GRIZZLY BEAR RECOVERY PLAN

Grizzly Bear Recovery Plan

(Original Approved: January 29, 1982)

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Date

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Executive Summary of the Recovery Plan for the Grizzly Bear

Current Status

The grizzly bear (*Ursus arctos horribilis*) was listed as threatened on July 28, 1975. The original recovery plan was approved on January 29, 1982. This is the first revision of that plan. The grizzly bear was originally distributed in various habitats throughout Western North America from Central Mexico to the Arctic Ocean. Current distribution is reduced to less than 2 percent of its former range south of Canada in five, and perhaps six, small populations with an estimated total population of 800-1,000 bears. Four regions, or ecosystems—the Northern Continental Divide and Cabinet/Yaak in Montana, the Selkirks of Idaho and Washington, and the North Cascades of Washington—accommodate grizzly populations that are contiguous with Canadian populations. A grizzly population also exists in the Yellowstone ecosystem. These represent the five known populations. The Bitterroot ecosystem in Idaho represents the possible sixth population. It contains sufficient habitat but few if any grizzly bears at this time. A seventh area, the San Juans ecosystem in Colorado, currently is being considered for evaluation, but there has been no confirmed record of grizzly bears in the San Juans since 1979.

Habitat Requirements and Limiting Factors

The grizzly has a broad range of habitat tolerance. Contiguous, relatively undisturbed mountainous habitat having a high level of topographic and vegetative diversity characterizes most areas where the species remains. Habitat loss and direct and indirect human-caused mortality is related to the decline in numbers.

Recovery Objective

Delisting of each of the remaining populations by population as they achieve the recovery targets.

Recovery Priority

The recovery priority for the grizzly bear has been designated as 6C, which indicates a subspecies with a high threat and a high recovery potential that is or may be in conflict with some form of economic activity.

Recovery Criteria

Each individual population will remain listed until its specific recovery criteria are met. The species throughout the lower 48 States can be delisted when the populations in all established recovery zones have been delisted. (The San Juan ecosystem is being evaluated as a possible recovery zone and is not yet considered established.) Recovery criteria include a minimum number of females with cubs seen annually, distribution of family groups throughout the recovery zone, and a limit on human-caused mortality.

Actions Needed

1. Minimize sources of human-bear conflict.
2. Limit habitat loss or degradation because of human actions such as road building, timber harvest, oil and gas exploration and development, mining, and recreation.
3. Improve habitat and/or security where applicable.
4. Understand the relationship between bear density and habitat value to better understand limiting factors.
5. Develop techniques to successfully move bears into areas where the populations are in need of augmentation.

6. Improve public relations and education to develop better support for and understanding of the species and to minimize adverse human actions.
7. Continue grizzly bear and habitat research to ensure adequate scientific knowledge is available on which to base management decisions.

Total Estimated Cost of Recovery

$26,000,000.

Date of Recovery

This varies by ecosystem. Some ecosystems, such as the North Cascades and the Bitterroot ecosystems, likely will not be recovered for 30-40 years, while some other ecosystems such as the Northern Continental Divide Ecosystem may be recovered sooner.

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Forward

"Escudilla"

Life in Arizona was bounded underfoot by grama grass, overhead by sky, and on the horizon by Escudilla.

To the north of the mountain you rode on honeycolored plains. Look up anywhere, any time, and you saw Escudilla.

To the east you rode over a confusion of wooded mesas. Each hollow seemed its own small world, soaked in sun, fragrant with juniper, and cozy with the chatter of pinon jays. But top out on a ridge and you at once became a speck in an immensity. On its edge hung Escudilla.

To the south lay the tangled canyons of Blue River, full of whitetails, wild turkeys, and wilder cattle. When you missed a saucy buck waving his goodbye over the skyline, and looked down your sights to wonder why, you looked at a far blue mountain: Escudilla . . .

To the west billowed the outliers of the Apache National Forest. We cruised timber there, converting the tall pines, forty by forty, into notebook figures representing hypothetical lumber piles. Panting up a canyon, the cruiser felt a curious incongruity between the remoteness of his notebook symbols and the immediacy of sweaty fingers, locust thorns, deer-fly bites, and scolding squirrels. But on the next ridge a cold wind, roaring across a green sea of pines, blew his doubts away. On the far shore hung Escudilla.

