. Wildl. Manage. 41(1):151-153.

_____, and E.C. Meslow. 1980. Harvest and population characteristics of black bears in Oregon (1971-74). Int. Conf. Bears Res. and Manage. 4:213-219.

Lindzey, J.S., G.L. Alt, C.R. McLaughlin, and W.S. Kordek. 1983. Population response of Pennsylvania black bears to hunting. Int. Conf. Bear Res. and Manage. 5:34-39.

Lloyd, K.A. 1979. Aspects of the ecology of black and grizzly bears in Coastal British Columbia. M.S. Thesis. Univ. British Columbia, Vancouver. 151 pp.

Lortie, G.M. 1978. A new management system for Yukon grizzly bear. Yukon Territory Wildl. Branch. 15 pp. Unpubl.

_____, and J. McDonald. 1977. Game harvest report and summary of questionnaire analyses. Yukon Territory Government Wildlife Research Internal Rept. 32 pp.

Lyon, L. J., T. N. Lonner, J. P. Weigand, C. L. Marcum, W. D. Edge, J. D. Jones, D. W. McCleerey, and L. L. Hicks. 1985. Coordinating elk and timber management. Final report of the Mont. Coop. Elk-Logging Study, 1970-1985. Montana Dept. of Fish, Wildl. & Parks, Helena. 53 pp.

Mace, R.D. and S. Riley. 1985. Relocations of grizzly bears in Northwest Montana: 1973-1984. Montana Dept. Fish, Wildlife and Parks. Kalispell, Montana. In prep.

_____. 1985. Analysis of grizzly bear food resources in the valley bottomlands and avalanche tracts of the Bob Marshall Wilderness Area, Montana. Paper presented at the Grizzly Bear Habitat Symposium. April 30-May 2, 1985, Missoula, Montana. In Press.

Mace, R. D. 1984. Identification and evaluation of grizzly bear habitat in the Bob Marshall Wilderness Area, Montana. M.S. Thesis. Univ. Montana, Missoula. 176 pp.

_____, and C. Jonkel. 1984. The effects of a logging activity on grizzly bear movements. Paper presented at the Predator Symposium, 1984. Univ. Montana, Missoula.

_____,_____. 1980. Grizzly bear response to habitat disturbance. Pages 70-98 in: C. Jonkel ed., Annul Rep. 3. Border Grizzly Proj. Univ. Montana, Missoula.

_____,_____. 1983. Regional food habits of the grizzly bear in Montana. Paper presented at the Sixth Int. Conf. on Bear Res. and Manage. In Press.

Marshall, P. B. 1955. Grizzly bear investigation and recheck. Fed. Aid in Wildl. Rept. Proj. Compl. Rept. W-60-R-2, Job No. I-D. Montana Dept. Fish and Game, Helena. 20 pp.

Martin, P. 1983. Factors influencing globe huckleberry fruit production in northwestern Montana. Int. Conf. Bear Res. and Manage. 5:159-165.

Martin, P. 1979. Productivity and taxonomy of the *Vaccinium globulare V. membranaceum* complex in western Montana. M.S. Thesis. Univ. Montana, Missoula. 136 pp.

Martinka, C. 1971. Status and management of grizzly bears in Glacier National Park, Montana. Pages 312-322 in: 36th North Am. Wildl. and Nat. Resour. Conf. Wildlife Management Institute, Washington, D.C.

_____. 1974. Population characteristics of grizzly bears in Glacier National Park, Montana. Mammal. 55(1):21-29.

_____. 1976. Ecological role and management of grizzly bears in Glacier National Park, Montana. Int. Conf. Bear Res. and Manage. 3:147-156.

_____. 1982. Effects of conterminous land use on grizzly bears in Glacier National Park. Presented at American Association for Advancement of Science Symposium on External Threats to Ecosystems of National Parks in Washington, D.C.

_____, and K. Kendall. 1985. Grizzly bear habitat research in Glacier National Park. Paper presented at the Grizzly Bear Habitat Symposium. April 30-May 2, 1985. Missoula, Montana. In Prep.

McArthur Jope, K. 1983. Habituation of grizzly bears to people: a hypothesis. Int. Conf. Bear Res. and Manage. 5:322-327.

McClellan, B. 1983. Akamina-Kishinena grizzly bear study - annul report. British Columbia Fish and Wildl. Branch, Cranbrook, B.C.

McCulough, D.R. 1982. Behavior, bears, and humans. Wildl. Soc. Bull. 10:27-33.

McCullough, D. 1981. Population dynamics of the Yellowstone grizzly bear. pp. 173-196 in Fowler, C.J. and T.W. Smith, eds., Dynamics of large mammal populations. Wiley Press 417 pp.

McLellan, B. 1984. Population parameters of the Flathead grizzlies. Canadian Border Grizzly project. 28 pp.

McClellan, B. 1983. Akamina-Kishinena grizzly bear study - annual report. British Columbia Fish and Wildl. Branch, Cranbrook, B. C.

_____, and C. Jonkel. 1980. Ackamina- Kishinena grizzly project. Pages 9-48 in: C. Jonkel ed. Annu. Rep. 5. Border Grizzly Project. Univ. Montana, Missoula. 222 pp.

_____, and R.D. Mace. 1985. Behavior of grizzly bears in response to roads, seismic activity, and people. Canadian grizzly project, Cranbrook, British Columbia. 53 pp.

Meagher, M. and J.R. Phillips, 1983. Restoration of natural populations of grizzly and black bears in Yellowstone National Park. Int. Conf. Bear Res. and Manage. 5:152-158.

Mealey, S., L. Marcum, R. Righter, C. Jonkel, and G. Joslin. 1976. Vegetation studies of disturbed grizzly habitat. Pages 5-34, in C. Jonkel ed., Annu. Rep. 1. Border Grizzly Proj. Univ. Montana, Missoula.

Mihalic, David A. 1974. Visitor attitudes toward grizzly bears in Glacier National Park. Michigan State University thesis.

Miller, G.D. 1980. Behavioral and physiological characteristics of grizzly and polar bears, and their relation to bear repellents. M.A. Thesis, Univ. of Montana, Missoula. vii & 106 pp.

Miller, S.D. and W.B. Ballard, 1982. Density and biomass estimates for an interior Alaskan brown bear, Ursus arctos, population. Canadian Field-Nat. 96(4):448-454.

Miller, S.J., N. Barichello, and D. Tait, 1982. The grizzly bears of the Mackenzie mountains Northwest Territories. N.W.T. Wildlife Service, Completion Report No. 3.

Moen, A.N. 1973. Wildlife ecology: an analytical approach. W.H. Freeman and Co., San Francisco. 458 p.

Montagne, J. and W. McMannis. 1961. Geological resume of the Bob Marshall Wilderness Area. Montana State Col., Bozeman. Mimeo.

Montana Dept. of Commerce, census and economic information center. 1981. Revised County Population Projections, 1981.

Montana Department of Commerce. 1984. 1983 Census Estimates-October 1984.

Montana Department of Fish, Wildlife and Parks. 1983. License Sales by County for License Year 1983.

Montana Department of Fish, Wildlife and Parks. 1983. Montana Hunting and Fishing License Sales, 1939 to 1983.

Montana Department of Fish, Wildlife and Parks. 1983. Regional Visitation Figures, 1980 to 1983.

Montana Department of Fish, Wildlife and Parks. Montana Recreation Map.

Montana Dept. of Agriculture, Statistical Reporting Service. 1984. Montana Agricultural Statistics-1984.

Montana Dept. of State Lands-Forestry Division. 1982. Timber Resources of Lincoln, Sanders, Flathead and Lake Counties.

Montana Dept. of Natural Resources and Conservation, Oil and Gas Conservation Division. 1983. Oil and Gas: Annual Review for the Year 1983.

Montana Dept. of Natural Resources and Conservation, Energy Division. 1984. Montana Historical Energy Statistics, 5 th Ed.

Mundy, K., and D. Flook. 1973. Background for managing grizzly bears in the national parks of Canada. Can. Wildl. Serv. Rep. Ser. 22. 35 pp.

Mysterud, I. 1977. Problems in research management of the brown bear in Norway. Viltrapport 4:19-51.

_____. 1980. Bear Management and sheep husbandry in Norway, with a discussion of predatory behavior significant for evaluation of livestock losses. Int. Conf. Bear Res. and Manage. 4:233-241.

Nagy, I., and R. Russell. 1978. Ecological studies of the boreal forest grizzly bear (Ursus arctos L.). Annu. rep. 1977. Canadian Wildl. Serv. 72 pp.

Nelson, R., G. Folk Jr., E. Pfeiffer, J. Craighead, C. Jonkel, and D. Steiger. 1983. Behavior, biochemistry, and hibernation in black, grizzly, and polar bears. In the. conf. Bear Res. and Manage. 5:284-290.

O'Gara, B. 1984. Identification of Montana's big game mammals. Montana outdoors 15(6):13-24

Onishuk, M., and D.S. Stockstad. 1957. Preliminary grizzly bear investigations. Fed. Aid Wildl. Rest Proj. Rept. No. W-71-R-3, Job no. A-3. Montana Dept of Fish and Game, Helena. 8 pp.

Ostroumov, A.G. 1968. Aerovisual census of brown bear in Kamchatka and some observations on their behavior. Bull. Mosc. Soc. Natur., Biol. Div. 73(2):35-50.

Otis, D.L., K.P. Burnham, G.C. White, and D.R. Anderson. 1978. Statistical inference from capture data on closed animal populations. Wildl. Monogr. 62:1-135.

Pearson, A.M. 1975. The northern interior grizzly bear. Can. Wildl. Serv. Rept. Ser. No. 34. 86 pp.

_____. 1976. Population characteristics of the Arctic mountain grizzly bear. Int. Conf. Bear Res. and Manage. 3:247-258.

Pfister, R., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest habitat types of Montana. Int. Mtn. For. and Range Exp. Sta. USDA For. Serv. Gen. Tech. Rep. IN THE-34. 174 pp.

Picton, H.D. 1983. Grizzly Link? Yellowstone and Glacier, its biology and dynamics. Paper presented at the Sixth In the. Conf. Bear Res. and Manage., Grand Canyon, AZ. In Press.

Poelker, R.J. and H.D. Hartwell, 1973. Black bear of Western Washington. Wash. St. Game Dept. Biol. Bull. No. 14. 180 pp.

_____, and L.D. Parsons, 1980. Black bear hunting to reduce forest damage. Int. Conf. Bear Res. and Manage. 4:191-193.

Pulliainen, E. 1983. Expansion of the brown bear (Ursus Arctos) into Finland from the East. Paper presented at the Sixth Int. Conf. Bear Res. and Manage., Grand Canyon, AZ. In Press.

Quimby, R. 1974. Grizzly bear. In: R.D. Jakimchuk, Ed., Mammal studies in northeastern Alaska. Reynolds, H.V. 1975. Annual report of survey inventory activities. Pt. II. Black bear, brown bear, polar bear, caribou. R.A. Hinman, Ed. ADF&G. Vol. VII. 156 pp.

Reynolds, H.V. 1975. Annual report of survey inventory activities. Part II. Black bear, brown bear, polar bear, caribou. R.A. Hinman, Ed. Alaska Dept. of Fish & Game, Juneau. Vol. VII. 156 pp.

_____. 1976. North slope grizzly bear studies. Fed. Aid Wildl. Rest. Proj. Rep. W-17-6 and W-17-7, Jobs 4.8R and 4.11R. Alaska Department of Fish and Game, Juneau

_____, and J. Hechtel. 1980. North slope grizzly bear studies. Fed. Aid Wildl. Rest. Proj. W-17-11, Job No. 4.14R. Alaska Dept. Fish and Game, Juneau. 66 pp.

Roben, P. 1980. Status of the brown bear in the Pyrenees. In the. Conf. Bear Res. and Manage. 4:243-247.

Rockwell, S., J. Perry, M. Haroldson, and C. Jonkel. 1978. Vegetation studies of disturbed grizzly habitat. Pages 17-78. in: C. Jonkel (ed.) Annu. Rep.3. Border Grizzly Proj. Univ. Montana, Missoula. 256 pp.

Rogers, L. 1976. Effects of mast and berry crop failures on survival, growth, and reproductive success of black bears. Trans. N. Am. Wildl. Nat. Resour. Conf. 41:431-438.

_____. 1977. Social relationships, movements, and population dynamics of black bears in northeastern Minnesota. Ph.d. Diss. Univ. Minnesota, Minneapolis. 194 pp.

Rognrud, M. 1956. Grizzly bear survey. Fed. Aid Rept. W-71-R, W-72-R, W-74-R, Job no. A-7. Montana Dept. of Fish and Game, Helena. 9 pp.

Roth, H.U. 1972. Status of the last brown bears of the alps in the Trentino, Italy. Int. Conf. Bear Res. and Manage. 2:307-308.

_____. 1980. Defecation rates of captive brown bears. Int. Conf. Bear Res. and Manage. 4:249-253.

Roughton, R.D. and M.W. Sweeny, 1982. Refinements in scent-station methodology for assessing trends in carnivore populations. J. Wildl. Manage. 46:217-229.

Russell, R.H., J.W. Nolon, N.A. Woody G. Anderson. 1979. A study of the grizzly bear in Jasper National Park, 1975-1978. Can. Wildl. Serv. Rept. 136 pp.

Schallenberger, A. 1974. Reconnaissance survey of grizzly bear habitat, Rocky Mountain Division, Lewis and Clark National Forest. Mimeo.

Schallenberger, A. 1980. Review of oil and gas exploitation impacts on grizzly bears. Int. Conf. Bear Res. and Manage. 4:271-276.

_____, and C.J. Jonkel. 1979. Rocky Mountain East Front grizzly studies, 1978. Univ. of Mont., Missoula. BGP Spec. Rpt. No. 27. 115 pp.

Servheen, C. 1981. Grizzly bear ecology and management in the Mission Mountains, Montana. Ph.D. Diss. Univ. Montana, Missoula. 138 pp.

_____, and L. Lee. 1980. Mission Mountain grizzly bear studies -- an interim report. BGP Spec. Rpt. No. 31. Border Grizzly Project, Univ. of Montana, Missoula.

_____, and T. Wojciechowski. 1978. Grizzly bear foods. Pp. 83-107 in: C. Jonkel ed. Annu Rep. 3. Border Grizzly Project. Univ. Montana, Missoula. 207 pp.

_____, and R. Klaver. 1983. Grizzly bear dens and denning activity in the Mission and Rattlesnake Mountains, Montana. In the. Conf. Bear Res. and Manage. 5:201-207.

Shaffer, M.L. 1983. Determining minimum viable population sizes for the grizzly bear. Int. Conf. bear Res. and Manage. 5:133-139.

Shaffer, S. 1971. Some ecological relationships of grizzly and black bears of the Apgar Mountains in Glacier National Park, Montana. M.S. Thesis, Univ. Montana, Missoula. 134 pp.

Schemnitz, S.D. (Ed.). 1980. Wildlife management techniques manual. Fourth Edition. The Wildlife Society, Washington, D.C. 686 pp.

Sidorowicz, G.A. and F.F. Gilbert, 1981. The management of grizzly bears in the Yukon, Canada. Wildl. Soc. Bull. 9(2):125-135.

Sizemore, D. 1980. Foraging strategies of the grizzly bear as related to its ecological energetics. Unpub. M.S. Thesis. Univ. of Montana, Missoula. 67 pp.

Skaar, D., D. Flath, and L. Thompson. 1985. Montana bird distribution. Montana Academy of Sciences. Monogr. 3., Vol. 44. 72 pp.

Steele, R. 1960. The role of fire in the Bob Marshall Wilderness Area. Montana. For. and Conserv. Exp. Sta., Univ. Mont., Missoula. 33 pp.

Stirling, I., A.M. Pearson, and F.L. Bunnell. 1976. Population ecology studies of polar and grizzly bears in northern Canada. Int. Conf. Bear Res. and Manage. 3:421-430.

Stockstad, D.S. 1953. Grizzly bear investigation and recheck. Fed. Aid in Wildl. Proj. Rept. W-60-R-1, Job no. VII A. Montana Dept. of Fish and Game, Helena, 4 pp.

_____. 1954. Grizzly bear investigation and recheck. Fed. Aid in Wildl. Rept. Proj. Compl. Rept. W-60-R-1, Job No. VII-A. Montana Dept. Fish and Game, Helena. 13 pp.

Stokes, A.W. 1970. An ethologist's views on managing grizzly bears. Bioscience 20:1154-1157.

Strandgaard, H. 1967. Reliability of the Petersen method tested on a roe-deer population. J. Wildl. Manage. 31:643-651.

Stringham, S. F. 1983. Roles of adult males in grizzly bear population biology. Int. Conf. Bear Res. and Manage. 5:140-151.

Sumner, J., and J. Craighead. 1973. Grizzly bear habitat surveys in the Scapegoat Wilderness, Montana. Montana Coop. Wildl. Res. Unit. Univ. Montana, Missoula. 49 pp.

Swenson, J.E. 1985. Effects of hunting on black bears in southwestern Montana. Presented at Black Bear Workshop in Missoula.

Taylor, G. 1979. Gallatin big game studies. Fed. Aid. Wildl. Rest. Proj. No. W-130-R-10, Job I-3.1 Montana Dept. of Fish, Wildl. and Parks, Helena.

Their, T., and D. Sizemore. 1981. An evaluation of grizzly bear relocations in the Border Grizzly Project Area, 1975-1980. Border Grizzly Project. Spec. Rept. 47. Univ. Montana, Missoula. 16 pp.

Tirmenstein, D.A. 1983. Grizzly bear habitat and management in the Rattlesnake National Recreation Area and Wilderness. M.S. Thesis. Univ. of Montana, Missoula. 213 pp.

Tompa, F.S. 1984. Grizzly bears in British Columbia -- Harvest must be reduced. British Columbia Wildl. Branch, 9 pp. Unpubl.

Troyer, W.A. 1961. The brown bear harvest in relation to management on the Kodiak Islands. Trans. North American Wildl. and Nat. Res. Conf. 26:460-468.

_____. and R.J. Hensel, 1964. Structure and distribution of a Kodiak bear population. J. Wildl. Manage. 28(4):769-772.

U.S.D.A. Forest Service. 1985. Kootenai National Forest plan. Draft Environmental Impact Statement. Appendix D - Grizzly Bear Management. Kootenai National Forest.

U.S. Department Of Interior. 1982. Grizzly bear recovery plan. U.S. Dept. Inter. Fish and Wildl. Serv. 195 pp.

U.S. Department of Interior, Fish and Wildlife Service, 1982. Guidelines for determining grizzly bear nuisance status and for controlling nuisance grizzly bears in the Northern Continental Divide and Cabinet-Yaak Grizzly Bear Ecosystems. 23 pp.

Vroom, G. 1974. Observations of wolves and grizzly bears. Banff National park. Banff Warden Service.

_____, S. Herrero, and R. Oglivie. 1980. The ecology of winter dens sites of grizzly bears in Banff National Park, Alberta. Int. Conf. Bear Res. and Manage. 4:321-330.

van Drimmelen, B. 1984. Grizzly bear management plan for the Skeena Region. British Columbia Wildl. Branch. 20 pp. Unpubl.

Waddell, T.E., and D.E. Brown, 1984. Exploitation of two subpopulations of black bears in an isolated mountain range. J. Wildl. Manage. 48(3):933-938.

Woodgerd, W.R. 1974. Letter to Lynn A. Greenwalt. Montana Dept. of Fish and Game, Helena. 2 pp.

Young, B.F. and R.L. Ruff, 1982. Population dynamics and movements of black bears in east central Alberta. J. Wildl. Manage. 46(4):845-860.

Zager, P. 1980. The influence of logging and wildfire on grizzly bear habitat in northwestern Montana. Ph.D. Diss. Univ. Montana, Missoula. 131 pp.

_____, P.C. Jonkel, and R.D. Mace. 1980. Grizzly bear habitat terminology. BCP Spec. Rpt. No. 41. School of Forestry, Univ. of Montana, Missoula. 15 pp.

_____, C. Jonkel, and J. Habeck. 1983. Logging and wildfire influence on grizzly bear habitat in northwestern Montana. Int. Conf. Bear Res. and Manage. 5:224-132.

Zunino, F., and S. Herrero. 1972. The status of the brown bear (Ursus arctos) in Abruzzo National Park, Italy, 1971. Biol. Conserv. 4(4):263-272.