The mountain bounded not only our work and our play, but even our attempts to get a good dinner. On winter evenings we often tried to ambush a mallard on the river flats. The wary flocks circled the rosy west, the steel-blue north, and then disappeared into the inky black of Escudilla. If they reappeared on set wings, we had a fat drake for the Dutch oven. If they failed to reappear, it was bacon and beans again.

There was, in fact, only one place from which you did not see Escudilla on the skyline: that was the top of Escudilla itself. Up there you could not see the mountain, but you could feel it. The reason was the big bear.

Old Bigfoot was a robber-baron, and Escudilla was his castle. Each spring, when the warm winds had softened the shadows on the snow, the old grizzly crawled out of his hibernation den in the rock slides and, descending the mountain, bashed in the head of a cow. Eating his fill, he climbed back to his crags, and there summered peaceably on marmots, cones, berries, and roots.

I once saw one of his kills. The cow's skull and neck were pulp, as if she had collided head-on with a fast freight.

No one ever saw the old bear, but in the muddy springs about the base of the cliffs you saw his incredible tracks. Seeing them made the most hardbitten cowboys aware of bear. Wherever they rode they saw the mountain, and when they saw the mountain they thought of bear. Campfire conversation ran to beef, bailes, and bear. Bigfoot claimed for his own only a cow a year, and few square miles of useless rocks, but his personality pervaded the county.

Those were the days when progress first came to the cow county. Progress had various emissaries.

One was the first transcontinental automobilist. The cowboys understood this breaker of roads; he talked the same breezy bravado as any breaker of broncos.

They did not understand, but they listened to and looked at, the pretty lady in black velvet who came to enlighten them, in a Boston accent, about woman suffrage.

They marveled, too, at the telephone engineer who strung wires on the junipers and brought instantaneous messages from town. An old man asked whether the wire could bring him a side of bacon.

One spring, progress sent still another emissary, a government trapper, a sort of St. George in overalls, seeking dragons to slay at government expense. Were there, he asked, any destructive animals in need of slaying? Yes, there was the big bear.

The trapper packed his mule and headed for Escudilla.

In a month he was back, his mule staggering under a heavy hide. There was only one barn in town big enough to dry it on. He had tried traps, poison, and all his usual wiles to no avail. Then he had erected a set-gun in a defile through which only the bear could pass, and waited. The last grizzly walked into the string and shot himself.

It was June. The pelt was foul, patchy, and worthless. It seemed to us rather an insult to deny the last grizzly the chance to leave a good pelt as a memorial to his race. All he left was a skull in the National Museum, and a quarrel among scientists over the Latin name of the skull.

It was only after we pondered on these things that we began to wonder who wrote the rules for progress.

Since the beginning, time had gnawed at the basaltic hulk of Escudilla, wasting, waiting, and building. Time built three things on the old mountain, a venerable aspect, a community of minor animals and plants, and a grizzly.

The government trapper who took the grizzly knew he had made Escudilla safe for cows. He did not know he had toppled the spire off an edifice a-building since the morning stars sang together.

The bureau chief who sent the trapper was a biologist versed in the architecture of evolution, but he did not know that spires might be as important as cows. He did not foresee that within two decades the cow country would become tourist country, and as such have greater need of bears than of beefsteaks.

The Congressmen who voted money to clear the ranges of bears were the sons of pioneers. They acclaimed the superior virtues of the frontiersman, but they strove with might and main to make an end of the frontier.

We forest officers, who acquiesced in the extinguishment of the bear, knew a local rancher who had plowed up a dagger engraved with the name of one of Coronado's captains. We spoke harshly of the Spaniards who, in their zeal for gold and converts, had needlessly extinguished the native Indians. It did not occur to us that we, too, were the captains of an invasion too sure of its own righteousness.

Escudilla still hangs on the horizon, but when you see it you no longer think of bear. It's only a mountain now.

Aldo Leopold

From A Sand County Almanac: *Sketches Here and There*
by Aldo Leopold. Copyright 1949 by Oxford University Press, Inc.

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Preface

The grizzly bear is a symbolic and living embodiment of wild nature uncontrolled by man. Entering into grizzly country presents a unique opportunity - to be part of an ecosystem in which man is not necessarily the dominant species (Herrero 1970).

Under authority of the Endangered Species Act (Act), the U.S. Fish and Wildlife Service listed the grizzly bear (*Ursus arctos horribilis*) as a threatened species in 1975. Since the arrival of Europeans in North America, grizzly bear populations have been eliminated from all but approximately 2 percent of their original range in the lower 48 States. The recovery of the grizzly is directed at establishing viable populations in the six to seven areas in parts of four to five States where the grizzly was known to or believed to exist when it was listed in 1975. Recovery in other areas of the bear's historic range where adequate space and habitat exists is under consideration.

PART 1

INTRODUCTION

Introduction

The grizzly bear (*Ursus arctos horribilis*) was listed as threatened on July 28, 1975. The original recovery plan was approved on January 29, 1982. This is the first revision of that plan. A discussion of the major changes from the 1982 recovery plan and the 1993 revision can be found in Appendix E.

The following is an edited summary of the history and biology of the grizzly bear as it appeared in the 1982 Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1982). For a more comprehensive review of this information including new literature, the reader is referred to the Grizzly Bear Compendium (IGBC 1987) and the literature listed in the Compendium.

History

The ancestor of all present day brown bears was the Etruscan bear (*Ursus etruscus*) that lived in the forests of Asia about 2 million years ago (Kurten 1968). During the warm interglacial periods of the Ice Age, retreating ice left vast areas of tundra-type, treeless vegetation. The evolution of some bear populations using this extensive new resource gave rise to the brown bear (*U. arctos*) in Asia.

Ursus minimus was the ancestor of both the Asiatic black bear (*U. thibetanus*) and the American black bear (*U. americanus*). Members of this black bear line wandered into North America more than 500,000 years ago (Kurten 1968). Isolated from their ancestors, the North American population adapted to the resources of the continent, eventually evolving into the American black bear (Herrero 1972).

Much later, about 50,000 years ago, brown bears crossed the treeless Bering Land Bridge and spread into North America (Churcher and Morgan 1976). Two subspecies of brown bears occupy North America; the grizzly bear (*U. a. horribilis*) on the mainland, and the Kodiak bear (*U. a. middendorffi*) on Kodiak, Shuyak, and Afognak Islands (Rausch 1963).

For brown bears to exploit the rich periglacial habitats, their ancestral forest adaptations had to be modified. Away from the protection of forest cover, morphological and behavioral changes were necessary for the bears to protect their young from other bears, wolves, and several now extinct Pleistocene carnivores. A sudden burst of violence or an effective threat by the mother toward any perceived threat was important to the survival of her cubs. This behavioral adaptation of greater aggressiveness to successfully care for cubs in this new habitat (Herrero 1970, 1972, 1978) is quite likely to have subsequently earned this subspecies of brown bear the name "horribilis."

Physical Characteristics

Grizzly bears are generally larger than black bears and can be distinguished by longer, curved claws, humped shoulders, and a face that appears to be concave. A wide range of coloration from light brown to nearly black is common. Guard hairs are often paled at the tips; hence the name "grizzly." Spring shedding, new growth, nutrition, and climate all affect coloration.

In the lower 48 States, the average weight of grizzlies is 400-600 pounds for males and 250-350 for females (Greer, Montana Department of Fish, Wildlife, and Parks, pers. comm. 1980). An occasional male may exceed 800 to 1,000 pounds. Adults stand 3.5 to 4.5 feet at the hump when on all fours, and may rear up on their hind legs to over 8 feet.

The muscle structure in grizzly bears is developed for massive strength, quickness, and running speeds up to 45 miles per hour. Movement includes the normal position on all fours and an upright position on the hind legs that improves the opportunity to see and smell.

Grizzly bears are relatively long-lived and individuals are known to have lived 40 years (Storer and Tevis 1955); a captive bear lived 47 years (Curry-Lindahl 1972). Pearson (1975) listed the oldest age classes as 28 years for males and 23 years for females; and Craighead et al. (1974), working in Yellowstone, found the oldest age was 25.5 years for both sexes. A female grizzly bear in the Cabinet Mountains was 34 years old as of 1989.

Social Organization and Behavior

Adult bears are individualistic in behavior and normally are solitary wanderers. Except when caring for young or breeding, grizzly bears have solitary patterns of behavior. Individuals probably react from learned experiences. Two individual bears may respond in opposite ways to the same situation (Scott 1964, Riegelhuth 1966). Strict territoriality is unknown, with intraspecific defense limited to specific food concentrations, defense of young, and surprise encounters.