APPENDIX A

WILDLIFE

MCA 12.9.103 GRIZZLY BEAR POLICY (1) Whereas, the Montana Fish and Game Commission has management authority for the grizzly bear, a resident wildlife species, and is dedicated to the preservation of grizzly bear populations within the state of Montana; and

Whereas the secure habitat for the grizzly has been greatly reduced as a result of the human development and population growth from 1850 through 1950 in the bear's traditional range in all western states; and

Whereas, a significant portion of the remaining grizzly bear habitat and population is located in Montana and these Montana populations occur in wildlands such as wilderness, primitive areas, de facto wilderness areas, national forests, national parks, Indian reservations, and seasonally, on adjacent private lands.

Now, therefore, in order to promote the preservation of the grizzly bear in its native habitat, the commission establishes the following policy guidelines for the Montana Department of Fish, Wildlife and Parks action when dealing with grizzly bear.

(a) Habitat. The department shall work to perpetuate and manage grizzly bear in suitable habitats of this state for the welfare of the bear and the enjoyment of the people of Montana and the nation. In performing this work the department should consider the following:

(i) the commission has the responsibility for the welfare of the grizzly and advocates the protection of the bear's habitat;

(ii) management of Montana's wildlands, including the grizzly bear habitat, is predominately, but not exclusively, a responsibility of various federal agencies and private landowners;

(iii) land use decisions made by these agencies and individuals affect grizzly bear habitat, thus cooperative programs with these agencies and individuals are essential to the management of this species;

(iv) preservation of wildlands is critical to the protection of this species and the commission advocates wildland preservation in occupied grizzly bear habitat; and

(v) while some logging may not be detrimental to grizzly habitat, each logging sale in areas inhabited by grizzly bear should be carefully reviewed and evaluated.

(b) Research. It is recognized by the commission that research on the habitat requirements and population characteristics of the grizzly bear is essential for the welfare of the species. Departmental research programs and proposals directed at defining those habitat requirements are encouraged and supported.

(c) Hunting and recreational use. The commission recognizes its responsibility to consider and provide for recreational opportunities as part of a grizzly bear management program. These opportunities shall include sport hunting, recreational experiences, aesthetics of natural ecosystems, and other uses consistent with the overall welfare of the species.

(i) the department should consider the variability of values between individuals, groups, organizations, and agencies when management programs for various grizzly bear populations are developed.

(ii) sport hunting is considered the most desirable method of balancing grizzly bear numbers with their available habitat, minimizing depredations against private property within or adjacent to grizzly bear habitat, and minimizing grizzly bear attacks on humans.

(d) Depredations. Contacts between grizzly bear and humans, or property of humans, require delicate handling and careful consideration. When these contacts reach the stage for definite action, the following actions should be carried out:

(i) grizzly bear, in the process of threatening or endangering human life, shall be captured or dispatched immediately.

(ii) where no immediate threat to human life exists, individual bear encounters with humans shall be evaluated on a case-by-case basis and when the attack is abnormal or apparently unprovoked, the individual bear involved shall be captured or dispatched.

(iii) when the attack is normal (e.g., a female defending her cubs, any bear defending its food, or any bear defending itself) but the situation leads itself to no reasonable possibility of leaving the bear in place, then the bear should be removed.

(iv) grizzly bear committing depredations that do not directly endanger human life but that are causing

property losses shall be evaluated on an individual case basis.

(v) where removal is determined to be the best resolution to the problem, depredating or nuisance bear shall be trapped, and if determined to be suitable for transplanting, shall be marked and released in suitable habitat previously approved with appropriate land management agencies.

(vi) reasonable efforts shall be made to inform the public of the transplant program, fully explaining the reasons for the capturing and locations of the release area.

(vii) upon request by an authorized scientific investigative agency or public zoological institution, a captured bear may be given to that agency or institution for appropriate nonrelease research purposes. A reasonable charge may be required to cover costs of handling.

(e) Depredating grizzly bear that are not suitable for release or research because of old age, acquired behavior, disease, or crippling, shall be killed and sent to the department's research facilities for investigation. The public shall be fully informed when these actions are taken and the reasons for these actions shall be fully explained.

(f) Coordination. The department shall consult with appropriate federal agencies and comply with applicable federal rules and regulations in implementation of this policy. (History: Sec. 87-1-301 MCA, IMP, 87-1-201, 87-1-301 MCA; Eff. 12/31/72; AMD, 1977 MAR p. 257, Eff. 8/26/77.)

APPENDIX B

NCDE Management Area Boundary Description

Occupied habitat in the NCDE is bounded on the west by U.S. Highway 93 from the U.S.-Canadian border, south to the junction with Montana Highway 82, then east along Highway 82 to the junction with Montana Highway 35 then south approximately along Highway 35 to its junction with Highway 93, then south approximately along Highway 93 to its junction with Interstate 90. The southern boundary approximately follows Interstate 90 east from this junction to the junction with Montana Highway 200, then approximately along Highway 200 east to a point on the highway at the confluence of Willow Creek and the Blackfoot River, then east approximately along a line from this point to the town of Wolf Creek. The eastern boundary follows north approximately along a line from Wolf Creek to Augusta then approximately along a line from Augusta to the confluence of Arnold Coulee and Pishkun Canal, then east along Pishkun Canal to Pishkun Reservoir, then east along the north shore of the reservoir to its northernmost point, then north approximately along a line from this point to the easternmost point on the shore of Eureka Reservoir, then approximately along a line from this point to the westernmost point on the shore of Bynum Reservoir, then approximately along a line from this point to Dupuyer, then approximately along a line from Dupuyer to East Glacier, then approximately along a line from East Glacier to Babb then approximately along a line from Babb to a point on the U.S.-Canadian border at the midpoint of Township 37 North, Range 14 West. The northern boundary follows the international border west from this point to the intersection with U.S. Highway 93.

APPENDIX C

CYE Management Area Boundary Description

The western boundary follows the Montana-Idaho border south from the U.S.-Canadian border to the intersection of this stateline and the Mineral County-Saunders County line. The southern boundary follows approximately along a line from this point to Thompson Falls, then along Montana Highway 200 east from Thompson Falls to a point on the highway approximately 1 mile north of Plains, then approximately along a line from this point to a point approximately 1 mile north of Plains on Montana Highway 28, then, from this point east along Highway 28 to the east end of Rainbow Lake. The eastern boundary follows approximately along a line from this point north to Bassoo Peak then approximately along a line from Bassoo Peak to the USFS Bend Ranger Station, then approximately along a line from this ranger station to the confluence of Silver Butte Fisher Creek and Fisher River at U.S. Highway 2 then north along Highway 2 to Libby, then from Libby east along the Kootenai River and north along the west shore of Lake Koocanusa to the U.S.-Canadian border. The northern boundary follows the international border from this point to the Montana-Idaho border.

50 CFR 17

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

Authority: Marine Mammal Protection Act of 1972, 86 Stat. 1027, as amended, §§ 101(a), 102(a)(2), 104, 105, 112(a) [16 U.S.C. §§ 1371(a), 1372(a)(2), 1374, 1375, and 1382(a)]; Endangered Species Act of 1973, 87 Stat. 884, as amended, §§ 4 (d) and (f), 9(a)(1)(G), and 11(a)(1) [16 U.S.C. §§ 1533 (d) and (f), 1538(a)(1)(G), and 1540(a)(1)].

Subpart A—Introduction and General Provisions

§ 17.1 Purpose of regulations.

(a) The regulations in this part implement the Endangered Species Act of 1973, 87 Stat. 884, 16 U.S.C. 1531-1543, except for those provisions in the Act concerning the Convention on International Trade in Endangered Species of Wild Fauna and Flora, for which regulations are provided in Part 23 of this subchapter.

(b) The regulations identify those species of wildlife and plants determined by the Director to be endangered or threatened with extinction under section 4(a) of the Act and also carry over the species and subspecies of wildlife designated as endangered under the Endangered Species Conservation Act of 1969 (83 Stat. 275, 16 U.S.C. 668cc-1 to 6) which are deemed endangered species under section 4(c)(3) of the Act.

[40 FR 44415, Sept. 26, 1975, as amended at 42 FR 10465, Feb. 22, 1977]

§ 17.2 Scope of regulations.

(a) The regulations of this part apply only to endangered and threatened wildlife and plants.

(b) By agreement between the Service and the National Marine Fisheries Service, the jurisdiction of the Department of Commerce has been specifically defined to include certain species, while jurisdiction is shared in regard to certain other species. Such species are footnoted in Subpart B of this part, and reference is given to special rules of the National Marine Fisheries Service for those species.

(c) The provisions in this part are in addition to, and are not in lieu of, other regulations of this Subchapter B which may require a permit or prescribe additional restrictions or conditions for the importation, exportation, and interstate transportation of wildlife.

(d) The examples used in this part are provided solely for the convenience of the public, and to explain the intent and meaning of the regulation to which they refer. They have no legal significance.

(e) Certain of the wildlife and plants listed in § 17.11 and § 17.12 as endangered or threatened are included in Appendix I, II or III to the Convention on International Trade in Endangered Species of Wild Fauna and Flora. The importation, exportation and reexportation of such species are subject to additional regulations provided in Part 23 of this subchapter.

[40 FR 44415, Sept. 26, 1975, as amended at 42 FR 10465, Feb. 22, 1977]

§ 17.3 Definitions.

In addition to the definitions contained in Part 10 of this subchapter and unless the context otherwise requires, in this Part 17:

"Act" means the Endangered Species Act of 1973 (16 U.S.C. 1531-1543; 87 Stat. 884);

"Alaskan Native" means a person defined in the Alaska Native Claims Settlement Act (43 U.S.C. section 1603(b); (85 Stat. 588)) as a citizen of the United States who is of one-fourth degree or more Alaska Indian (including Tsimshian Indians enrolled or not enrolled in the Metlaktla Indian Community), Eskimo, or Aleut blood, or combination thereof. The term includes any Native, as so defined, either or both of whose adoptive parents are not Natives. It also includes, in the absence of proof of a minimum blood quantum, any citizen of the United States who is regarded as an Alaska Native by the Native village or town of which he claims to be a member and whose father or mother is (or, if deceased, was) regarded as Native by any Native village or Native town. Any citizen enrolled by the Secretary pursuant to section 5 of the Alaska Native

why the applicant is justified in obtaining the permit, including:

(i) The details of the activities sought to be authorized by the permit;

(ii) The details of how such activities will be carried out;

(iii) The relationship of such activities to scientific objectives or to objectives enhancing the propagation or survival of the wildlife sought to be covered by the permit; and

(iv) The planned disposition of such wildlife upon termination of the activities sought to be authorized.

(b) *Issuance criteria.* Upon receiving an application completed in accordance with paragraph (a) of this section, the Director will decide whether or not a permit should be issued. In making his decision, the Director shall consider, in addition to the general criteria in § 13.21(b) of this subchapter, the following factors:

(1) Whether the purpose for which the permit is required is adequate to justify removing from the wild or otherwise changing the status of the wildlife sought to be covered by the permit;

(2) The probable direct and indirect effect which issuing the permit would have on the wild populations of the wildlife sought to be covered by the permit;

(3) Whether the permit, if issued, would in any way, directly or indirectly, conflict with any known program intended to enhance the survival probabilities of the population from which the wildlife sought to be covered by the permit was or would be removed;

(4) Whether the purpose for which the permit is required would be likely to reduce the threat of extinction facing the species of wildlife sought to be covered by the permit;

(5) The opinions or views of scientists or other persons or organizations having expertise concerning the wildlife or other matters germane to the application; and

(6) Whether the expertise, facilities or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application.

(c) *Permit conditions.* In addition to the general conditions set forth in Part 13 of this subchapter, every permit issued under this section shall be subject to the following special conditions:

(1) In addition to any reporting requirements contained in the permit itself, the permittee shall also submit to the Director a written report of his activities pursuant to the permit. Such report must be postmarked or actually delivered no later than 10 days after completion of the activity.

(2) The death or escape of all living wildlife covered by the permit shall be immediately reported to the Service's office designated on the permit.

(3) The carcass of any dead wildlife covered by the permit shall be stored in a manner which will preserve its use as a scientific specimen.

(d) *Duration of permits.* The duration of permits issued under this section shall be designated on the face of the permit.

[40 FR 44415, Sept. 26, 1975, as amended at 41 FR 19226, May 11, 1976]

§ 17.33 [Deleted]

§§ 17.34-17.39 Permits. [Reserved]

§ 17.40 Special rules—mammals.

(a) *Kangaroo; Eastern Gray (Macropus giganteus), Red (Megalia rufa), and Western Gray (Macropus fuliginosus)*—(1) *Prohibitions.* The following prohibitions apply to the Eastern Gray, Red and Western Gray kangaroos:

(i) *Import.* (A) Except as permitted in paragraph (a)(1)(i)(B) of this section, or in paragraph (a)(2) of this section, it shall be unlawful to import any such wildlife for commercial purposes.

(B) Upon receiving from the Australian Government a certificate that (*1*) a particular Australian State has developed an effective sustained-yield program for such wildlife, and (*2*) the taking of such wildlife in that State will not be detrimental to the survival of the species or subspecies of which such wildlife is a part, the Director may, consistent with the purposes of the act, permit by publication of a notice in the FEDERAL REGISTER the commercial importation of any such wildlife originating from that State, upon proof that such wildlife is lawfully taken and exported from that State: *Provided*, That if the Director determines from all the evidence that a previously certified Australian State no longer maintains an effective sustained yield program for such wildlife, he may by regulation prohibit any further commercial importation of such wildlife from that State.

(ii) *Unlawfully imported kangaroos.* It shall be unlawful, in the course of a commercial activity, to deliver, receive, carry, transport, or ship in interstate or foreign commerce any such wildlife imported unlawfully.

(iii) *Commercial transactions.* It shall be unlawful to sell or offer for sale in interstate or foreign commerce any such wildlife imported unlawfully.

(2) *Permits.* The following permits are available for the Eastern Gray, Red and Western Gray kangaroos:

(i) *Economic hardship.* (A) The Director may grant permits for the importation of such wildlife to prevent economic hardship. The provisions of § 17.23 (with the exception of §§ 17.23(b)(4), 17.23(b)(8), and 17.23(d)), shall apply to the issuance of such permits. In addition, the requirements of section 10(b) of the Endangered Species Act of 1973 (16 U.S.C. 1539(b)) regarding hardship exemptions for endangered species shall apply to applications for hardship exemptions under this section as if such wildlife were classified "endangered:" and the applicant for an exemption under this section must submit all information required by section 10(b).

(B) The duration of any economic hardship permit issued for such wildlife under this provision will be limited by section 10(b) of the Endangered Species Act of 1973 as if those species were listed as "endangered" under the act.

(b) *Grizzly bear (Ursus arctos horribilis)*—(1) *Prohibitions.* The following prohibitions apply to the grizzly bear:

(i) *Taking.* (A) Except as provided in paragraphs (b)(1)(i) (B) through (F), of this section no person shall take any grizzly bear in the 48 conterminous states of the United States.

(B) Grizzly bears may be taken in self-defense, or in defense of others, but any such taking shall be reported in writing to the United States Fish and Wildlife Service, Division of Law Enforcement, P.O. Box 19183, Washington, D.C. 20036, and to appropriate State officials, within 5 days after it occurs.

(C) *Removal of nuisance bears.* A grizzly bear constituting a demonstrable but non-immediate threat to human safety, or committing significant depredations to lawfully present livestock, may be taken, but only if:

(1) it has not been reasonably possible to eliminate such threat or depredation by live-capturing and releasing unharmed in a remote area the grizzly bear involved; and

(2) the taking is done in a humane manner by authorized Federal or State employees; and

(3) the taking is reported in writing to the United States Fish and Wildlife Service, Division of Law Enforcement, P.O. Box 19183, Washington, D.C. 20036, and to appropriate State officials, within 5 days after it occurs.

(D) *Federal or State scientific or research activities.* Authorized Federal or State employees may pursue, capture, or collect grizzly bears for scientific or research purposes.

(E) *Northwestern Montana.* If it is not contrary to the laws and regulations of the State of Montana, a person may hunt grizzly bears in the Flathead National Forest, the Bob Marshall Wilderness Area, and the Mission Mountains Primitive Area of Montana: *Provided*, That if in any year in question, 25 grizzly bears have already been killed for whatever reason in that part of Montana, including the Flathead National Forest, the Bob Marshall Wilderness Area and the Mission Mountains Primitive Area, which is bounded on the north by the United States-Canadian Border, on the east by U.S. Highway 91, on the south by U.S. Highway 12, and on the west by Montana-Idaho State line, the Director shall post and publish a notice prohibiting such hunting, and any such hunting for the remainder of that year shall be unlawful; *Provided further*, That any taking of a grizzly bear, for whatever reason, in the above-described portion of Montana shall be reported in writing to the United States Fish and Wildlife Service, Division of Law Enforcement, P.O. Box 19183, Washington, D.C. 20036, and to the Montana Department of Fish and Game, within 5 days after the taking occurs; and except that any taking on an Indian reservation within the above-described area shall be so reported only to the United States Fish and Wildlife Service, Division of Law Enforcement, P.O. Box 19183, Washington, D.C. 20036.

(F) *National Parks.* The regulations of the National Park Service shall govern all taking of grizzly bears in National Parks.

(ii) *Unlawfully taken grizzly bears.* (A) Except as provided in paragraph (b)(1)(ii)(B) of this section, no person shall possess, deliver, carry, transport, ship, export, or sell grizzly bear taken unlawfully.

(B) Authorized Federal or State employees may for scientific or research purposes possess, deliver, carry, transport, ship, or export unlawfully taken grizzly bears.

(iii) *Import or export.* (A) Except as provided in this paragraph (b)(1)(iii)(A), below, no person shall import any grizzly bear into the United States.

(1) *Federal or State scientific or research activities.* Authorized Federal or State employees may import grizzly bears into the United States for scientific or research purposes.

(2) *Public zoological institutions.* Public zoological institutions (see 50 CFR 10.12) may import grizzly bears into the United States.

(B) Except for public zoological institutions (see 50 CFR 10.12), no person shall, in the course of a commercial activity, export any grizzly bear from the United States.

(iv) *Commercial transactions.* (A) Except for public zoological institutions (see 50 CFR 10.12), no person shall, in the course of a commercial activity, deliver, receive, carry, transport, or ship in interstate or foreign commerce any grizzly bear.

(B) Except for public zoological institutions (see 50 CFR 10.12) dealing with other public zoological institutions, no person shall sell or offer for sale in interstate or foreign commerce any grizzly bear.

(v) *Other violations.* No person shall attempt to commit, cause to be committed, or solicit another to commit any act prohibited by this paragraph (a)(1) of this section.

(2) *Definitions.* As used in paragraph (b) of this section the term "grizzly bear" means any member of the species, *Ursus arctos horribilis* of the 48 conterminous states of the United States, including any part, offspring, dead body, part of a dead body, or product of such species.

(c) *Primates.* (1) Except as noted in paragraph (c)(2) of this section, all provisions of § 17.31 shall apply to the Lesser slow loris, *Nycticebus pygmaeus;* Philippine tarsier, *Tarsius syrichta;* White-footed tamarin, *Saguinus leucopus;* Black howler monkey, *Alouatta pigra;* Stumptail macaque, *Macaca arctoides;* Gelada, *Theropithecus gelada;* Formosan rock macaque, *Macaca cyclopis;* Japanese macaque, *Macaca fuscata;* Toque macaque, *Macaca sinica;* Long-tailed langur, *Presbytis potenziani;* Purple-faced langur, *Presbytis senex;* Tonkin snub-nosed monkey, *Rhinopithecus avunculus;* Pigmy chimpanzee, *Pan paniscus;* and Chimpanzee, *Pan troglodytes.*

(2) The prohibitions referred to above do not apply to any live member of such species held in captivity in the United States on the effective date of the final rulemaking, or to the progeny of such animals, or to the progeny of animals legally imported into the United States after the effective date of the final rulemaking. *Provided*, That the person wishing to engage in any activity which would otherwise be prohibited must be able to show satisfactory documentary or other evidence as to the captive status of the particular member of the species on the effective date of this rulemaking or that the particular member of the species was born in captivity in the United States after the effective date of this rulemaking. Identification of the particular member to a record in the International Species Inventory System (ISIS), or to a Federal, State or local government permit, shall be deemed to be satisfactory evidence. Records in the form of studbooks or inventories kept in the normal course of business, shall be acceptable as evidence, provided that a notarized statement is inserted in such record to the effect that:

(i) The records were kept in the normal course of business prior to November 18, 1976, and accurately identify (by use of markers, tags, or other acceptable marking devices) individual animals; or

(ii) That the individual animal identified by the records was born in captivity on ————(Date).

The notarized statement in paragraph (c)(2)(i) of this section, shall be acceptable only if the notarization is dated on or before January 3, 1977. The notarized statement in (c)(2)(ii), of this section, shall be acceptable only if the notarization is dated within 15 days of the date of birth of the animal.

(d) Gray wolf (*Canis lupus*) in Minnesota—(1) *Zones.* For purposes of these regulations, the State of Minnesota is divided into the following five zones.

APPENDIX E

NCDE POPULATION DENSITY JUSTIFICATIONS

APPROACH: Several assumptions were made regarding grizzly bear ecology, habitat use patterns, mortality patterns, and home-range size to estimate current population densities. These assumptions, which we felt would generate reasonable minimum and maximum estimates, are listed below:

1. Existing density estimates could be applied to areas of similar habitat features, food type, mortality patterns, and levels of human activity and encroachment (Zunino and Herrero 1972, Martinka 1974, Pearson 1975, Lortie 1978, Reynolds and Hechtel 1980, Miller and Ballard 1982, Tompa 1984, van Drimmelen 1984).

2. Only annual densities were estimated. This annual density would correspond to the number of grizzlies living in an area year-round.

3. Home-range size, the degree of home-range overlap, and population density are partly related to habitat quality. As a result, areas of similar habitat quality should support similar numbers of grizzly bears. Furthermore, grizzly bears tend to limit their movements between the lowest available habitat and the closest major Mountain divide (Mace and Jonkel 1980, Aune et al. 1984, Mace 1985). This home-range pattern would help define density unit boundaries.

4. There are areas with high mortality in the NCDE and population densities were adjusted to reflect this factor.

5. Although the habitat may be excellent, areas of high human activity would reduce a density estimate.

6. It is assumed that there are areas of high bear density and low bear density. This may result at least partially from the patchy distribution of important components of habitat (Mealey et al. 1976). Bears are not uniformly distributed throughout a density unit.

7. It is assumed that movement of bears between density units is equal. All individuals within each density unit do not remain within the boundaries of the unit.

RATIONALE BEHIND EACH DENSITY ESTIMATE

Density Unit No. 2. Red Meadow

Location: Eastern half of Whitefish Range from North Fork Flathead River to Tobacco Valley. USA-Canadian border to Red Meadows Creek. Habitat Unit Region 2.

Past Density Estimates: Jonkel and Cowan (1971) gave an estimate of 1/13 mi^2. Thier (USDA 1982) estimated 1/15 mi^2 for the area from Red Meadow Creek north to International border based on instrumented bears and untagged observations.

Dept. FWP Density Estimate: 1/15-1/10 mi^2 (14-22 bears)

Unit Size: 215 mi^2.

Discussion: It would be inappropriate to extrapolate the Martinka (1974) density estimate for Glacier National Park to this area. McLellan's 1984 estimate of 1 per 3-6 mi^2 was essentially for floodplain and benchland habitats and could not be directly extrapolated to the U.S. side.

Our density estimate was based on the proximity of this Unit to Glacier National Park (1/8 mi^2) and British Columbia (1/3-6 mi^2), but lowered to account for mortality and habitat differences.

Density Unit No. 3. Southern Whitefish Range:

Location: Red Meadow Creek south to Columbia Falls, Mt. Habitat Region 2.

Past Density Estimates: None for this area.

Dept. FWP Estimate: 1/25-1/18 mi^2 (33-46 bears)

Unit size: 831 mi^2

Discussion: Grizzlies are less commonly observed (or shot) in the area from Red Meadow Creek to the south as compared to the Northern Whitefish (Hadden and Jonkel 1983). These authors reported an average of 5 grizzly bear sightings per year for the period 1980-1983 in an area at the southern extreme of the unit. However, a seasonal concentration of grizzly bears (to feed on huckleberries) occurs in the Apgar Mountains (Kendall 1985). Densities are considered to be less on the west side of the Whitefish Divide than on the east side, and recent sightings compiled by Manley (1984) substantiate this. Mealey et al. (1976) graphically showed that the distribution of important grizzly bear habitat components decreased from north to south. Martinka (1971) stated that: "...the habitat within the Park is more suitable for the grizzly than it is adjacent to the Park, where we find extensive coniferous forests. This appears to be much more suitable habitat for the black bear and the number of grizzlies on those areas is less".

Density Unit No. 4. Glacier National Park:

Location: Glacier National Park, Northwestern Montana. Habitat Region 2.

Past Density Estimates: Martinka's (1974) estimate of 1/8 mi^2 for a 390 mi^2 area within the park extrapolated to the entire Park.

Dept. FWP Estimate: 1/8-1/6 mi^2 (193-264 bears)

Unit Size: 1583 mi^2.

Discussion: The Department used Martinka's (1974) estimate of 1 grizzly per 8 mi^2 for the entire Park. Martinka's (1974) study area was selected to proportionately represent the habitats and physiographic features of the entire park. However, the Department did not feel it appropriate to extrapolate this figure directly to any other place in Montana. This estimate is reasonable for an unhunted population in apparently superior habitat and is consistent with other similar areas (Mundy and Flook 1973, Dean 1976, McLellan 1984). Glacier National Park is a unhunted population where human impacts are strictly controlled.

Density Unit No. 5. St. Marys:

Location: Western edge of the Blackfeet Indian Reservation, next to Glacier National park. Habitat Regions 3 and 4.

Past Density estimate: None for this unit.

Dept. FWP density estimate: 1/20-1/10 mi^2 (11-21 bears)

Unit size: 211 mi^2

Discussion: Virtually no information is available for the Blackfeet Reservation. Although it is excellent habitat and is adjacent to Glacier National Park which has a density of 1/8 mi^2, the Department felt that the Reservation was primarily seasonal habitat for Glacier bears, and not many animals live in the lower elevation sites throughout the year. Martinka (pers. comm., Glacier National Park, Mt.) stated that 1 bear/15 mi^2 was a reasonable estimate for this unit. To be conservative the Department chose to use 1/20 mi^2 as the estimate of the minimum.

Density Unit No. 6. Badger-Two Medicine:

Location: Eastern front of Rocky Mountains. Unit includes Badger and Two Medicine Creeks on the Blackfeet Indian Reservation. Habitat Regions 3 and 4.

Past Density Estimates: None. Closest estimates are Martinka (1974), Aune et al. (1984), and Aune's reevaluation of his 1984 data discussed earlier.

Dept. FWP Estimate: 1/20-1/16 mi^2 (16-20 bears)

Unit Size: 323 mi^2.

Discussion: Aune and Stivers (1982) consider this area to be a high mortality area for the East Front population.

The Department assumed that this area was potentially the same as the East Front Unit, except for the number of suspected bear killings annually in this area. Department personnel observed 7 grizzly bears in this area in 1984. Aune (pers. comm.) felt that there were undoubtedly other bears not observed.

Density Unit No. 7. South Fork:

Location: From Hungry Horse Reservoir south to Big Salmon Lake. Swan Mountain Crest east to the Continental Divide. Unit includes portion of the Bob Marshall and Great Bear wilderness areas. Habitat Region 2.

Past Density Estimates: Mace and Jonkel's (1980) density estimate of 1/10 mi^2 for a 128 mi^2 study area.

Dept. FWP Estimate: 1/15-1/10 mi^2 (108-160 bears)

Unit Size: 1624 mi^2.

Discussion: Mace and Jonkel's (1980) estimate was based on 1 year's data in superior fall habitats; this may be considered a seasonal concentration area. They stated that their density should not be extrapolated to other areas (emphasis added). A minimum density estimate for this area was recalculated using only tagged bears and their composite home range, yielding a density of 1/19 mi^2. We raised this estimate from 1/19 to 1/15 based on comments from bear professionals and wildlife managers in the area. In addition, this area is adjacent to high densities in Glacier National Park and also has provided a consistent level of hunter harvest over time. We extended this density estimate into the Bob Marshall as far south as Big Salmon Lake. South of this lake the habitat is drier (the Mission Mountains catch most of the moisture) and fewer bears are observed. As stated previously, this Unit includes both wilderness and non-wilderness acreage. It seems reasonable to assume that if an estimate of 1/15 mi^2 could be made for the nonwilderness portion of the Unit, then densities should be similar in wilderness acreages within the Unit. Additionally, 5 grizzly bears were subtracted from the density estimate because habitat was lost when Hungry Horse Reservoir was inundated (Bissell 1985).

Density Unit No. 8: East Front:

Location: West of the Continental Divide from Birch Creek to Sun River. Includes part of Bob Marshall Wilderness and Sun River Game Preserve. Habitat Regions 3 and 4.

Past Density Estimates: Aune et al. (1984) gave a density range of 1/11.5 mi^2 in the spring to 1/22.2 mi^2 in the fall. Reevaluation of Aune's 1984 data (based on marked bears only) yielded a density of 1/22 mi^2.

Dept. FWP Estimate: 1/18-1/12 mi^2 (62-93 bears)

Unit Size: 1,119 mi^2.

Discussion: Aune et al. (1984) stated that their density estimate could not be extrapolated to all areas of the East Front (emphasis added). The Department, using Aune's re-evaluated absolute minimum estimate of 1/22 mi^2 as a basis, raised the estimate of the minimum to 1/18 mi^2 based on pooled expertise from bear professionals and wildlife managers in the area, as well as Aune's own interpretations of a minimum. We extrapolated this estimate to include similar habitat in the Bob Marshall Wilderness Area. This East Front unit includes the Sun River Game Preserve in which hunting has been prohibited since 1973.

Density Unit No. 9. Swan Front:

Location: This Unit extends from the northern end of Hungry Horse Reservoir through the Swan River Valley to approximately Beaver Creek. Habitat Region 2.

Past Density Estimate:None for this unit.

Dept. FWP Estimate: 1/30-1/20 mi^2 (26-39 grizzlies).

Unit Size: 780 mi^2.

Discussion: Telemetry data from the Mission core and from the South Fork Unit show that bears in these two units do not use the valley to any great degree. None of the 12 bears monitored in the South Fork ever went into the Swan Valley (Mace and Jonkel 1980). Thus the estimate of 1/30 for this area represents the number of bears living year-round (except denning). Although the riparian zone of the Swan River is excellent habitat, the level of human encroachment is substantial (78% growth in last decade; Lake County Land Services Department 1985). This unit is also adjacent to the higher density areas of the South Fork and Glacier National Park. Considering the above information and the pooled expertise from bear professionals and wildlife managers in the area we felt it was appropriate to apply a density of 1/30 mi^2 for this unit.

Density Unit No. 10. Mission Mountains:

Location: This unit includes the Mission Mountains from the southern edge of the management area north between the Mission and Swan Valleys to Bigfork Habitat Region 1.

Past Density Estimate: 1/19 mi^2 (Servheen 1981) based on tagged and untagged observations in a core study area.

Dept. FWP Estimate: 1/45-1/25 mi^2 (23-42 grizzlies).

Unit Size: 1044 mi^2.

Discussion: Servheen's (1981) estimate of 1/19 mi^2 for parts of the Mission Mountains was re-evaluated. To be consistent with other research density estimation procedures, a composite home range was developed from Servheen (1981). Using only marked grizzly bears, within the composite range, the Department developed a minimum

estimate of 1/56 mi^2. The Department recognizes that there are high and low density areas within this unit. There are recent sightings in the Rattlesnake Wilderness, and there is at least some movement from the northern Mission Mountains. An instrumented female with 1 yearling was known to den in the Rattlesnakes (Servheen 1981). The Rattlesnake wilderness is considered sparsely populated at present. Servheen (1981) reported a density of 1/80 mi^2 for the Rattlesnake area.

Servheen (1981) estimated the current grizzly population in the Mission Mountains at 25. The northern part of the Mission Mountains is felt to have a lower density than the core of the Missions. Servheen (1981) reported a density of 1/32 mi^2 from Lost Creek north. R. Klaver (pers. comm.) reports that black bear problems in cherry orchards are frequent, but grizzly bear problems are infrequent.

Based on comment received, professional consultations, and a reevaluation of Servheen's (1981) dissertation, the Department combined several units, and developed an estimate of 1 bear/45 mi^2.

Density Unit No. 11. Scapegoat:

Location: Scapegoat Wilderness and southern portion of Bob Marshall Wilderness Area. Habitat Regions 3, 4, and 5.

Past Density Estimates: Data collected for 1984 (with a minimum of effort) by Aune (pers. comm.) documented 26-28 bears, distinct from his core area, on an area encompassing portions of the Sun River Game Preserve and the Scapegoat unit. This area is 672 mi^2 yielding a density of 1/26-1/28 mi^2. Dept. FWP Estimate: 1/30-1/18 mi^2 (63-106 bears)

Unit Size: 1,903 mi^2.

Discussion: Because this Scapegoat unit has provided a lower hunter harvest than areas to the north, the large size of the area involved, and the limited data available, we chose to be conservative and use a density of 1/30 mi^2.

The Department was reluctant to extrapolate the density estimates of Aune et al. (1984) to this area, although many of the habitat features, and probable food habits are similar. However, inferences from other studies in this area suggest that densities may be lower than areas to the north. Sumner and Craighead (1973) placed 6 horse carcasses in the high country of a 104 mi^2 study area. The minimum number of grizzlies visiting the carcasses was 6 - 4 of which were 1 family unit. Sumner and Craighead (1973) also counted tracks seen while hiking wilderness trails between

July 15 and September 15. Five grizzly tracks were seen in 260 miles of trails in the Scapegoat Area, while no grizzly tracks were observed in 95 miles of trails in the southern Bob Marshall Study Area. Mace (1984) observed no grizzly bears and saw no tracks during a 2-year habitat study in the southern Bob Marshall in a study area of 156 mi^2. There were grizzlies in Mace's study area however, as several diggings were observed near the Swan Crest. There are several problems in using tracks as an index to population density (Cooney 1941; Stockstad 1953, 1954; Hamlin and Frasina 1975). Craighead et al. (1982) felt that grizzly bears in the Wilderness may have learned to avoid trails frequented by man.

CORRESPONDENCE ON GRIZZLY BEAR RELOCATION

Helena, MT 59620
February 5, 1985

Dear

The Montana Department of Fish, Wildlife and Parks is currently reviewing its grizzly bear management program under a programmatic EIS process. In order to better define the management options open to us, we would appreciate your help in answering the following questions:

1. Would your state/province be interested in receiving grizzly bears from Montana for reintroduction (up to 20/year)?

2. Would you be willing to accept grizzly bears which have caused problems (livestock depredation, campground bears etc.)?

3. Would you be willing to pay the costs associated with moving grizzly bears to your state/province?

4. Does your state/province have any [illegible] grizzly bears into any area?

Thank you very much for your help. Please ma[illegible] Arnold Dood, Montana Department of Fish, Wildlife and Parks, Roy Huffman Building, MSU Campus, Bozeman, MT 59715.

Sincerely,

[illegible]
Wildlife [illegible]

RM/bl
804/2.1
804/2/File

Saskatchewan

Minister of Parks and Renewable Resources

Legislative Building
Regina, Canada
S4S 0B3

(306) 565-6128

March 5, 1985

Mr. Arnold Dood,
Montana Department of Fish, Wildlife and Parks,
Roy Huffman Building,
MSU Campus,
BOZEMAN, MT. 59715

Dear Mr. Dood:

Mr. Marcoux's letter to the former Minister, Honourable Bob Pickering, has been referred to me for reply.

I appreciate your offer of grizzly bears from Montana for reintroduction to the Province. Unfortunately Saskatchewan has no suitable habitat where grizzlies could be released without creating conflicts with agriculture. We have, therefore, decided not to reintroduce the grizzly bear.

Yours sincerely,

Colin Maxwell

Colin Maxwell

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

[illegible]

February 21, 1985

Mr. Arnold Dood
Montana Department of Fish, Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, Montana 59715

Dear Mr. Dood:

This responds to the letter from your department of February 5, 1985, concerning the interest of this state in accepting surplus grizzly bears from Montana. Because Alaska already has a very abundant and healthy brown/grizzly bear population, the answer to all of the questions posed in your letter is no. If you would be interested in the results of our experiences in translocation of bears, I invite you to contact Dr. Robert Tobey, Area Game Biologist, P.O. Box 47, Glennallen, Alaska 99588.

On the other hand, we might reconsider our stand in this matter if Montana were willing to consider a trade of Alaskan wolves for Montana bears. Presumably such an exchange would be on a pound for pound basis.

Sincerely,

Don W. Collinsworth
Commissioner

ARIZONA GAME & FISH DEPARTMENT

March 11, 1985

Mr. Robert D. Brannon, Research Assistant
Montana Department of Fish, Wildlife & Parks
Wildlife Research Bureau
MSU Campus, Box 5
Bozeman, Montana 59717-0001

Dear Mr. Brannon:

Arizona is not ready for grizzly bear transplants nor will we be in the foreseeable future. As I am sure you are aware, introductions of an animal of this nature would take considerable planning and public input. In addition, I am not aware of any interest, by our Commission or the public, for the reintroduction of grizzly bears.

Good luck with your management of grizzly bears and if I can be of any further help please feel free to contact me. If Arizona has any need for grizzly bears we will be seeking your advice and counsel.

Sincerely,

Rud Bristow
Director

RB:RDT:ljt

---

15 005 040

Arnold Dood,
Montana Department of
Fish, Wildlife and Parks
Roy Huffman Building
MSU Campus,
Bozeman, Montana
59715.

Dear Sir:

In response to your letter of February [illegible], we are not interested in receiving grizzly bears from Montana. We feel our grizzly bear populations are healthy and we do not have any plans or requirements for reintroductions.

Yours sincerely,

Alberta
ENERGY AND NATURAL RESOURCES
Fish & Wildlife Division

File No. 8560-2
Telephone No. 427-6750

Mr. Arnold Dood
Montana Dept. Fish, Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT
59715

Dear Mr. Dood

In response to your letter concerning access problem grizzly bears from Montana our policy is to accept grizzlies from other agencies if,

a) designated release areas with low or nil grizzly populations are available,

b) a maximum translocation of 500 km,

c) cost of most of the capture and translocation must be borne by the donor agency, and

d) history of the individual bear must be reviewed.

Considering the above conditions we would evaluate each request to receive a bear independently.

Yours truly,

Director of Wildlife

JAG/df

cc D C Surrendi

Province of British Columbia
Ministry of Environment
Wildlife Branch
Parliament Buildings
Victoria
British Columbia
V8V 1X5

File: 0775

March 6, 1985

RECEIVED
MAR [illegible]
WILDLIFE BRANCH

RECEIVED
FISH & WILDLIFE BRANCH

Mr. Ron Marcoux
Associate Director
Montana Department of
Fish, Wildlife & Parks
Helena, MT 59620

Dear Mr. Marcoux:

In response to your February 5, 1985 inquiry, regarding the transplant of grizzly bears, I am pleased to advise you that at least two of our southern-most regions have shown tentative interest.

Both the Kootenays and the Okanagan regions may accept grizzly bears, which do not have a human safety record. As the grizzly bear populations in the Kootenay's are stable or increasing, reintroduction there is not a priority. Therefore, they are not in the position to consider costs of translocation.

In the Okanagan region, the area of the Cascades north of Manning Park may be ear-marked for grizzly bear reintroduction but not in the current fiscal year. That region may consider the sharing of expenses.

It is my advice that you contact both regions directly for any possible arrangements in this regard (see contact persons and addresses below).

Yours truly,

J.M.C. Walker
Director

cc I. Robertson (Attn: R. Demarchi)
106 5th Ave. S. Cranbrook
Cranbrook, B.C. V1C 2G2
489-3521

I. Withler (Attn: Bob Lincoln)
1547 Okaha Lake Rd.
Penticton, B.C. V2A 7M2
493-0261

STATE OF COLORADO
Richard D. Lamm, Governor
DEPARTMENT OF NATURAL RESOURCES
James B. Ruch, Director
1313 Sherman
Denver, Colorado 80203-2205

DIVISION OF WILDLIFE

April 2, 1985

Mr. Arnold Dood
Montana Dept. of Fish, Wildlife
and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59715

Dear Mr. Dood:

As evidenced by the attached Resolution,
the Colorado Division of Wildlife would have
to answer "no" to all four questions on Mr
Marlowe's inquiry of March 22, 1985

Sincerely,

Robert D. Hernbrode
Terrestrial Wildlife Specialist
Terrestrial Wildlife Section

RDH:bc
cc [illegible]

In January 1982 the Colorado Wildlife Commission adopted the following resolution:

RESOLUTION

WHEREAS, the growth of the human population has impinged upon the habitat needed by the grizzly bear and the gray (timber) wolf within Colorado, and

WHEREAS, any introduction of wolves or grizzly bear into Colorado is to potential conflict with huntable species of wildlife, the livestock industry, and the human welfare, and

WHEREAS, a population of gray (timber) wolves or grizzly bear introduced into Colorado could become a management problem, when not contained within its designated management area, and

WHEREAS, biological control of big game herds through predation is not feasible, and

WHEREAS, the human welfare, and the value of Colorado's livestock and wildlife resources is of considerable importance,

NOW THEREFORE BE IT RESOLVED, that the Colorado Wildlife Commission hereby establishes and declares its opposition to every person or entity which may now or in the future suggest or plan the introduction of either the gray (timber) wolf or the grizzly bear as free-roaming populations within the State of Colorado.