Each bear appears to have a minimum distance within which another bear or person cannot enter; any intrusion of this distance may evoke a threat or an attack (Herrero 1970, Mundy and Flook 1973). Surprise is an important factor in many confrontations involving bears and humans. A female with young exhibits an almost reflexive response to any surprise intrusion or perceived threat to her "individual distance" (Mundy and Flook 1973, Herrero 1976). While females with young compose less than 20 percent of the total grizzly population, they caused at least 79 percent of the injuries to people during the 1970-1973 period (McArthur 1979).

Defense of a food supply is another cause of confrontation between humans and bears. Bears generally defend a kill or carrion out of perceived need, and people defend supplies and property for the same reasons.

If campers take reasonable care of their garbage and food supplies, and if back-country hikers make noise (bells, singing, talking) to avoid suddenly surprising bears while traveling through grizzly bear habitat, most grizzly bears will flee in response to human intrusions (Herrero 1976).

Grizzly bears of all ages will congregate readily at plentiful food sources and form a social hierarchy unique to that grouping of bears (Hornocker 1962, Craighead 1979). Mating season is the only time that adult males and females tolerate one another, and then it is only during the estrous period. Other social affiliations are generally restricted to family groups of mother and offspring, siblings that may stay together for several years after being weaned, and an occasional alliance of subadults or several females and their offspring (Murie 1944, 1962; Jonkel and Cowan 1971; Craighead 1976; Egbert and Stokes 1976; Glenn et al. 1976; Herrero 1978).

Population Characteristics

Density

The mean density of grizzly bears in the Yellowstone Grizzly Bear Ecosystem (YGBE), which contains relatively dry grizzly habitat, was computed to be one bear per 34 mi^2 (88 km^2) by Craighead et al. (1974); in Glacier National Park, a relatively mesic, more productive grizzly habitat, the mean density was estimated by Martinka (1974) to be one bear per 8 mi^2 (20 km^2) on a 290 mi^2 study area; in southeastern British Columbia, grizzly density was estimated to be approximately one bear per 6 mi^2 (16 km^2) (McLellan 1989); in the

Northern Continental Divide Ecosystem (NCDE) outside of Glacier Park, density was estimated to be one bear per 15-23 mi^2 (39-60 km^2) (Dood et al. 1986); in Mt. McKinley National Park, a mean density of one bear per 11 mi^2 (28 km^2) was found (Dean 1976); and on Kodiak Island, Troyer and Hensel (1964) found grizzly bear density greater than one per 75 mi^2 (194 km^2). Knight et. al. (1988) estimated a density of one bear per 16 mi^2 (40.8 km^2) for the U.S. portion of the Selkirks Ecosystem (SE). Weilgus et al. (1993) estimated densities of one bear per 27 mi^2 (71 km^2) for the U.S. and one per 17 mi^2 (43 km^2) for the Canadian portion of the SE. Densities of grizzlies appear to be determined in part by the nature of the habitat, and the abundance and quality of foods.

No estimates of density or total population are made for the remaining grizzly bear ecosystems in the conterminous 48 States.

Home Range

"Space is a species' communal home range; the size is determined by the cruising radius of that species. This home range must contain all of the species' requirements—food, cover and water—for both sexes and all age classes, for all seasons and for all of the species' activities." (King 1938).

In theory, territoriality is the optimal mechanism to space individuals where resources are plentiful and predictable (Geist 1974). To defend a territory of low food availability by overt aggression would not be beneficial to the bear. The energy cost of defending the area would outweigh the return in resources (Bunnell and Tait 1978). Territoriality, if it occurs in grizzly bear behavior, also serves as a population regulating mechanism by spacing individual bears and thereby limiting population density (Etkin 1964). While there is little evidence that grizzly bears exhibit territoriality, a solitary grizzly bear appears to maintain an individual spacing between itself and other bears. The distance maintained may vary with circumstance and season. Females with cubs may enforce a distance of several hundred meters (Herrero 1970, Cole 1972, Pearson 1975).

The home ranges of adult bears frequently overlap. The home ranges of adult male grizzlies are generally two to four times larger than that of females (Pearson 1975, Craighead 1976, Herrero 1978, Servheen and Lee 1979, Aune and Kasworm 1989, Compton et al. 1990, Kasworm and Thier 1991b, Blanchard and Knight 1991). Adult male black bear home ranges are also significantly larger than the home ranges of females (Jonkel and Cowan 1971, Kemp 1972, Amstrup and Beecham 1976, Rogers 1977). The home ranges of both grizzly and black bear females appear to be smaller while they are with cubs, but ranges expand when the young are yearlings in order to meet increased foraging demands (Kemp 1972, Pearson 1975, Herrero 1978, Russell et al. 1978).