Signed by Colorado Wildlife Commission

Roll call vote Divelbiss - yes, Higbee - yes, Kennedy yes, Redden - yes, Smith - yes, Tool - yes, Fernandez - yes

Motion unanimously carried

As you can see from this resolution our answers to the four questions are NO.

DEPARTMENT OF NATURAL RESOURCES Dennis Gallagher Executive Director WILDLIFE COMMISSION James C. Kennedy Chairman Timothy W. Smith Vice Chairman Richard A. Higbee Secretary Richard L. Divelbiss Member Dorothy A. Fernandez Member Robert L. Redden Member James T. Smith Member Joan A. Tool Member

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME

1416 Ninth Street
Sacramento, California 95814
(916) 445-9561

February 21, 1985

Mr. Arnold Dood
Montana Department of Fish,
Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59620

Dear Mr. Dood:

The Director asked me to respond to your questions concerning reintroduction of grizzly bears into California.

A few years ago we gave serious consideration to reintroducing grizzly bears in California. The problem of man-bear encounters was the main reason we chose not to reintroduce grizzly bears.

Current agricultural and recreation activities in California have resulted in high concentrations of people in grizzly habitat. This fact alone would prevent us from accepting grizzly bears from Montana.

As a side note, we have had some serious reservations on relocating black bears. The rationale in relocating problem grizzly bears into California would present some serious economic concerns as well as a hazard to public safety.

Good luck with the implementation and implementation of your Grizzly Bear Management Plan.

Sincerely,

Theodore G. Mount, Chief
Wildlife Management Division

bcc: Bob Burnett

Yukon

Department of Renewable Resources
Box 2703, Whitehorse Yukon Y1A 2C6
(403) 667-5811 Telex 036-8 280

Our File 1997-1-9
Your File

85 03 18

Arnold Dood
Montana Department of Fish,
Wildlife and Parks,
Roy Huffman Building
MSU Campus
Bozeman, Montana
59715

Dear Mr. Dood

Your Department's letter of February 5, 1985 regarding a review of your grizzly bear management program, and specifically a request for us to accept nuisance bears from Montana, was referred to me for reply.

I can appreciate, and sincerely sympathize with, your problem but my answer to all four of your questions is no. We have an abundance of grizzly bears in Yukon and the logistics and costs of transporting Montana bears would be too great.

Our Senior Big Game Biologist, Brian Pelchat, is keenly interested in your management strategies for grizzly bears. Would you kindly send him details of your current program, including any reports you may have summarizing population information and harvest data, and of course the results of your program review, when completed, would be appreciated.

Sincerely,

Hugh J. Monaghan
Director
Fish and Wildlife

cc Brian Pelchat

EXPO 86

DEPARTMENT OF GAME AND FISH

February 13, 1985

Mr. Arnold Dood
Montana Department of Fish,
Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, Montana 59715

Dear Mr. Dood:

Thank you for your letter of February 5, 1985, soliciting information on our state's desire and willingness to accept grizzly bears. We do not have, nor do we foresee developing, any plans for reintroduction of grizzly bears into any areas of New Mexico.

I would like to suggest that if you have not done so yet, you might contact Mexico. They have some excellent habitat and may be interested in developing an introductory program.

If I can assist you in any other way please let me know.

Sincerely,

Harold F. Olson
Director

bd

cc Bill Montoya

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
1100 Valley Road
P.O. Box 10678
Reno, Nevada 89520-0022
(702) 789-0500

April 9, 1985

Mr. Arnold Dood
Montana Department of Fish,
Wildlife and Parks
Roe MSU
Bozeman, MT 59717

Dear Mr. Dood:

In regard to your correspondence offering to supply the State of Nevada with surplus grizzly bears, while we appreciate the offer, we do not feel that we have sufficient habitat in Nevada to support a viable free roaming population of these unique animals.

There is some question of the species occurrence in Nevada historically and it is doubtful that we ever had maybe other than occasional transient grizzlies. We currently have an extremely limited distribution of black bears as they occur only in a fairly small area of the Sierra Nevada Mountains between Reno and Lake Tahoe.

Again, we appreciate your offer, but must decline same.

Sincerely,

William A. Molini
Director

WAM:mp

cc: Game Division

Nebraska Game and Parks Commission
2200 North 33rd Street / P.O. Box 30370 / Lincoln, Nebraska 68503

February 12, 1985

Arnold Dood
Montana Department of Fish,
Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59715

Dear Mr. Dood:

In response to Ms. Marcoux's letter of February 5, 1985, concerning our potential interest in grizzly bears in Nebraska, the answer is a qualified "No" to each of the four questions which you posed.

Sincerely yours,

Bill

William J. Bailey, Jr.
Assistant Director

WJB:jb

cc Ron Marcoux

IDAHO DEPARTMENT OF FISH AND GAME
600 South Walnut • Box 25
Boise • Idaho • 83707

March 19, 1985

Mr. Arnold Dood
Montana Department of Fish, Wildlife and Parks
Roy Huffman Building
Montana State University Campus
Bozeman, Montana 59715

Dear Mr. Dood:

The long-range plans for management of grizzly bear in Idaho are quite straight forward and simple. We intend to take care of the grizzlies that live in Idaho and work on protecting grizzly habitat. We will be doing a fair bit of work through the Endangered Species Act to beef up enforcement of our grizzly bear regulations and investigate the distribution and abundance of grizzlies in Idaho.

We will relocate grizzlies inside Idaho as necessary, but do not plan to reintroduce any from outside the state. We have, in the past, relocated problem bears from Idaho into Yellowstone National Park and into Canada. We will continue to handle some problem bears in this fashion as circumstances warrant.

Good luck on the EIS.

Sincerely,

Jerry M. Conley
Director

JMC:JT:ds

• EQUAL OPPORTUNITY EMPLOYER •

TEXAS
PARKS AND WILDLIFE DEPARTMENT

February 20, 1985

Mr. Arnold Dood
Montana Department of Fish,
Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59715

Dear Mr. Dood

This is in response to Mr. Ron Marcoux's letter of February 5, 1985 concerning grizzly bear.

To the best of our knowledge, there is no grizzly bear habitat in Texas where, if stocked, this species would not come into serious conflicts with other land uses. Therefore, this Department would not be interested in acquiring grizzly bears from Montana or any other state or province at this time or in the foreseeable future. There are no plans to reintroduce grizzly bears into any area of the state.

Sincerely,

Charles D. Travis
Executive Director

CDT:CKW:nh

South Dakota
Department of
Game, Fish and Parks

Division of Wildlife
Sigurd Anderson Building
445 East Capitol
Pierre, South Dakota 57501-3185
(605) 773-3381

March 15, 1985

Mr. Arnold Dood
Montana Department of
Fish, Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59715

Dear Mr. Dood

Answers to questions in Mr. Ron Marcoux's letter dated February 13, 1985, are as follows

1. No, South Dakota would not be interested in receiving grizzly bears from Montana for reintroduction
2. No
3. No
4. No.

I hope this information helps you

Sincerely,

Ron Fowler
Game Staff Specialist

RF/sh

NORTH DAKOTA
GAME & FISH
DEPARTMENT

February 19, 1985

Mr. Arnold Dood
Montana Department of Fish, Wildlife and Parks
Roy Huffman Building
MSU Campus
Bozeman, MT 59715

Dear Mr. Dood:

Reply is made to Mr. Marcoux's letter of February 5, concerning our interest in grizzly bears.

He raised four questions, and I can answer them all at once by simply saying "no."

I can see no reason for reconsidering this decision. Any further questions feel free to write.

Sincerely,

Dale L. Henegar
Commissioner

DLH:ch
cc: Mr Marcoux

Department of Fish and Wildlife
506 S.W. MILL STREET, P.O. BOX 3503, PORTLAND, OREGON 97208

February 21, 1985

c/o Arnold Dood

Ron Marcoux, Associate Director
Montana Department of Fish, Wildlife & Parks
Helena, MT 59620

Dear Ron:

Thank you for your grizzly bear offer; however, Oregon has no plans to reintroduce grizzlys now or in the future. We have enough problems with black bears. Do you want some black bears?

Sincerely,

John Thiebes
Acting Staff Biologist
Big Game Management

JT:mp

Dale L. Henegar
COMMISSIONER

DEPUTY COMMISSIONER

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Game and Fish Department

CHEYENNE, WYOMING 82002

W. DONALD CRICHTON
DIRECTOR

February 13, 1985

Mr. Arnold Dood
Montana Department of Fish, Wildlife & Parks 06012765
Log Bullmore Building
MSU Campus
Bozeman, Montana 59715

Dear Mr. Dood

Don Dexter has asked that I respond to a letter written to him by Ron Marcoux, dated February 1, 1985, wherein he poses four questions regarding grizzly bear. I will respond to each question in the order in which they were asked.

1. Would Wyoming be interested in receiving grizzly bear from Montana for reintroduction (up to 12 a year)? I cannot conceive of a situation where we would need to ask Montana for grizzly bears for reintroduction purposes. We have many situations each year where grizzly bears are trapped with the need for transplanting. In fact years, we have not suffered a shortage of grizzly bears for transplanting, but have suffered for places to put them. At the present time, we do not have any habitats in Wyoming outside the Yellowstone ecosystem where we plan to reintroduce the grizzly.

2. Would you be willing to accept grizzly bears which have caused problems? Wyoming would not be willing to accept so-called problem bears. It has been our experience that when transplanting problem bears, particularly adult bears, we transplant the problem with the bear.

3. Would you be willing to pay the costs associated with moving grizzly bears to your state? I presume my answer to question 1 solves this question mute.

4. Does your state/province have any plans to reintroduce grizzly bears into any area? See my response to question 2.

I hope this letter has sufficiently addressed questions contained in Mr. Marcoux's letter. If you need further clarification, please let me know.

Sincerely,

Dale Strickland

DALE STRICKLAND
ASST. CHIEF GAME WARDEN

DS hlg
cc Don Dexter

Arnie Dood

BOB B. WILLIAMS
Director

STATE OF WASHINGTON
DEPARTMENT OF GAME
600 North Capitol Way GJ-11 • Olympia, Washington 98504-0111 • (206) 753-5700

February 22, 1985

Ron Marcoux, Associate Director
Montana Department of Fish, Wildlife & Parks
Helena, Montana 59620

Dear Mr. Marcoux

Our Director has referred your letter of February 13 to me. I appreciate the concerns you and your agency have regarding grizzly bears. We are involved in cooperative studies on grizzly bear and cooperate with other agencies through participation on the Interagency Grizzly Bear Committee.

We have no plans to reintroduce grizzly bears in Washington. We have grizzly in the Selkirks and the north Cascades in minimal numbers and feel that natural repopulation will occur if the conditions are present to support the bears.

Sincerely,

THE DEPARTMENT OF GAME

Richard J. Poelker, Administrator
Wildlife Management

RJP cg

OFFICE MEMORANDUM

MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

To Arnie Dood Date February 19, 1985
From Ron Marcoux
Subject Telephone Call From Bill Geer

Last Thursday, I received a call from Bill Geer, Director of Utah's Wildlife Resources Division, regarding Utah's position on taking any of our grizzly bears. Bill's response was that "it would take more than an act of God for Utah to accept a 'good' grizzly bear, not to mention a problem bear."

I will continue to keep you informed of any further responses we receive in this office.

RM/bfs

APPENDIX G

GUIDELINES FOR DETERMINING GRIZZLY BEAR PROBLEM STATUS AND FOR CONTROL ACTIONS IN THE NORTHERN CONTINENTAL DIVIDE ECOSYSTEMS*

*Developed through interagency cooperation of the Montana Department Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, Bureau of Land Management, and Border Grizzly Project, April 14, 1981, Helena, Montana, and reviewed February 23, 1982, Helena, Montana. Modified from the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area."

Revised 8/85

Montana FWP and U.S. FWS Contacts Regarding Grizzly Bear Problems

Montana Department of Fish, Wildlife & Parks, Helena, MT	Office #	Home #
*Glenn Erickson, Bureau Chief, Wildlife Division	444-2612	449-6211
Arnie Olsen, Admin., Wildlife Division	444-2612	442-7594
Ron Marcoux, Associate Director	444-3186	442-9433
Kalispell - Region 1		
* , Regional Supervisor	755-5505/5506	
Louis Kis, Warden Captain	755-5505	257-2951
Jim Cross , Wildlife Manager	755-5505	755-4914
Missoula - Region 2		
*Jim Ford, Regional Supervisor	721-5808	728-7167
Earle Davis, Warden Captain	721-5808	549-0883
John Firebaugh, Wildlife Manager	721-5808	728-0335
Bozeman - Region 3 (Yellowstone Ecosystem)		
*LeRoy Ellig, Regional Supervisor	586-5419	587-3930
Ken Greer, Lab Supervisor	994-2660	587-9213
Jim Ramsey, Warden Captain	586-5419	586-6779
Arnold Foss, Regional Game Manager	586-5419	587-8625
Great Falls - Region 4		
*Dan Vincent, Regional Supervisor	454-3441/42	761-3832
Robert R. Chesterfield, Warden Captain	454-3441/42	761-4930
James L. Mitchell, Wildlife Manager	454-3441/42	452-9483
MT FWP Research Laboratory - Bozeman		
Ken Greer, Lab Supervisor	994-6357	586-9213
Dan Palmischiano	994-6356	586-0478
John Weigand	994-6361	388-4757
Billings - Region 5 (Yellowstone Ecosystem)		
*Roger Fliger, Regional Supervisor	252-4654	252-5924
Dennis Gagenston, Warden Captain	252-4654	652-6558
Charles Eustace, Wildlife Manager	252-4654	245-2214

* Primary Contacts

		Office #	Home #
U.S. Fish & Wildlife Service (Billings Area Office)			
Bill Rightmire, ADC Supervisor		657-6454	373-5951
Chris Servheen, Grizzly Bear Recovery Coordinator (Missoula)	(FTS)	585-3223	421-1488
	(Comm.)	329-5223	
Wayne G. Brewster, Endangered Species Team Leader (Helena)	(FTS)	585-5225	443-7340
	(Comm.)	449-5225	
ADC District 1			
Jim Hoover, District Supervisor Columbus, MT		322-5872	322-5872
ADC District 3			
Carter Niemeyer, District Supervisor East Helena, MT		227-5711	227-6418

SECTION I

Guidelines for Determining Grizzly Bear Problem Status in the Northern Continental Divide and Cabinet-Yaak Grizzly Bear Ecosystems

Grizzly bears must be determined to be a problem or potential problem by specific criteria before they will be controlled. Control must be compatible with Federal and State laws and regulations and in concert with the Grizzly Bear Recovery Plan objectives for limiting man-caused grizzly mortality.

A grizzly bear will be determined to be a problem or potential problem if any or all of the following conditions apply:

Condition A. The bear causes significant depredation to lawfully present livestock or uses unnatural food materials (human and livestock foods, garbage, home gardens, or livestock carrion and properly stored game meat in possession of man, etc.) which have been reasonably secured from the bear resulting in habituation of the bear towards people or significant loss of property.

Condition B. The bear has displayed aggressive (not defensive) behavior toward man which constitutes a demonstrable immediate or potential threat to human safety and/or a minor human injury resulted from a human/bear encounter.

Condition C. The bear has had an encounter with people resulting in a substantial human injury or loss of human life.

Condition D. The bear moves into a visitor use or residential area without causing an incident, but there is indication that due to its persistent use of the area it may become overly familiar with humans. Such a bear may become habituated, and may be relocated if a suitable release site, free of circumstances similar to the capture site, is available. This is an action to prevent a possible incident or nuisance conditioning of the bear and does not count as an offense when determining the disposition of the bear, using Table 1 of the guidelines, should the bear be recaptured in a future control action.

The following are considerations in determining grizzly problem status under Condition A.

1. Unnatural foods were reasonably secure from grizzlies. The following are examples of reasonably secure conditions:

    a. Livestock use did not occur in habitat components critically important to grizzlies in time or space; edibles and/or garbage was not dominant (i.e., food was canned or in other sealed containers) and edibles and/or garbage was made unavailable (hung out of reach or secured in a solid-sided-bear-proof-structure);

b. Livestock and wildlife carcasses were removed or properly buried so that the material would not reasonably be expected to attract grizzlies;

c. Game meat was hung 100 yards from any camp area;

d. No artificial feeding of grizzlies occurred.

The following are considerations in determining grizzly problem status under Condition B:

1. The bear has displayed aggression toward man. Sound evidence must be available to establish that the problem bear acted aggressively without provocation (not defensively), and that such behavior constituted a threat to human safety and/or a minor human injury occurred as a result of a nondenfensive grizzly attack.

The following are considerations in determining grizzly problem status under Condition C:

1. An encounter with people which resulted in a serious human injury or loss of human life. A bear that is involved in an accidental encounter with people or in a provoked attack (the bear acted defensively not aggressively) which results in a minor human injury should not be considered a nuisance under this condition.

2. If information is insufficient to clearly establish fact 1 under Condition A., the grizzly probably should not be determined a problem under that condition. If information is insufficient to clearly establish fact 1 under B, the grizzly probably should not be determined a problem under that condition.

SECTION II

Table 1. GUIDELINES FOR GRIZZLY BEAR CONTROL ACTION
(See Footnotes 1,2,4)

TYPE OF GRIZZLY	NO OFFENSE OFFENSES	TYPE OF PROBLEM CONDITION A 1st	CONDITION A 2nd	CONDITION A 3rd	CONDITION B 1st	CONDITION B 2nd	CONDITION C 1st
Females							
Orphaned Cub***	REL						
Cub		REL*	REL	REM**	REL	REM	REM
Yearling***		REL	REL	REM	REL	REM	REM
Subadult***		REL	REL	REM	REL	REM	REM
Prime Adult with Young***		REL	REL	REM (adult)	REL	REM (adult)	REM (adult)
Old Adult***		REL	REM		REM		REM
Old Adult with Young		REL	REL	REM (adult	REL	REM (adult)	REM (adult)
3/ Males							
Orphaned Cub	REL						
Cub		REL	REL	REM	REL	REM	REM
Yearling		REL	REM	___	REM	___	REM
Subadult		REL	REM	___	REM	___	REM
Prime Adult		REL	REM	___	REM	___	REM
Old Adult		REM		___	REM	___	REM

*REL - RELOCATE **REM - REMOVE FROM POPULATION
Problem grizzlies that are sick or injured beyond a point where natural recovery is likely will be removed.

***Cub - Yount of the year
***Yearling - 12 to 24 months old
***Subadult - 24 to 48 months old
***Young - Cub, yearling, or subadult accompanying mother
***Old - Indicates advanced age and deteriorated physical state, indicators are tooth wear and physical appearance

1. If a grizzly bear is not determined to be a problem after application of criteria in Section I, no control action will be initiated.

2. After a bear has been captured during a control action, the decision on where to relocate the bear or whether to kill it must be made within 24 hours of its capture. The relocation must be made as expeditiously as possible after the disposition of the bear is determined. Bears will not be held in a snare but will be immobilized, marked, and placed in an appropriate holding facility.

3. On-site release may be accomplished if the bear taken is: (a) determined not to be a problem bear or; (b) on a first offense when the bear cannot be relocated because of terrain, weather, or inaccessibility to a relocation site. Females with cubs, where relocation is identified in the above table, will be released on-site if relocation is not feasible for previously stated reasons or if the cubs cannot also be caught and relocated with the female. An on-site release will not be conducted in developed areas. On-site releases will be accomplished after approval of the land management agency if the release is monitored in such a way to determine its success or failure with respect to bear survival and conflict resolution.

SECTION III

RELOCATION PROCEDURE

While guidelines cannot be written to cover every situation, experience has shown that a general sequence of events can be outlined, which, when followed, will enhance efficiency and coordination. The Montana FWP Regional Office will be the principal coordination point for all relocations. Once a control action has been determined necessary by application of the guidelines and criteria in Sections I and II, the Fish, Wildlife and Parks Regional Office will be notified if not already involved. If the bear is to be killed, the action will be completed by authorized State or Federal employees, and the carcass transported to the FWP laboratory in Bozeman for examination and subsequent disposition.

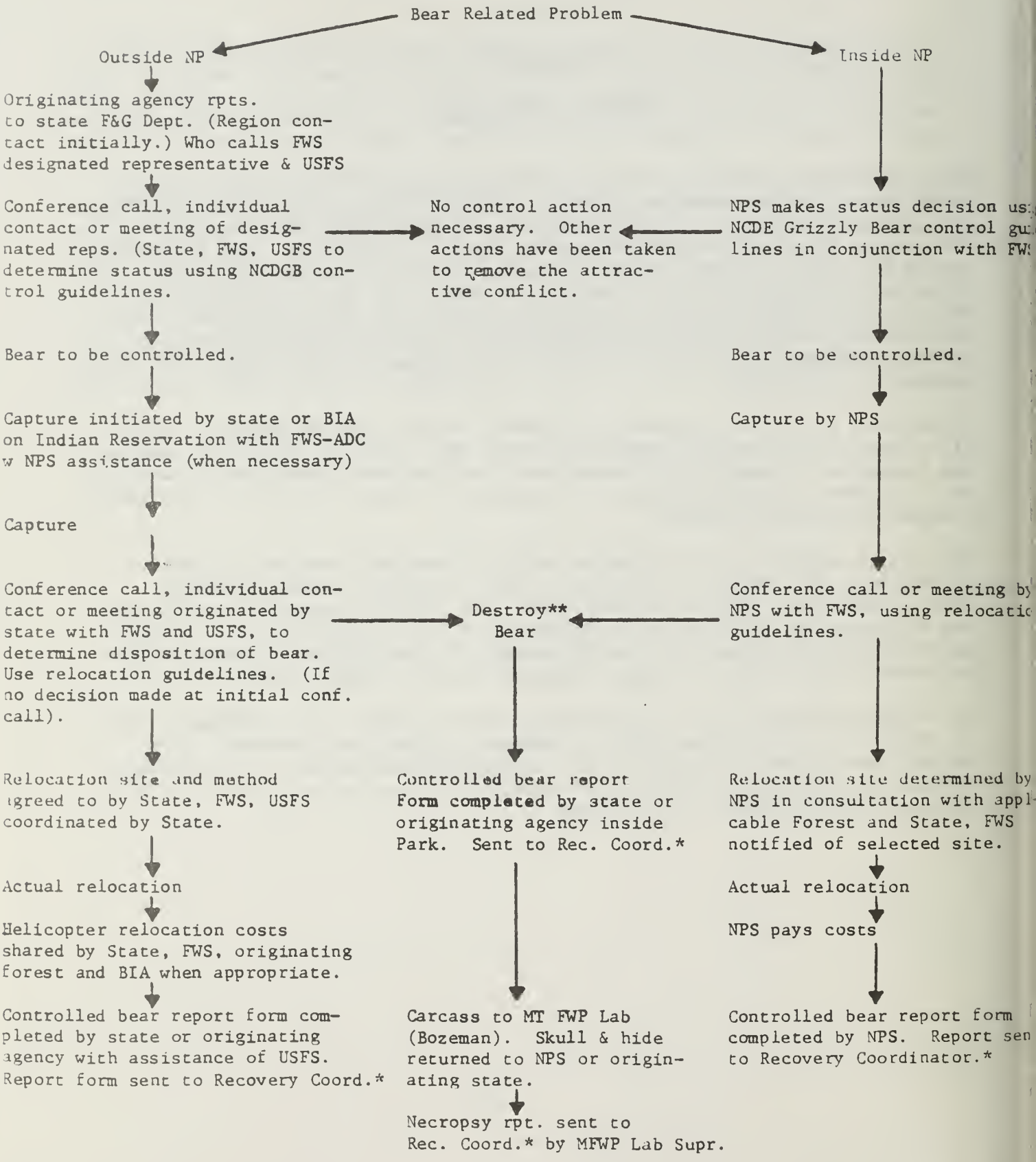
If the bear is to be relocated in northwest Montana, the FWP Regional Office will contact the other FWP Regional Offices, FWS, and land management agencies and determine the appropriate relocation site from those identified in Section IV. A schematic diagram showing the sequence of notification and the decision process is provided on page 9.

The proper selection of a relocation site is dependent upon many factors including age, sex, history of the bear, type of offense, season, distance from capture site, and overall logistics. The rate of successful relocations can be materially affected by the selection of the relocation site. Distance moved appears to be one of the major factors, so bears should be moved as far as possible within the constraints applied by other considerations.

All relocated bears will be lip tattooed and ear-tagged. The information will be recorded on the attached forms (reproduced copies) and forwarded to the Grizzly Bear Recovery Coordinator for subsequent distribution. All available information should be included to document the relocation and to aid in future analysis and refinement of procedures.

FIGURE 2.

ACTION PROCEDURES FOR DETERMINING BEAR PROBLEM STATUS AND MANAGEMENT ACTION



*Recovery Coordinator distributes report to agency representatives in Ecosystem.

**Alternative may include transport to a zoo or research. Decision made at conference phone call.

*Grizzly Bear Recovery Coordinator, USFWS, HS 105D, University of MT. Missoula, MT. 59812

CHECK LIST FOR PROBLEM BEARS

Capture Date _____

Release Date _____

Ear Tag _____ Radio Frequency _____ Recorder _____

Age _____ Sex _____

Type of Capture _____

Location of Release _____

Distance Moved _____

Radio Type _____

Mounted By _____

Offense types:

defending cubs, food, or itself _____
overt attack (pursuit of people) _____
cabin break-in _____
cattle molestations _____
proximity to people _____
crop depredation _____
bee hive depredation _____
repeat offender _____

Transportation _____

Drugs used and dosage _____

Personnel: Capture _____

Transport _____

Release _____

General nature of animal (docile, aggressive, etc.) _____

_____

_____

Consultations and approval _____

_____

_____

SECTION IV

Identified Relocation Sites

U.S. Forest Service

Flathead National Forest

Forest criteria for accepting problem grizzly bears:

1. No record of unprovoked encounters with people.
2. In good physical condition and not injured.
3. Repeat offenders will not be approved for relocation.
4. Each bear must be evaluated prior to release.
5. Each bear will be ear tagged and tattooed as a minimum.
6. In most cases, only orphaned cubs and subadult female bears will be accepted from Glacier N.P.
7. Should a bear leave the relocation site, the Regional Supervisor of the Montana Department Fish, Wildlife & Parks will be notified as soon as possible.
8. Bears otherwise meeting requirements 1-5 that have caused livestock depredation on the Lewis and Clark, Helena, or Lolo National Forests may be released to spring range in the South Fork of the Flathead.

During the period May 31 to September 8, bears will be relocated to areas outside the wilderness. Bears may be relocated within the wilderness from March 1 to May 31 and after Labor Day.

Site	Location (T. R.)	Transportation (Helicopter vs Road)	Specific Restrictions on each site (if any) Type of Bear Unacceptable	Season Unaccept.
Spotted Bear District				
1. Slide or Upper Sullivan		Helicopter		
2. Twin Creek Drainage		Helicopter		
3. Sargeant Creek Drainage		Helicopter		
4. Corporal Creek Drainage		Helicopter		
5. Soldier Creek (Tin Basin)		Road		
6. Rock Creek Drainage		Road		
7. Connor Creek Drainage		Road		
8. Bunker Creek Drainage		Road		
9. Upper Trail Crek (via Big Bill Rd.)		Road		
10. Upper South Fork*		Helicopter		5/31-9/8

Site	Location (T. R.)	Transportation (Helicopter vs. Road)	Specific Restrictions On each site (if any Type of Bear Unacceptable	Season Unacceptable
Hungry Horse District				
1. Felix Peak		Helicopter		
2. Unawah Mountain		Helicopter		
3. Red Sky Mountain*		Helicopter		5/31-9/8
4. Spruce Pt.*		Helicopter		5/31-9/8
5. Hemitite Peak*		Helicopter		5/31-9/8
6. Vinegar Mountain*		Helicopter		5/31-9/8
7. Mt. Bradley*		Helicopter		5/31-9/8
8. Twin Peak*		Helicopter		5/31-9/8
9. Red Plume Mountain*		Helicopter		5/31-9/8
10. Slippery Bill Mountain		Helicopter		5/31-9/8
11. Unawah Creek Drainage		Road		
12. Puzzle Creek		Road		
13. Trapper Bigelow		Road		
14. 25 Mile		Road		
15. Long Creek		Helicopter		

* Within Wilderness

Contacts (listed in order of priority)

1. Lloyd Reesman, District Ranger
   Office phone - 387-5243
   Home phone - 755-8703

2. Tom Holland, Wildlife Biologist
   Office phone - 387-5243
   Home phone - 755-5479

Spotted Bear

1. , District Ranger

   Office phone - 387-5243 or 755-7311 (summer)

2. Tom Holland, District Biologist
   Office phone - 387-5243 or 755-7311 (summer)
   Home phone - 755-5479

Supervisor's Office

1. Bob Hensler
   Office phone - 755-5401
   Home phone - 755-6813

2. John Denne
   Office phone - 755-5401
   Home phone - 755-3165

3. Ed Brannon
   Office phone - 755-5401
   Home phone - 755-5770

Advance approval of the Regional Forester has been received to relocate grizzly bears within wilderness areas. It is our intent that bears be relocated near elk winter habitat in the South Fork where carrion may provide a temporary food source. The exact location can best be determined at the time a bear is captured. Bears may be relocated within the Wilderness from March 1 to May 31 and after Labor Day. Bears will be carefully screened to meet the established requirements.

There are many summer activities with potential for conflict planned near the proposed release sites. The time a bear is ready for release has bearing on potential conflict, so it is essential that the District Ranger be contacted prior to release when the best possible location will be mutually selected.

The continued success in relocating grizzly bears is dependent on how well individual bears are evaluated. It is our judgement that bears from Glacier National Park are most often in problem situations because of their interaction with people. In most cases we consider these bears a higher risk for relocation than bears from habitats outside the Park. For this reason, only orphaned cubs and subadult females that meet all the suitability requirements, and which are a "good risk," will be approved for relocation to the Flathead National Forest.

SECTION III (Cont.)

Identified Relocation Sites

Lewis and Clark National Forest

Forest criteria for accepting problem grizzly bears:

1. No grizzly bear which is feeding on dead livestock or is involved in livestock depredations immediately prior to capture will be relocated in any of the designated spring use areas.

2. No grizzly bear involved in cabin depredation will be relocated in any of the designated spring use areas.

3. Grizzly bear captured on the Rocky Mountain Front will normally be relocated west of the Continental Divide.

4. Designated sites will not be available for translocated bears if current use of the area by native grizzlies is known.

5. Grizzly bear will not normally be relocated after October 15 due to heavy dispersed human use associated with big game hunting seasons, a rapid decline in dependable food sources, and the limited amount of time available for an animal to adapt to a new environment prior to denning.

6. Male grizzly bears will be moved at least 70 miles and females and subadults at least 30 miles, whenever possible.

7. A maximum of three individual grizzly bears or female-cub groups will be accepted on the Forest during a seasonal use period in a given calendar year.

8. Male grizzly bears will be considered for relocation onto the Lewis and Clark N.F. under the following conditions:

   a. The bear has no known history of aggressive behavior towards humans.

   b. The bear has no known history of livestock depredation.

   c. Approval for relocation of male bears will be determined on a case-by-case basis.

The summer-fall relocation sites were selected to avoid the more heavily used trails and popular camping areas. An evaluation of current or expected public recreational use, Forest Service work crew schedules, etc. will be factors to consider in determining which site is best suited for a specific relocation effort.

Grizzly bear relocation sites were selected for two seasonal use periods determined by forage availability and accessibility of the area to grizzlies. Spring use areas are those usable by grizzly bears from the time they leave the den until late June when higher elevation habitats become available. Summer-fall use areas will generally be considered as those providing the necessary habitat requirements for grizzlies during the period July 1 to October 15.

Spring Release Sites (April 1 - June 30)	Location (T. R.)	Transportation (Helicopter vs Road)	Specific Restrictions on each site (if any) Type of Bear Unacceptable	Season Unaccept.
. Ninemile Park*	25N, 10W; S. 33 & 34	Helicopter		5/31-9/8
. Ray Creek Trail*	24N, 10W, S. 19 & 30	Helicopter		5/31-9/8
. Dryden Creek*	24N, 10W, S. 33 & 34	Helicopter		5/31-9/8
. Two Shacks Flat*	23N, 10W, S. 27 & 28	Helicopter		5/31-9/8
. Prairie Creek*	21N, 10W, S. 6 & 7	Helicopter		5/31-9/8
. West Fork Sun River*	21N, 11W, S. 22	Helicopter		5/31-9/8
. Grassy Hills*	18N, 8W, S. 31	Helicopter		5/31-9/8
. Elk Creek	18N 8W, S. 8 & 10	Helicopter/Road		5/31-9/8

Summer-Fall Release Sites (July 1 - October 15)	Location (T. R.)	Transportation (Helicopter vs Road)	Specific Restrictions on each site (if any) Type of Bear Unacceptable	Season Unaccept.
. Goat Ridge*	23N, 11W, S. 5 & 8	Helicopter		5/31-9/8
. Grizzly Gulch*	22N, 11W, S. 16 & 21	Helicopter		5/31-9/8
. Pine Creek*	22N, 12W, S. 27 & 34	Helicopter		5/31-9/8
. Blind Fork*	21N, 12W, S. 23 & 26	Helicopter		5/31-9/8
. Flint Mountain*	18N, 10W, S. 8 & 9	Helicopter		5/31-9/8
. Scapegoat Mountain*	18N, 10W, S. 13,14,15	Helicopter		5/31-9/8
. Bailey Basin	18N 8W S. 22	Helicopter		5/31-9/8

/

Inside Wilderness -- No bears will be relocated to the Lewis & Clark N.F. during mmer months because all release sites are in wilderness areas.

Contacts -- Lewis & Clark N.F. (listed in order of priority)

1. Lloyd Swanger, District Ranger, Rocky MT District, Choteau
   Office phone: 466-5771
   Home phone: 466-5625

2. Lewis Young, Wildlife Biologist, Rocky Mt. District, Choteau
   Office phone: 466-5771
   Home phone 466-2877

3. Roger Evans, Wildlife Biologist, Supervisor's Office, Great Falls
   Office phone: 727-0901
   Home phone: 452-6004

4. Jerry Reese, Range/Wildlife/Recreation Staff Officer, Supervisor's Office, Great Falls
   Office phone: 727-0901
   Home phone:

5. Dale Gorman, Forest Supervisor, Great Falls
   Office phone: 727-0901
   Home phone: 453-0719

SECTION III
Identified Relocation Sites
U.S. Forest Service

Helena National Forest

Forest criteria for accepting nuisance grizzly bears:

1. Bears may not be located within wilderness between Memorial Day and Labor Day.
2. Male bears must be sub-adult or younger in view of Forest Service recent experience.
3. No stock killing bears (cattle or sheep) will be accepted due to sensitive nature of stock-depredation in past years.
4. All bears will be equipped with radio collars and monitored through the first denning season by MDFWP.
5. A maximum of one (1) bear per year will be accepted in the Scapegoat Wilderness.

Site	Location (T. R. S.)	Transportation (Helicopter vs Road)	Specific Restrictions on each site (if any) Type of Bear Unacceptable	Season Unaccept.
1. Crow Peak* (Note: This site involves Lolo, Helena, and Lewis & Clark Nat'l. Forests)	17N, 9W, S.9,10,11	Helicopter	See above	5/31-9/8
2. Mineral Hill* (Note: This site involves Lolo & Helena National Forests)	16N, 10W, S. 7 & 18	Helicopter	See above	5/31-9/8

*Within wilderness

Contacts - Helena National Forest (listed in order of priority)

1. Ron DesJardins, District Ranger
   Office phone: 362-4265
   Home phone: 362-4518

2. Gordon Gray, Forest Wildlife Staff
   Office phone: 449-5083
   Home phone: 443-3289

3. Carl Frounfelker, Forest Wildlife Biologist
   Office phone: 449-5082
   Home phone: 449-6282

4. Robert S. Gibson, Forest Supervisor
   Office phone: 449-5203
   Home phone: 442-4886
   (Kent Nelson, Acting Forest Supervisor)

Lolo National Forest

Forest criteria for accepting bears:

1. The Youngs Peak area is the forest's first priority area. Second priority is Mt. Headley, and the third is Lake Elsina

2. No condition B. or C. bears.

3. Male grizzlies may be accepted as provided below.

Site	Location (T. R.)	Transportation (Helicopter vs Road)	Specific Restrictions on each site (if any) Type of Bear Unacceptable	Season Unaccept.
1. Youngs Peak	17N, 13W	Helicopter/Road	M-old adult F-old adult	None
2. Mt. Headley	23N, 29W	Helicopter/Road	F-old adult F-old adult w/young F-prime adult w/young M-prime adult M-old adult	None
3. Lake Elsina	17N, 17W	Helicopter/Road	F-old adult F-old adult w/young M-all categories	None

Footnote - Livestock killing bears are not desired since all sites are adjacent to livestock grazing areas.

Contacts -- Lolo N.F. (Listed in order of priority)

(use prefix 585 for FTS)

1. Orville Daniels, Forest Supervisor
   Office phone: 329-3563
   Home phone: 728-4268

2. Chuck Spoon, Program Officer for Resources
   Office phone: 329-3569
   Home phone: 251-2065

Contacts -- Lolo N.F. (cont.)

3. Greg Munther, Fisheries Biologist
   Office phone: 329-3567
   Home phone: 728-7083

4. Mike Hillis, Wildlife Biologist
   Office phone: 329-3575
   Home phone: 777-3967

5. Jerry Deibert, Wildlife Biologist
   Office phone: 826-3821
   Home phone: 826-3820

Glacier National Park

No release sites available

Bureau of Land Management

No release sites available

Bureau of Indian Affairs

Flathead Indian Reservation: No release sites available
Blackfeet Indian Reservation: No release sites available

APPENDIX H

COMPARISON OF WILDLIFE SPECIES BY STATEWIDE PRIORITY,*
WILDLIFE DIVISION EXPENDITURES (FY82), AND HUNTING RECREATION DAYS

	(Arith.) Priority Ranking	Rank By Expenditure	Rank By Hunting Days	No. Hunting Days (1980)	% of Days
Mule Deer	1	2	2	551,262	26.00
Whitetail Deer	3	3	3	259,418	12.00
Elk	2	1	1	566,659	26.00
Antelope	4	6	9	32,208	1.50
Bighorn Sheep	5	8	12	2,904	0.10
Mountain Goats	6	13	13	1,695	0.05
Prairie Grouse	7	9	8	91,045	4.00
Pheasants-Huns-Chukers	8	7	6	148,852	7.00
Black Bear	9	12	5	150,116	7.00
Waterfowl	10	4	4	228,814	11.00
Moose	11	16	11	3,150	0.10
Mountain Grouse	12	15	7	113,725	5.00
Grizzly	13	11			
Furbearers	14	5			
Bobcat	15				
Endangered Species	16	17			
Turkey	17	18	10	10,288	0.40
Nongame	18	10			
Mountain Lion	19	14			
				2,160,136 days	

*Priority is "arithmatic" average of regional priorities. This may not represent true state priority.

APPENDIX I

MANAGEMENT GUIDELINES

The following general management guidelines are applicable coordination measures that will be considered when evaluating the effects of existing and proposed human activities in identified seasonally important habitats for a variety of wildlife species.

1. Identify and evaluate for each project proposal the cumulative effects of all activities, both existing uses and other planned projects. Potential site specific effects of the project being analyzed are a part of the cumulative effects evaluation which will apply to all lands within a designated biological unit. A biological unit is an area of land which is ecologically similar and includes all of the year-long habitat requirements for a sub-population of one or more selected wildlife species.

2. Avoid human activities or combinations of activities on seasonally important wildlife habitats which may result in an adverse impact on the species or reduce the habitat effectiveness.

3. Space concurrently active seismographic lines at least nine (9) air miles apart to allow an undisturbed corridor into which wildlife can move when displaced (Olson 1981). One line survey crew may be allowed to work between active lines in order to reduce the total time of activity in any one area.

4. Establish helicopter flight patterns of not more than one-half (.5) mile in width along all seismographic lines, between landing zones and the lines, and between landing zones and other operations, unless flying conditions dictate deviations due to safety factors.

5. Because helicopters produce a more pronounced behavioral reaction by big game and raptors than do fixed-wing aircraft, helicopters will maintain a minimum altitude of 600 feet (183 meters) above ground level when flying between landing zones and work areas where landing zones are not located on seismic lines, unless species, specific guidelines recommend otherwise (Hinman 1974; McCourt et al., 1974; Klein 1973; Miller and Gunn, 1979).

6. Designate landing zones for helicopters in areas where helicopter traffic and associated human disturbances will have the minimum impact on wildlife populations. Adequate visual and topographic barriers should be located between landing zones and occupied seasonal-use areas.

7. The use of helicopters instead of new road construction to accomplish energy exploration and development is encouraged.

8. Base road construction proposals on a completed transportation plan which considers important wildlife habitat components and seasonal-use areas in relation to road location, construction period, road standards, seasons of heavy vehicle use, road management requirements, etc.

9. Use minimum road and site construction specifications based on projected transportation needs. Schedule construction times to avoid seasonal-use periods for wildlife as designated in the species specific guidelines.

10. Locate roads, drill sites, landing zones, etc., to avoid important wildlife habitat components based on a site specific evaluation.

11. Insert "dog-legs" or visual barriers on pipelines and roads built through dense vegetative cover areas to prevent straight corridors exceeding one-fourth (1/4) mile where vegetation has been removed (Stubbs and Markham 1979).

12. Roads which are not compatible with area management objectives and are no longer needed for the purpose for which they were built will be closed and reclaimed. Native plan species will be used whenever possible to provide proper watershed protection on disturbed areas. Wildlife forage and/or cover species will be use in rehabilitation projects where deemed appropriate.

13. Keep roads which are in use during oil and gas exploration and development activity closed to unauthorized use. Place locked gates and/or road guards at strategic locations to deter unauthorized use when activities are occurring on key seasonal ranges.

14. Impose seasonal closures and/or vehicle restrictions based on wildlife or other resource needs on roads which remain open.

15. Bus crews to and from drill sites to reduce activity levels on roads. Shift changes should be scheduled to avoid morning and evening wildlife feeding periods.

16. Keep noise levels at a minimum by muffling such things as engines, generators, and energy production facilities.

17. Prohibit dogs during work periods.

18. Prohibit firearms during work periods or in vehicles traveling to and from work locations.

19. Seismographic and exploration companies should keep a daily log of activities. Items such as shift changes, shut down/start up times, major changes in noises or activity levels, and the location on the line where seismic crews are working should be recorded.

APPENDIX J

SPECIFIC GRIZZLY BEAR GUIDELINES

All previously mentioned general management guidelines are applicable coordination measures that should be considered when evaluating human activities in grizzly bear habitat. The following are additional species specific guidelines.

1. Avoid human activities in identified grizzly bear habitat constituent elements or portions of constituent elements containing specific habitat values during the following seasonal-use periods (see data summarization):

A. Spring habitat (concentrated use areas)..Apr 1-June 30

B. Breeding Areas.....May 1-July 15

(Currently identified breeding areas include upper Muddy Creek, the head of Rinkers Creek, the Ear Mountain area, and the head of North Fork Dupuyer Creek.)

C. Alpine feeding sites.....July 1-Sept 15

D. Subalpine fir/whitebark pine habitat types..Aug 1-Nov 30

E. Denning habitat.....Oct 15-Apr 15

2. Avoid human activities in grizzly bear habitat components which provide important food sources during spring and early summer (April 1 - July 15). These habitat components include riparian shrub types, Populus stands, wet meadows, sidehill parks, and avalanche chutes. Maintain an undisturbed zone of at least 1/2 mile between activities and the edge of these habitat components where many important bear foods occur.

3. Establish flight patterns in advance when activities require the use of helicopters. Flight patterns should be located to avoid seasonally important grizzly bear habitat constituent elements and habitat components during the designated seasonal-use periods.

4. No seismic or exploratory drilling activities should be conducted within a minimum of one mile of den sites during the October 15 - April 15 period (Reynolds et al. 1983).

5. Seismic permits should include a clause providing for cancellation or temporary cessation of activities, if necessary, to prevent grizzly/human conflicts.

6. Scheduling of well drilling on adjacent sites, within important grizzly bear use areas, should be staggered to provide a disturbance free area for displaced bears.

7. Pipeline construction required for the development of a gas or oil field should be condensed into the shortest time frame possible and subject to seasonal restrictions when conducted in important grizzly bear habitat.

8. Field operation centers associated with seismic or oil and gas exploration activities should be placed carefully to avoid seasonally important habitat components or constituent elements. Such placement of sites is necessary in order to avoid direct or potential conflicts between man and grizzly bear.

9. Retain frequent dense cover areas adjacent to roads for travel corridors and security cover necessary to protect important habitat components. Three sight distances are desirable to provide visual security for grizzlies. A sight distance is the average distance at which a grizzly or other large animal is essentially hidden from the view of an observer by vegetation cover. The same security cover guidelines also apply to timber harvest units.

10. No off-duty work camps will be allowed within occupied seasonally important constituent elements.

11. Incinerate garbage daily or store in bear-proof containers and remove to local landfill dumps daily.

12. Commercial activities permitted on public land should be planned and coordinated to avoid conflicts with grizzly bear trapping operations being conducted under the monitoring program. General public use of areas where trapping operations are active will be controlled through appropriate administrative actions by the agencies involved.

The following are grizzly bear management guidelines specifically oriented toward livestock grazing:

1. Livestock grazing on important spring habitat for grizzly bears should be deferred until after July 1.

2. Boneyards and livestock dumps are prevalent along the east front and are frequented by grizzly bears. Ranchers and landowners should be encouraged to place carcasses of dead livestock and garbage on remote areas of their land. Dead cows and calves should be hauled a considerable distance from calving grounds to discourage bears from feeding on carrion and newborn calves.

3. Sheep grazing allotments in management situation No. 1, as defined in the Yellowstone Guidelines, on lands administered by government agencies should be eliminated.

4. In riparian habitats that receive high amounts of bear use, fencing to exclude livestock grazing and trampling may be necessary where livestock turn-out dates prior to July 1 are allowed.

APPENDIX K

United States Department of the Interior

FISH AND WILDLIFE SERVICE

MAILING ADDRESS
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225

STREET LOCATION
134 Union Blvd
Lakewood Colorado 80228

IN REPLY REFER TO
FA/SE/Grizzly
Bear, IGBC

MAY 10 1984

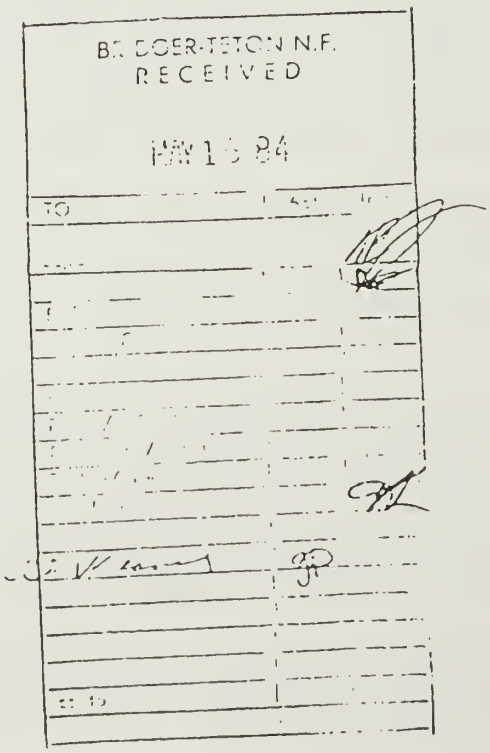
INTERAGENCY GRIZZLY BEAR COMMITTEE MEMBERS, INVITEES, SUBCOMMITTEE CHAIRMEN, ET AL.

Enclosed is a copy of our Memorandum of Agreement (MOA) that has been signed by all parties. I want to thank everyone for their part in getting it signed. The Governors' signatures on this MOA exemplify the importance of the document and the IGBC.

I strongly encourage all members to personally participate and remain active in IGBC affairs so that we can meet our responsibility of attaining the objectives established in the Grizzly Bear Recovery Plan.

Galen L. Buterbaugh
Chairman, IGBC

Enclosure



UNITED STATES DEPARTMENT OF AGRICULTURE, UNITED STATES DEPARTMENT OF THE INTERIOR AND STATES OF IDAHO, MONTANA, WYOMING, AND WASHINGTON MEMORANDUM OF AGREEMENT TO REVISE AND EXPAND THE INTERAGENCY GRIZZLY BEAR COMMITTEE

A. Need

The grizzly bear is listed as a threatened species in the 48 conterminous states under provisions of the Endangered Species Act of 1973, as amended. To achieve the recovery of the grizzly bear, it is necessary that all federal and state agencies with responsibilities for this species coordinate their management and research actions to the greatest extent possible to insure the best utilization of available resources and prevent duplication of effort.

To attain the objectives established by the Grizzly Bear Recovery Plan, the United States Department of Agriculture (U.S. Forest Service), the United States Department of the Interior (Fish and Wildlife Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs), and the states of Idaho, Montana, Wyoming, and Washington find it in the best interest of the grizzly bear to revise and expand the Interagency Grizzly Bear Committee (IGBC) established in April 1983.

B. Organization

Members

3 Regional Foresters, USDA Forest Service
1 Regional Director, National Park Service
1 Regional Director, U.S. Fish and Wildlife Service
1 State Director, Montana, Bureau of Land Management
1 State of Idaho Representative)
1 State of Montana Representative) Named by
1 State of Wyoming Representative) Appropriate Governor
1 State of Washington Representative)

Advisor

Grizzly Bear Recovery Coordinator, U.S. Fish and Wildlife Service

Invitees

In addition to the members specified above, the following parties involved with the grizzly bear management and research in the state of Washington may participate in the committee and attend committee meetings: Regional Forester, National Park Service Regional Director, and the Fish and Wildlife Service Regional Director. The Bureau of Indian

Affairs Area Directors from Portland, Oregon, and Billings, Montana; and representatives from the Canadian provinces of British Columbia and Alberta also are invitees to committee and subcommittee meetings.

Subcommittees

Yellowstone Ecosystem
- National Park Superintendents (2)
- National Forest Supervisors (5)
- State Representatives from Wyoming, Montana, and Idaho
- U.S. Fish and Wildlife Service Representatives (2)

Northern Continental Divide Ecosystem
- National Park Superintendent (1)
- National Forest Supervisors (5)
- State Representative from Montana
- U.S. Fish and Wildlife Service Representative (1)
- Bureau of Indian Affairs and/or Tribal Representative from each Indian Reservation (2)
- Bureau of Land Management Representative, Montana (1)
- Canadian Representatives

Northwest Ecosystems
- National Park Superintendent (1)
- National Forest Supervisors (5-7)
- State Representatives from Montana, Idaho, and Washington
- U.S. Fish and Wildlife Service Representatives (2)
- Canadian Representative

Research
- U.S. Fish and Wildlife Service Representative
- U.S. Forest Service Representative
- National Park Service Representative
- States of Idaho, Montana, Washington, and Wyoming Representatives
- Bureau of Indian Affairs and/or Tribal Representative(s)
- Bureau of Land Management Representative
- Canadian Representatives
- (Existing Interagency Grizzly Bear Study Team to continue under Research Subcommittee)

C. IGBC Operation

1. Chairmanship of the IGBC shall rotate among representatives with the chairman serving a 2-year term, beginning with the representative of the U.S. Fish and Wildlife Service. Chairmen of the Research Subcommittee and Yellowstone, Northern Continental Divide and Northwest Ecosystems Subcommittees will be elected by by Subcommittee members for 2-year terms.
2. Meet a minimum of twice per year, with additional meetings as needed and agreed to by majority of Committee.

D. IGBC Committee Responsibilities

1. Implement the Grizzly Bear Recovery Plan, and all management and research activities necessary to provide for recovery of the grizzly bear.

2. Make provision for implementation of approved actions.

3. Guide and plan research direction.

4. Evaluate implementing activities to determine the effectiveness of achieving recovery plan objectives.

5. Take appropriate action under existing authority where necessary and make joint recommendations to federal agency heads and states.

6. Review and approve or disapprove actions proposed by Subcommittees.

E. Northern Continental Divide Ecosystem, Yellowstone Ecosystem, and Northwest Ecosystems Subcommittee Responsibilities

1. Implement management actions in a coordinated fashion.

2. Propose management policy to the IGBC.

3. Establish necessary task forces to implement approved actions when necessary (i.e., law enforcement, information and education, improvements).

4. Identify research needs and financial needs for management and submit to the IGBC.

5. Report to IGBC on progress concerning management actions necessary for grizzly bear recovery.

F. Research Subcommittee Responsibilities

1. Identify and propose needed research programs to the IGBC as directed by the Grizzly Bear Recovery Plan.

2. Coordinate and direct needed research activities approved by IGBC.

3. Review and develop research plans to assure that they adequately address research needs and that the objectives, methods, analyses, timetables, and budgets are valid and realistic.

4. Establish ad hoc task forces to examine and report on special topics as approved by IGBC.

5. Review research findings and reports for scientific validity and make recommendations to IGBC on their adequacy or relevance for assisting management decisions. Circulate these reports for peer review when necessary.

John B. Crowell, Jr. — 5 January 1984
U.S. Department of Agriculture
Assistant Secretary for Natural Resources and Environment
Date

G. Ray Arnett — 5 Dec 83
U.S. Department of the Interior
Assistant Secretary for Fish and Wildlife and Parks
Date

Garrey E. Carruthers — 12/31/83
U.S. Department of the Interior
Assistant Secretary - Land and Water Resources
Date

Kenneth L. Smith — 1/4/84
U.S. Department of the Interior
Assistant Secretary for Indian Affairs
Date

John V. Evans — 2-6-84
State of Idaho
Date

Ted Schwinden — 3/1/84
State of Montana
Date

3/21/84
State of Washington
Date

4/5/84
State of Wyoming
Date

BEAR MANAGEMENT UNIT BOUNDARY DESCRIPTIONS

I) Whitefish - This unit is bounded on the west by U.S. Highway 93 from the U.S.-Canadian border south to Kalispell. From Kalispell, the southern boundary follows U.S. Highway 2 to West Glacier. The eastern boundary is the North Fork of the Flathead River north to the international border, which is the northern boundary.

II) South Fork - The northern boundary follows U.S Highway 2 from Kalispell to the Continental Divide. The eastern boundary follows the Divide south to the South Fork of Sun River. The southern boundary follows the South Fork of the Sun River west to West Fork then north along West Fork to Indian Creek then west along Indian Creek to White River Pass then from White River Pass south down the westernmost portion of the headwaters of Molly creek west to the South Fork of the White River then west along the South Fork to the White River then west along White River to the South Fork of the Flathead River then north along the South Fork to Big Salmon Creek then west along the south shore of Big Salmon Lake and Big Salmon Creek to Tango Creek west along Tango Creek to the Lake County-Flathead County Line then north along this line to the headwaters of Cooney Creek then west along Cooney Creek to Montana Highway 83. The western boundary follows Montana Highway 83 north from the crossing of Cooney Creek to the intersection with Montana Highway 82 then west along Highway 82 to U.S. Highway 93 then north along Highway 93 to Kalispell.

III) East Front - The northern boundary follows the U.S-Canadian border from the northeasternmost corner of Glacier National Park to the midpoint of Township 37 North, Range 14 West. The eastern boundary follows along a line from a point on the international border at the middle of Township 37 North, Range 14 West to Babb then approximately along a line from Babb to East Glacier then approximately along a line from East Glacier to Dupuyer then approximately along a line from Dupuyer to the westernmost point on the shore of Bynum Reservoir then approximately along a line from this point to the easternmost point on the shore of Eureka Reservoir then approximately along a line from this point to the northernmost point on the shore of Pishkun Reservoir. The southern boundary follows from this point west along the northern shore of the reservoir then west along Pishkun Canal to the Sun River then west along Sun River and the north shore of Gibson Reservoir to the North Fork of the Sun River. The western boundary follows the North Fork of the Sun River north from this point to the Continental Divide then along the Divide to U.S. Highway 2 then along Highway 2 to the southeasternmost corner of Glacier National Park then

along the eastern boundary of the park to the U.S.-Canadian border.

IV) Scapegoat - The northern boundary is the southern boundary of the South Fork Bear Management Unit (BMU) and East Front BMU to approximately the confluence of Arnold Coulee and Pishkun Canal. The eastern boundary follows approximately along a line from this point to Augusta then south approximately along a line from Augusta to the town of Wolf Creek. The southern boundary follows west approximately along a line from Wolf Creek to a point on Montana Highway 200 at the confluence of Willow Creek and the Blackfoot River then west along Highway 200 to the junction with Montana Highway 83. The western boundary follows Highway 83 north from this junction to the southern boundary of the South Fork BMU.

V) Missions - The eastern boundary follows Montana Highway 83 east and south from the junction with Montana Highway 82 to the junction with Montana Highway 200. The southern boundary follows Highway 200 west from this junction to the junction with Interstate 90 then west along Interstate 90 from this junction to the junction with Montana Highway 93. The western boundary follows from this point north approximately along Highway 93 to its junction with Montana Highway 35 then approximately along Highway 35 to its junction with Highway 82 and 83.

APPENDIX M

MODELING SUSTAINABLE HARVEST RATES FOR GRIZZLY BEARS

Richard B. Harris
Montana Cooperative Wildlife Research Unit
University of Montana

Part 1. Data Requirements

The ideal model for determining allowable harvest rates for a grizzly bear population would incorporate the following information:

1. Natality rates (preferably age-specific). In bears, natality rates are actually made up of 3 components:

    a. Litter size
    b. Breeding interval
    c. Age at first reproduction

2. Age-specific survival in the absence of hunting

3. Relative vulnerability to hunting by age and sex class

4. Initial age-structure, and

5. Response of rates #1, #2, and #3 to lowered density caused by hunting ("density response" or "compensatory response").

Of these, only #1 is available for more than a very few grizzly bear populations. Age-specific survival rates are available only for the unhunted Yellowstone area population. We can make reasonable guesses at #3, based on general knowledge of bear behavior and hunters, but we have no hard data. The initial age-structure is generally unknown, although an appropriate stable age distribution can be simulated if #1, #2, and #3 are known. We have very little information on #5. McCullough (1981) modeled compensatory responses in the Yellowstone population of 1959-1972. The work of Fowler et al. (1980) and Eberhardt and Siniff (1977) has provided guidance to modelers regarding the expected response of vital rates of populations of large mammals to changes in density.

Further, the concept of sustainable yield is itself valid only in a probabilistic way. Given enough time or enough variability in vital rates, any harvest will eventually drive a model population to extinction. However, some harvest rates do so with a vanishingly small probability, or require longer times to do so than are reasonable to consider. Additionally, Harris (1984) has shown that the concept of sustainable yield is not independent of the size

of the population in question. Smaller populations were shown to decline at slightly smaller proportional harvests than were larger populations.

Part 2. Modeling sustainable yield of grizzly bear populations using a stochastic simulator.

Sustainable yields of grizzly bear populations were simulated using a stochastic, age-structured simulation model which I term URSIM. Details of the model are available in Harris (1984). The following gives a summary of the procedures and results.

A grizzly bear simulation model was built in 1984 for purposes of examining age-structures of harvested samples. The analysis of age-structures appeared in Harris (1984). Here, I used the identical model to examine sustainable yields, focusing on the stable portion of the sustained yield curve (Fig. 1). The vital rates used in this modeling effort were identical to those in Harris (1984), and are summarized in Table 1. These rates were intended as average birth and death rates of typical southern interior grizzly bear populations, and were written using data from Montana (Jonkel 1982, Aune and Stivers 1983, Martinka 1974, Craighead et al. 1974, Knight et al. 1983, Knight and Eberhardt 1985) and British Columbia (McClellan 1983, Mundy and Flook 1973). Relative vulnerabilities to hunting were guessed, based on discussion with grizzly bear biologists, and knowledge of home range size (e.g. Bunnell and Tait 1980) and legal status (e.g. protection of females with cubs). A review of model assumptions is appended.

In Harris (1984), 4 slightly different mechanisms of population regulation were modeled. For this exercise, I used only 1; the "specific model" termed DMADM in Harris (1984). In this "specific model", all 3 natality functions (age at first reproduction, litter size,and breeding interval) are considered density-independent, i.e., they are influenced by yearly changes in carrying capacity (assumed to represent favorable and unfavorable years), but are not influenced by the density of the population relative to its carrying capacity. Survival rates of all sex/age classes are density-dependent. Survivorship of males younger than 4 years and independent of their mother is a function of the number of males older than 4 years in the population. Survivorship of all other sex/age classes is a function of the total number of animals in the population. This model closely resembles the view of population regulation of bears suggested by Bunnell and Tait (1981). In building a separate survivorship function for sub-adult males, I intended to mimic the compensatory processes thought to occur when adult males are removed from a population (e.g. Kemp 1976, Young and Ruff 1982). Populations simulated using this model were intermediate in their resilience to harvest compared to the other 3 used by Harris (1984).

Methods

Ten independent unharvested age-structures were generated for starting the simulations. Each was generated using the same parameters: carrying capacity was set at 475, the carrying capacity" of adult males was set at 76 (.16 of K, a value found earlier to be the mean proportion adult males of simulated populations, Harris 1984), and environmental variability was modeled such that 95% of yearly carrying capacities varied from 380 to 594. In specifying K, it should not be concluded that I claim to know what the equilibrium number of animals in any given area is. The simulation model requires specification of K because density-dependence operates with respect to K. The value 475 was chosen to produce sustainable harvests at population sizes near those estimated by Dood et al. (1985). It was expected that the variability of yearly carrying capacities would reduce the actual number in the population from the 475 figure; preliminary simulations suggested that unharvested equiplibrium would occur at about 450. Thus, only populations from 445 to 455 were considered candidates for the initial age-structures. The 10 actually averaged 448 (s.d. = 3).

Each of these 10 age structures was then harvested for 60 years at 20, 22, 24, 26, 28, 30, 32, and 34 animals per year. Mean harvest rates were computed starting at year 20, when it was assumed age-distributions would have stabilized in response to harvest.

Results

None of the 50 simulations at harvests of 26 per year or higher produced sustainable yields because all populations declined chronically. Instantaneous rates of change (r) of the 10 simulations at each harvest were as follows:

	Instantaneous rate of change (r)	
Harvest per year	Mean	Standard Deviation
26	-0.0349	0.0125
28	-0.0402	0.0199
30	-0.0481	0.0161
32	-0.0666	0.0132
34	-0.0744	0.0158

None of the simulations at harvests of 20 or 22 per year declined chronically. Three of the simulations at a harvest of 24 per year produced population extinction; 3 others had significantly ($p<.001$) negative trajectories during years 20-60, and were judged to be on their way to extinction. The remainder of this paper deals with those simulations

using harvests of 20-24 per year only, because those harvested at 26 or greater never stabilized to allow computation of average harvest rates.

Table 2 summarizes the results of simulations performed with 20-24 animals per year harvested. There are 2 ways to interpret these results: i) in terms of the harvest rate, irrespective of sex of the animal, and ii) as separate harvest rates for males and females.

i). Overall harvest rates. Simulated harvests of 6.35% of the total population or less did not lead to population decline. At mean harvest rates of 6.6%, 6 of 10 populations declined chronically. Thus, the maximum sustainable yield (defined as the hunt that had 10% or less chance of producing chronic decline within 60 years) of these simulated populations was apparently between 6.35 and 6.6%. A lower probability of decline would have required harvests of less than 6.35%. Note that these harvests consisted of approximately 69% males; harvests with higher proportions of males would have had higher sustainable yields; those with lower proportions would have had lower sustainable yields. Note also that the standing population was approximately 60% females, due primarily to the predominately male harvest.

ii). Separate sex harvest rates. Proportional harvest of males were much higher than of females. Mean female harvest rates at 20 animals per year were 2.94% at 22 animals per year they were 3.54%. The 4 non-declining populations harvested at 24 per year had female harvest rates of 3.6%; the 6 that declined had female harvest rates of from 3.8 to 7.7%. Non-declining populations had male harvest rates averaging 8.8 to 11.2% (20 to 24 per year harvested). It appears that simulated populations were much less sensitive to male harvest rates than to female harvest rates.

Implications

It appears that up to approximately 6.5% of a grizzly bear population having similar properties as the modeled populations may be harvested without causing declines. Note however, that among this population's attributes are relative vulnerabilities to harvest highly skewed toward males. The average proportion of males in harvested samples was actually close to 70%. Viewed another way, the number of females harvested appeared to be critical. Harvests of 3.5% of the female segment did not lead to extinction; harvests of 3.6% did. It appears that a safe practice would be to keep harvests of females in populations similar to those modeled at 3% or below.

The maximum overall sustainable man-caused mortality rate derived here is greater than the 3% suggested by Sidorowicz and Gilbert (1981) for the Yukon Territory, and

the maximum female sustainable man-caused mortality is greater than the 2% recommended by Tompa (1984) for British Columbia. Both Sidorowicz and Gilbert (1981) and Tompa (1984) used more conservative estimates of population-wide natality rates than the present effort. The maximum sustainable mortality rates presented here are slightly greater than the 4.5-5.9% suggested by Cowan (1972, p. 353) as appropriate for grizzlies in North America.

Review of Assumptions

The model considers only a single, isolated population. Because no ingress or egress is possible, dispersal is equivalent to death. The environment in which the population exists is abstracted into the single variable K. All biotic and abiotic factors that affect he potential size of the population (e.g. prey species, competing species, availability of denning sites, berries, carrion, etc.) are subsumed by K. Further, variation in K is considered independent of population size, that is, populations are incapable of reducing their carrying capacity (e.g. by overgrazing). The carrying capacity varies each year independently of previous years, i.e. serial correlation and cycles are not modeled. As well, the variability in K is assumed proportional to K (i.e. distributed log-normally), with relatively good and poor years equally likely. Finally, the 13% coefficient of variation for year K is assumed representative of ecosystems for southern interior grizzly populations.

All hunting occurs in the fall, no spring hunt is modeled. The number killed, rather than the effort expended, is considered constant each year. The implicit assumption is that, at least over a broad range of bear densities, grizzly bear hunters exhibit no functional response. The hunt modeled is opportunistic rather than trophy-oriented. Relative vulnerabilities by age/sex class are determined by inherent behavioral properties of bears, as opposed to conscious selection by hunters (except for legal protection of family groups). Age/sex specific behaviors that result in different relative vulnerabilities are also assumed independent of both bear population density and hunting pressure.

Life-history events that actually occur over a period of time are condensed into essentially instantaneous events, each occurring only once per year, and always in the same order. In nature, deaths probably occur at all times of the year; the model condenses natural mortality into the period between fall hunting and spring family breakup. This order creates a small amount of compensatory natural survival following a hunt, because mortality is lower when acting on a slightly smaller post-hunt population than an unhunted population.

Responses of density-dependent rates are assumed to follow the general pattern for large-mammals described by Fowler et al. (1980). Thus, populations below the level at which density effects are felt have intrinsic growth rates close to the maximum biologically possible. Specific birth, death, and vulnerability to hunting rates are based as closely as possible on empirical data. In some cases, the best available data are weak or non-existent. Rates with the weakest supporting data include survival rates (particularly for orphaned cubs and sub-adults), relative hunting vulnerabilities, and values for all rates when the population is greater than K.

Finally, genetics is not treated. Inbreeding depression, as well as founder and bottleneck effects leading to loss of genetic diversity, while important considerations for conservation of the species, are assumed not to materially affect the age-structures of hunted samples.

Implications for Management of Grizzlies in Montana

The state of Montana has managed the harvest of grizzly bears under a quota system for the past few years. This modeling effort can aid in developing quotas of sustainable yield when population size can be estimated. Two types of quotas may be used:

- Population quotas (defined as the proportion of the entire population that can be removed annually be man without causing chronic decline) cannot be greater than about 6.5% of the total population if mean harvests are at least 70% male. If mean harvests are less than 70% male, quotas of 6.5% of the total population may lead to chronic decline. With small sample sizes typical of Montana grizzly bear removals (15-25 yearly) it may take some years before sample sizes are large enough for harvest sex ratio statistics to be reliable. One approach to insure that sex ratio is sufficiently weighted toward males is to require that the lower bound of a specified (binomial) confidence interval around the sampled sex ratio be greater than 70%.

- Female quotas (defined as the proportion of the female segment of the population that can be removed annually by man without causing chronic decline) should not exceed 3% of the female segment. An additional unknown in generating female quotas is the proportion of the population estimate made up by females. Sex ratios obtained in the field from trapping are known to be biased, but the exact amount of bias is usually unknown. However, the simulations suggest that grizzly bear populations exposed to moderate harvest levels with males much more vulnerable than females stabilize at approximately 60% females (Table 2). Thus, it seems reasonable to calculate allowable female mortality assuming 60% females in the standing population. Maximum

Table 1. Vital rates used in URSIM, the stochastic model to simulate grizzly bear populations. Sources from which rates were approximated appear in text. Accuracy of the estimations of sustainable yields depend on accuracy of these rates.

Recruitment Functions

Age at 1st reproduction: 5 6 7 8
Percent: 65% 26% 9% 1%
Mean age at 1st reproduction: 5.50

Litter size: 1 2 3
Percent: 19% 55% 26%
Mean litter size: 2.07 cubs

Breeding interval: 2 3 4 5 (years)
Percent: 14% 63% 20% 2%
Mean breeding interval: 3.09 years

Mean cub/reproductive female/year: .670

Average Natural Survival Rates *

Age	Mean Survival Females	Males
0	91.4%	91.4%
1	91.4%	91.4%
2	88.0%	88.0%
3	77.4%	77.4%
4	90.0%	90.0%
5 to 12	95 %	95 %
13 to 20	90 %	90 %
21 to 24	75 %	75 %

Hunting Vulnerability

	Relative Vulnerability to Hunting
Cub with mother	0.05
Older juvenile with mother	0.20
Lone female, age 0-4	2.00
Lone female, age 5-24	0.80
Female with young	0.20
Lone male, age 0-4	7.00
Lone male, age 5-24	1.00

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* These rates are based on maximum survivorships, which occur at population levels below carrying capacity. The rates for ages 0-4 are composite averages of rates applied to young with mothers and young on their own for whatever reason.

Table 2. Sustainable yields and sex ratios from populations harvested at 20, 22 and 24 animals/year. Populations harvested at 20 and 22/year were stable over the 60 years of simulations. Tabulated values for simulations at harvests of 26 animals/year are for the 4 stable populations only because 6 simulated populations declined chronically, preventing calculations of sustainable yield. All entries in the table are means.

Statistic	Harvest/year (all animals)		
	20	22	24 (stable)
Sample size	10	10	4
Overall harvest rate	5.37%	6.35%	6.60%
Female harvest rate	2.94%	3.54%	3.60%
Male harvest rate	8.85%	10.40%	11.24%
Percent males in harvest	69.55%	68.88%	68.65%
Percent females in population	60.33%	60.44%	62.17%

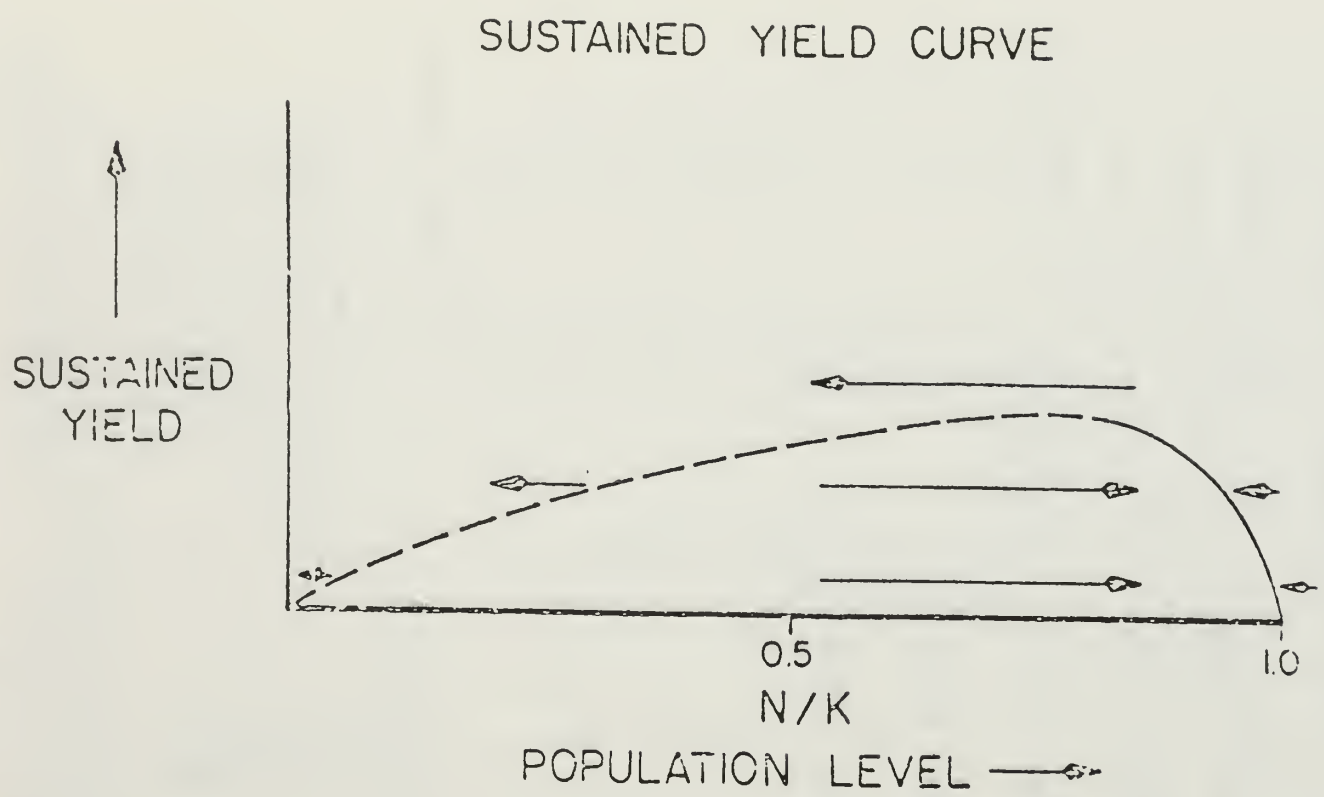


Figure 1. A generalized sustained yield curve, showing trajectories of populations. Populations along the descending right-hand portion (solid line) are stable; those along the left-hand portion (dashed line) are unstable and either decline to extinction or increase to the right-hand portion. This study identified the top of the curve for simulated grizzly bear populations.

allowable man-caused losses of females under these assumptions would then be

Population estimate X 0.60 X 0.03

If a sport hunting season is desired, this argues strongly for management efforts at producing harvests heavily weighted toward males. Hunting seasons in early spring or late fall may aid in keeping harvests predominately male.

Managers should keep in mind that the model considers only a single, homogenous population while real populations may vary geographically in recruitment, mortality and harvest pressure. Thus for example, while a 3% or less population-wide removal rate of females should not cause a population-wide decline, some sub-populations may decline while others may expand. Further, it must be emphasized that the values presented here are approximations derived from a modeling effort. Total mortality quotas based on these values, may be above or below the maximum sustainable if harvest parameters misrepresent the response of a particular grizzly bear to total mortality, or if population estimates to which the total mortality rate are applied are inaccurate. The guidelines are intended for maximum sustainable harvest management, and may or may not be appropriate for other management goals.

REFERENCES

Aune, K. and T. Stivers. 1983. Rocky mountain front grizzly bear monitoring and investigation. Montana Dept. Fish, Wildl. and Parks Res. Report, Helena.

Beddington, J.R., and R.M. May. 1977. Harvesting natural populations in a randomly fluctuating environment. Science. 463-465.

Boyce, M.S. 1977. Population growth with stochastic fluctuations in the life table. Theor. Pop. Biol. 12:366-373

_____ 1979. Population projections with fluctuating fertility and survivorship schedules. Proc. Summer Comp. Sim. Conf., 10: 385-388. Toronto.

Bunnell,F.L. and D.E.N. Tait. Bears in models and reality - implications to management. pp. 15-23 in Martinka, C.J. and K.L. MacArthur, eds., Bears - their biology and management. Bear Biol. Assoc. Conf. Ser. No. 3, Kalispell, MT.

Caughley, G. 1977. Analysis of vertebrate populations. Wiley Press. 234 pp.

Craighead, J.J., J.R. Varney, and F.C. Craighead, Jr. 1974. A population analysis of the Yellowstone grizzly bears. Bull. 40, Mont. For. and Cons. Exp. Sta., Univ. of Montana, Missoula, 20 pp.

Dood, A.R. , R.D. Brannon, and R.D. Mace. 1985. Grizzly bear environmental impact statement. preliminary draft. Mont. Dept. of Fish, Wildlife and parks., Helena, MT.

Eberhardt,L.L. and D.B. Siniff. 1977. Population dynamics and marine mammal management policies. J. Fish. Res. Board Canada. 34: 183-190.

Fowler, C.W., W.T. Bunderseon, M.B. Cherry, R.J. Ryel, and B.B. Steele. 1980. Comparative population dynamics of large mammals: a search for management criteria. Report no., MMC-77-20 to the U.S. Marine Mammal Commission. NTIS PB80-178627, Springfield, VA.

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

Jonkel, C. 1982. 5-Year Summary Report. Border Grizzly Project, School of Forestry, Univ. of Montana, Missoula.

Kemp, G. A. 1976. The dynamics and regulation of black bear, Ursus arctos populations in northern Alberta. pp. 191-197 in Pelton, M.R., J.W. Lentfer, and G.E. Folk, eds., Bears - their biology and management. IUCN publ. New. Ser. No. 40, Morges, Switzerland.

Knight, R. R., B. M. Blanchard, G. Brown, K. C. Greer, L. E. Oldenburg and L. J. Roop. 1983. Yellowstone Grizzly Bear Investigations - Report of

the Interagency Study Team. U. S. Dep. Int. Nat. Park Serv. 52 pp.

Knight, R. R. and L. L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66: 323-334

Martinka, C. J. 1974. Population characteristics of grizzly bears in Glacier National Park, Montana. J. Mammal. 55: 21-29

McClellan, B. 1983. Akamina-Kishinena grizzly bear study - annual report. British Columbia Fish and Wildl. Branch, Cranbrook, B. C.

McCullough, D. 1981. Population dynamics of the Yellowstone grizzly bear. pp. 173-196 in Fowler, C.J. and T.W. Smith, eds., Dynamics of large mammal populations. Wiley Press 417 pp.

Munoy, K. R. D. and D. R. Flook. 1973. Background for managing grizzly bears in the national parks of Canada. Can. Wildl. Serv. Rep. Series No. 22. 35 pp.

Siggorowicz, G.A. and F.F. Gilbert. 1981. The management of grizzly bears in the Yukon, Canada. Wildl. Soc. Bull. 9(2): 125-135.

Tait, D.E.N. 1979. Abandonment as a reproductive tactic - the example of grizzly bears. Amer. Nat. 115(6):800-808.

Young, B.F. and R.L. Ruff. 1982. Population dynamics and movements of black bears in east central Alberta. J. Wildl. Manage. 46(4): 845-860

APPENDIX N

Grizzly Bear Mortality Report Form

Bear Identification: Ear Tag Nos. _____ Tatoo _____

Radio collar frequency _____ Sex _____ Age____

Date of Mortality _____ Location (be specific, include legal description or UTM's)_____

Description of Cause _____

_____

Carcass disposition _____

Comments (bear history, etc.) _____

_____

_____

Copies of this form should be sent to: Arnold Dood, Endangered Species Biologist, Montana Dept of Fish, Wildl. & Parks, Box 5, Montana State University, Bozeman, MT 59717.

APPENDIX O

Nuisance/Relocation Grizzly Bear Report Form
(Use to report all nuisance complaints and all relocations).

Bear Identification: Ear tag nos._____ Tatoo_____

Radio collar frequency _____ Sex____ Age_____

Nuisance/Capture Site (be specific, include legal description or UTM's)_____

Release Site (be specific, include legal description or UTM's ___

_____

Release Date_____ Nuisance/Capture Date_____ Transplant

Distance_____ Recorder_____

Nature of Nuisance _____

_____

Comments (bear history, etc.) _____

_____

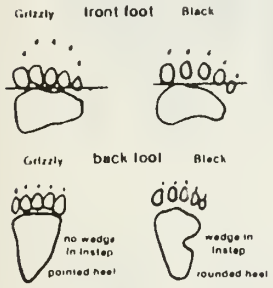
_____

Copies of this form should be sent to: Arnold Dood, Endangered Species Biologist, Montana Dept. of Fish, Wildl. & Parks, Box 5, Montana State University, Bozeman, MT 59717.

ATTACHMENTS

TRACKS

Hind foot tracks of bears seldom show claw marks, and front tracks of black bears seldom show claw marks, but when they are evident, length of front foot claw marks from toe pads can help distinguish grizzly from black bears. Claws of adult grizzlies are rarely less than 1¾" long. Claws of black bears seldom exceed 1½".

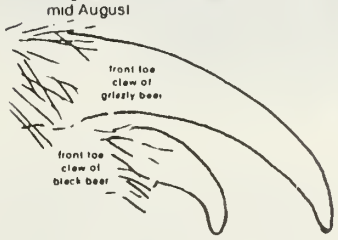


COLOR

Color of both black and grizzly bears may range from light brown (blonde) to very dark black. Color is not an indicator of the species. Many grizzlies have light-tipped hairs which gives them a distinctive sheen, and the nickname "silvertip".

PELT QUALITY

In spring when bears emerge from hibernation their pelts are prime for tanning. As they begin to shed they rub away patches of old hair and the pelts are no longer fit for trophies until shedding has been completed, about mid August.



HUNTER

WHAT KIND OF BEAR IS THIS?

SA-1

Montana Department of Fish Wildlife and Parks

It is not always easy to distinguish between the black and grizzly bears. Color and size are not dependable criteria, so other features must be looked for.

If you are hunting black bears in an area that may be inhabited by grizzlies, take your time and be sure what you're shooting at. Better to pass a shot at a black bear than kill a grizzly.

10,000 copies of this public document were published at an estimated cost of $.013 per copy for a total cost of $400.00 which includes $300.00 for printing and $100.00 for distribution.

AIDS TO IDENTIFICATION OF SPECIES

Look for a combination of characteristics to make identification

BLACK BEAR

1. No prominent shoulder hump. Highest point of body is the back.
2. In profile muzzle is straight and long. Frontally, head and face appear round.
3. Claws dark, much shorter and more curved than grizzly claws.

GRIZZLY BEAR

1. Highest point of back is a muscular hump over the front shoulders.
2. In profile distinct brow gives "dished" look to face. The brow is not as well defined in yearlings.
3. Front claws are long, very prominent, and often light colored. Can sometimes be observed from great distances.

Occupied Grizzly Habitat
National Park
National Forest

greater yellowstone area

In the Greater Yellowstone area, all things — including bears and people — function together. The area includes portions of 5 National Forests and 2 National Parks in Montana, Wyoming, and Idaho. Although Yellowstone National Park is considered the heart of grizzly country, the bears roam throughout the area.

Contact a National Park or Forest Ranger or a State Conservation Officer about current bear activity in the areas you plan to visit.

Understanding Grizzlies can reduce your chances for conflict and help conserve the bears.

The Grizzly has a low reproductive capacity because (1) females may not breed until 5-8 years old, and (2) females take care of their cubs for 2-3 years, during which time no other young are produced. If too many Grizzlies are killed, the bear population will decrease and may face extinction.

Grizzly bears are very powerful and possess a tremendous sense of smell, good hearing, but poor eyesight. A Grizzly learns quickly and has a good memory.

Bears are attracted to human foods which offer a powerful "reward". They can develop a bad habit after only one reward. Bears that do obtain human food or garbage may lose their fear of people and become a danger. When the behavior of wild bears has been corrupted by obtaining human foods they oftentimes have to be destroyed to protect the visitors.

Preventing bear-human conflicts is the key. Storing *your* food properly is the best way you can help yourself and the Grizzly while in the Greater Yellowstone Area. Don't let *your* carelessness cause the unnecessary death of a bear.

Bear US IN MIND

26 07 400 8-83

Bear US IN MIND

SA-2

Photo by John and Frank Craighead

grizzly country

bear us in mind

Bear US IN MIND

WELCOME to the Greater Yellowstone Area — a unique and special place. Here is one of the last homes of the magnificent Grizzly Bear, a vanishing symbol of our natural heritage.

Grizzlies once ranged throughout most of the western United States. Today, fewer than 1,000 grizzly bears survive in the wild areas of Montana, Wyoming, and Idaho.

The grizzly is listed by the U.S. Fish and Wildlife Service as a THREATENED species — one which may become Endangered unless conservation measures are carried out that minimize bear-human conflicts.

The Greater Yellowstone Area makes up a large and essential part of the grizzly's remaining habitat.

All bears are powerful and potentially dangerous, yet you can enjoy this area, provide for your personal safety, and usually prevent bear-human conflicts by taking a few precautions.

No matter where you are in Grizzly country

REMEMBER . . .

- Food and odor attract bears
- Bears don't like surprises
- Bears are wild animals

food & odors ATTRACT BEARS

- Keep a clean camp and store food and garbage properly *at all times*. Store food in your car trunk if available. Otherwise, place food in a bag, backpack, or pannier and hang from a tree branch at least 10 feet above ground and 4 feet out from the tree trunk. Do not store food in tents.
- Deposit garbage in bear-proof containers where available or pack it out. Never bury it.
- Avoid cooking smelly or greasy foods. Sleep some distance uphill from your cooking area and food storage site. Keep sleeping bags and personal gear clean and free of food odor. Don't sleep in the same clothes you wore while cooking.
- Store odorous products as though they were food. Don't use perfumes or deodorants. Women may choose to stay out of bear country during their menstrual period.
- Where hunting is permitted, keep game meat out of reach of bears. Dispose of fish entrails by puncturing the air bladder and dropping in deep water where it will decompose naturally.
- Horse pellets should be stored the same as food.

Bears don't like SURPRISES!!!

Use caution where visibility or hearing is limited. Make your presence known to bears by singing, talking, wearing bells, or making other noises. Travel in groups. Do not hike after dark.

Be alert. If you notice bears, dead animals, or bear signs such as tracks, droppings, or diggings, choose another area.

Dogs can disturb a bear and lead it back to you. If dogs are permitted in the area, don't allow your dog to run free.

Bears are WILD animals

Bears usually avoid people, but their responses are unpredictable. A female may be quickly provoked if her cubs are disturbed or if you come between the cubs and her.

If you spot a bear — but it doesn't see you — avoid it by quickly and quietly leaving the area.

If You ENCOUNTER a Bear

Even if you have taken all precautions, you may still encounter a bear. If you do —

- Stay calm — it will probably leave you alone. Do not make abrupt moves or noises that would startle the bear.
- Give the bear plenty of room. Slowly detour, keeping upwind so it will get your scent and know you are there. If you cannot detour, look for a climbable tree and wait for the bear to move away from your route.
- If a grizzly bear does charge, your options are:
  - drop a pack or coat to distract the bear,
  - climb at least 12 feet up a stout tree,
  - as a last resort, assume a "cannonball" position to protect your head and stomach while playing dead.

Because grizzlies can attain short bursts of speeds up to 40 mph, running away is a poor option.

ATTACHMENT 2 CONT.

AIDS TO IDENTIFICATION OF SPECIES

Look for a combination of characteristics to make identification

BLACK BEAR

1. No prominent shoulder hump. Highest point of body is the back.
2. In profile muzzle is straight and long. Frontally, head and face appear round.
3. Claws dark, much shorter and more curved than grizzly claws.

GRIZZLY BEAR

1. Highest point of back is a muscular hump over the front shoulders.
2. In profile distinct brow gives "dished" look to face. The brow is not as well defined in yearlings.
3. Front claws are long, very prominent, and often light colored. Can sometimes be observed from great distances.

All bear hunting is prohibited in certain areas of this state, as follows:

1. All State Game Preserves, and hunting districts beginning with numbers 6 and 7.
2. Griz/Elk Closed Area: For description see page 8 current legal descriptions of hunting district boundaries.

Hunters taking a grizzly bear must report the kill within 48 hours to an officer of the Department of Fish, Wildlife and Parks and must personally present the hide and skull within 10 days to an officer of the Department for purposes of inspection, tagging, and recording of kill. Evidence of sex must remain intact on the carcass or skin.

It is prohibited for any person to remove any portion of a grizzly bear from the state of Montana without first obtaining a trophy license.

IT IS ILLEGAL TO BAIT BEARS OR TO HUNT BEARS WITH DOGS.

SA-3

MONTANA

1984 BEAR HUNTING REGULATIONS

MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

BEAR LICENSES

BLACK BEAR —

Conservation License (Prerequisite)	$2.00
Resident Black Bear	$8.00
Nonresident Black Bear	$100.00

A black bear tag is included on the Montana Resident Sportsman License and Nonresident $300.00 Combination Big Game, Bird and Fishing License.

GRIZZLY BEAR —

$2.00 Conservation License, $35.00 Resident Sportsman License or $300.00 Nonresident Combination License (Prerequisite).

Resident Grizzly Bear	$50.00
Nonresident Grizzly Bear	$300.00
Grizzly Bear Trophy License	$25.00

Grizzly bear hunting licenses are available only from the Department of Fish, Wildlife and Parks, 1420 East 6th Avenue, Helena, MT 59620.

Grizzly bear hunting licenses may not be purchased after August 31, 1984.

GRIZZLY BEAR HUNTING SEASONS

Application Deadline for Grizzly Licenses is August 31

ALL DISTRICTS OR PORTIONS OF DISTRICTS NOT LISTED AS OPEN TO GRIZZLY BEAR HUNTING SHALL REMAIN CLOSED TO HUNTING OF GRIZZLIES.

HUNTING DISTRICTS OR PORTIONS OF DISTRICTS OPEN TO HUNTING	SEASON DATES
Portion of 101 east of Highway 93, Districts 110, 130, 140, 141, 281, Portion of 406 west of Highway 89, District 415, 422, 424, 428*, 441, 442 and 450.	Oct. 21 - Nov. 25, 1984

*District 428 will close to all bear hunting when the elk quota in Deer-Elk-Bear-Lion District 424 is reached.

District 427	Oct. 21 - Nov. 11, 1984
District 150, 151 and 280	Sept. 15 - Nov. 25, 1984

The annual limit per grizzly license holder is one grizzly bear of either sex. There shall be no more than twenty-five (25) grizzly killed by hunting or any other human activity in the ecosystem generally referred to as the Bob Marshall ecosystem area during the 1984 season. At such time as the total kill by human activity equals twenty-five (25) the hunting season for grizzly bear will be closed.

Grizzly bear season will close on 48 hours notice in the 100 and 200 series hunting districts when six (6) female grizzly bear have been killed by hunting or other human activity.

Grizzly bear season will close on 48 hours notice in the 400 series hunting districts when three (3) female grizzly bear have been killed by hunting or other human activity.

It is improbable but possible that the quota could be reached before hunting season even opens.

The taking of cub bear and female bear with cubs is prohibited. Cubs are defined as young of the year. The season will be closed to grizzly hunting in areas specified closed to all bear hunting.

Hunters taking grizzly bears must retain the hide and skull from each bear taken, even though the head may have been damaged.

Attachment 3

ME-3

OCTOBER RADIO PUBLIC SERVICE ANNOUNCEMENT 30 Seconds

BLACK AND GRIZZLY BEAR IDENTIFICATION

ONE OF YOUR BASIC RESPONSIBILITIES AS A HUNTER IS BEING SURE OF YOUR TARGET. BECAUSE GRIZZLIES AND BLACK BEARS ARE SOMETIMES HARD TO TELL APART, HUNTERS ARE ASKED TO BE ESPECIALLY CAREFUL IF HUNTING BEARS THIS FALL.

LOOK FOR A COMBINATION OF FEATURES. MOST GRIZZLIES HAVE A PRONOUNCED SHOULDER HUMP, A DISHED FACE AND LONG, PROMINENT CLAWS. COLOR AND SIZE ALONE CAN BE MISLEADING.

TAKE THE TIME TO IDENTIFY YOUR TARGET, AND IF IN DOUBT, THEN SIMPLY LET THE ANIMAL MOVE ON.

THIS MESSAGE HAS BEEN BROUGHT TO YOU AS A SERVICE OF THIS STATION AND THE MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS.

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

RADIO PUBLIC SERVICE ANNOUNCEMENT 30 SECONDS

MAY 1984

SPRING BLACK BEAR SEASON OPENS

THE SPRING BLACK BEAR HUNTING SEASON OPENED IN MID-APRIL.

AND HUNTERS, YOU ARE RESPONSIBLE FOR BEING ABLE TO TELL THE DIFFERENCE BETWEEN A GRIZZLY AND BLACK BEAR.

REMEMBER, THE GRIZZLY IS PROTECTED IN THE SPRING AND HUNTED ONLY IN THE NORTHWESTERN MONTANA AREA IN THE FALL.

FOR MORE INFORMATION ON THE DIFFERENCE BETWEEN GRIZZLIES AND BLACK BEARS, CONTACT ANY FISH, WILDLIFE AND PARKS OFFICE.

THIS MESSAGE IS PRESENTED TO YOU IN THE PUBLIC INTEREST BY THIS STATION AND THE MONTATA DEPARTMENT OF FISH, WILDLIFE AND PARKS.

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

RADIO PUBLIC SERVICE ANNOUNCEMENT 60 SECONDS

MAY 1984

SPRING BLACK BEAR SEASON OPENS

THE SPRING BLACK BEAR SEASON IS OPEN NOW IN MONTANA.

HUNTERS ARE RESPONSIBLE FOR KNOWING THEIR QUARRY AND BEING ABLE TO IDENTIFY GRIZZLIES AND BLACK BEARS.

REMEMBER, THE GRIZZLY IS PROTECTED IN SPRING AND HUNTED IN NORTH-WESTERN MONTANA ONLY IN THE FALL. GRIZZLIES AND BLACK BEARS ARE SOMETIMES HARD TO TELL APART. LOOK FOR A COMBINATION OF FEATURES. COLOR AND SIZE ALONE CAN BE MISLEADING.

MOST GRIZZLIES HAVE:

- A PRONOUNCED SHOULDER HUMP,
- FROSTED FUR WHICH GIVES A "SILVERTIPPED" GRIZZLY EFFECT,
- A DISHED FACE AND
- LONG, PROMINENT FRONT CLAWS.

TAKE YOUR TIME TO IDENTIFY YOUR TARGET... AND IF IN DOUBT, THEN SIMPLY LET THE ANIMAL MOVE ON. IT'S THE SMARTEST THING YOU CAN DO.

YOU SEE IF GRIZZLIES ARE MISTAKEN AND KILLED FOR BLACK BEARS, THE FUTURE OF BOTH GRIZZLY AND BLACK BEAR HUNTING WILL BE JEOPARDIZED.

FOR MORE INFORMATION ON THE DIFFERENCE BETWEEN GRIZZLY AND BLACK BEARS, CONTACT ANY FISH, WILDLIFE AND PARKS OFFICE.

THIS MESSAGE IS PRESENTED TO YOU IN THE PUBLIC INTEREST BY THIS STATION AND THE MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS.

the GRIZZLIES' future depends on us!

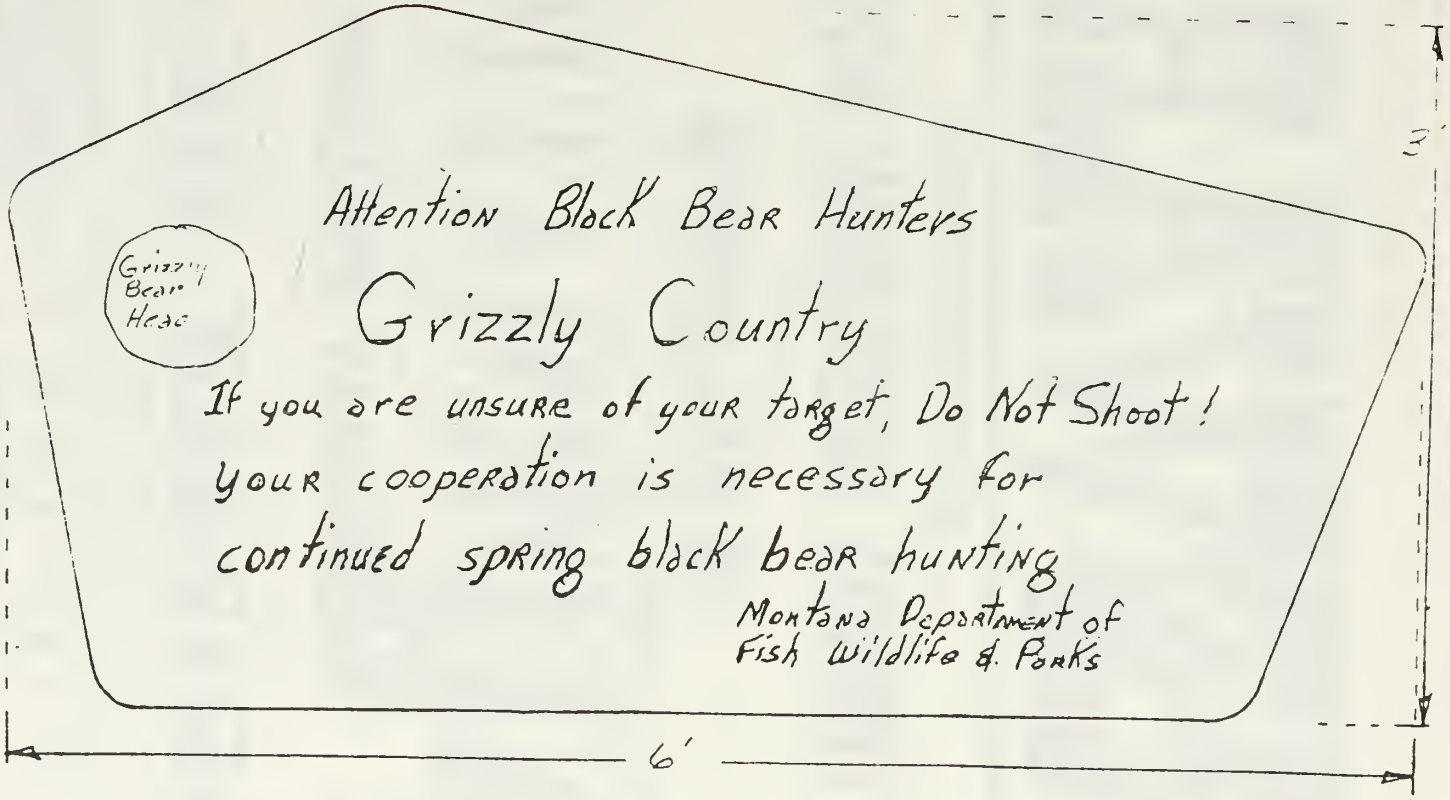
Bears need your CONCERN not your food!

AVOID CONFRONTATIONS:

1. Store food and garbage properly
2. Avoid surprise encounters
3. Stay out of areas of heavy grizzly activity

US IN MIND

greater yellowstone area


Attention Black Bear Hunters
Grizzly Bear Head
Grizzly Country
If you are unsure of your target, Do Not Shoot!
Your cooperation is necessary for
continued spring black bear hunting
Montana Department of
Fish Wildlife & Parks
3'
6'

REWARD

Grizzlies are protected by Federal Law.
They are threatened by illegal killing and loss of habitat.

NATIONAL AUDUBON SOCIETY

will pay up to

$15,000

for

INFORMATION

leading to the arrest and conviction of anyone

ILLEGALLY KILLING

a

GRIZZLY BEAR

or transporting grizzly bear hides or parts

CONTACT

U.S. Fish and Wildlife Service
(303) 234-4612 (406) 657-6340
or your nearest state fish and game office.

Idaho—(208) 334-3736 Montana—(406) 449-2612 Wyoming—(307) 777-7604 Washington—1-800-562-5626

BLACK or GRIZZLY BEAR?

BLACK BEAR

1. Highest point of back is well back of shoulders. No prominent shoulder hump.

2. In profile muzzle is long and straight.

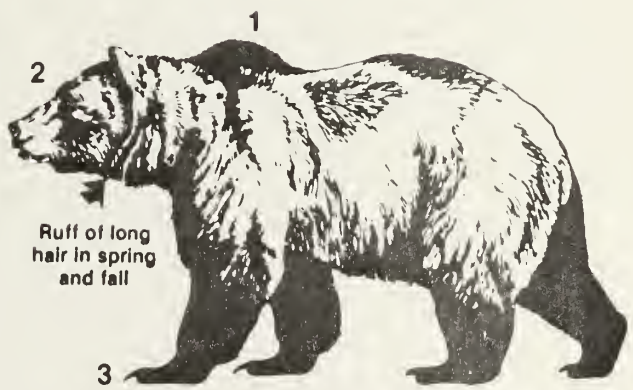
3. Front claws dark colored, relatively short and well-curved.

GRIZZLY BEAR

1. Highest point of back is muscular hump over front shoulders.

2. In profile, brow gives "dished" look to face. Not as well defined in yearlings.

3. Front claws up to 4″ long or longer, slightly curved. Front claws light colored and can sometimes be observed from great distances.



COLOR Color and size are not good identifying characteristics. Color of both species may range from light brown (blonde) to very dark black. Many grizzlies have light tipped hairs which give them a distinctive sheen.

RUBBING During spring, rubbed spots make the hide poor quality. Look for rubbed spots and that the bear is not a grizzly.

BE SURE BEFORE YOU SHOOT

Montana Department of Fish, Wildlife & Parks

800 copies of this public document were published at an estimated cost of $7.75 per copy, for a total cost of $6,200.00, which includes $5,200.00 for printing and $1,000.00 for distribution.