Grizzly bears disperse as subadults; however, their pattern of dispersal is not well documented. Dispersing young males apparently leave their mothers' home range and their dispersal may be mediated by the avoidance of the home ranges of established adults. This increases their susceptibility to mortality and human/bear conflict by finding and utilizing unnatural food sources. Young females may establish a home range soon after family breakup, often within the vicinity of their mothers' home range (Pearson 1975). Grizzly bear mothers may tolerate female offspring and may shift their home range to accommodate them.

Home range sizes of both grizzly and black bears vary in relation to food availability, weather conditions, and interactions with other bears. In addition, individual bears may extend their range seasonally or from one year to the next (Jonkel and Cowan 1971, Greer 1972, Craighead 1976, Rogers 1977, Russell et al. 1978).

Age and Sex Structure

Age and sex structures are dynamic variables influenced by many factors such as habitat conditions, time of the year observations are made, hunting, and others. Pearson (1972), working with a hunted population in the Yukon, found 24 percent cubs and yearlings, 32 percent subadults (2-6 years) and 44 percent adults. The population structure of grizzly bears on Kodiak Island (hunted) was 26 percent cubs, 22 percent yearlings, 27 percent subadults, and 25 percent adults (Troyer and Hensel 1964).

Craighead et al. (1974) recorded an average age composition in a hunted population to be 18.6 percent cubs, 13.0 percent yearlings, 24.9 percent subadults (2-4 years), and 43.7 percent adults, during the period 1959 through 1967 in the YGBE. Blanchard and Knight (1980) recorded 6.5 percent cubs, 16.1 percent yearlings, 37.1 percent subadults, and 40.3 percent adults for the area in 1980. The population in the Yellowstone ecosystem had not been hunted since 1974.

Age and sex classifications for small study areas may not reflect true composition because of the home range size differences between sexes and overlapping ranges. Larger ranges and mobility of males may bias samples toward males (Hornocker 1962, Troyer and Hensel 1964, Jonkel and Cowan 1971, Kemp 1972, Egbert and Stokes 1976). Higher male vulnerability to mortality throughout their life span results in a sex ratio in favor of females in adult age classes, although samples based on capture information usually are biased in favor of males because of their higher vulnerability to capture.

Natality

Mating appears to occur from late May through mid-July, with a peak in mid-June and estrus lasting from a few days to over a month (Craighead et al. 1969, Herrero and Hamer 1977). Females in estrus are receptive to practically all adult males (Hornocker 1962). A male may isolate and defend a female in areas of low bear density; but in areas of high density, males and females both may be promiscuous (Craighead et al. 1969).

Age of first reproduction and litter size varies and may be related to nutritional state (Herrero 1978, Russell et al. 1978). Age at first reproduction varies from 3.5 to 8.5 years of age, and averages 5.5 years in the areas studied in the lower 48 States. Litter size varies from one to four cubs with an average of approximately two throughout much of the range of the species. Reproductive intervals for females average 3 years, and animals that lose young early in the year may come into estrus and breed again that same year.

The limited reproductive capacity of grizzly bears precludes any rapid increase in the population. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals, resulting primarily from the late age of first reproduction, small average litter size, and the long interval between litters.

Assuming initiation of breeding at 4.5 years, a female grizzly bear would add her first recruitment to the population when she was 5.5 years. The age of second breeding likely would not occur until she is 7.5. Therefore, during the first 10 years of her life, a female grizzly bear is capable of adding only two litters to the total population. If there are litters of two cubs with a 50:50 sex ratio, and a 50 percent survivorship of young to age 5.5, at best she can replace herself with one breeding age female in the first decade of her life.

Assuming optimum conditions, 50 percent survivorship to age 5.5, equal sex ratios, and using the oldest documented female weaning her last litter at age 24.5 years (Craighead et al. 1974, Wakkinen, Idaho Department of Fish and Game, pers. comm. 1991), a single female would have the potential capability of adding only three and one-half females to the population during her lifetime. Given a normal rate of mortality for all age classes, a protracted reproductive cycle of 3.4 years to 7 years, and the increasing stresses

of habitat encroachment by humans, actual reproductive expectancy is usually far less. Obviously, providing maximum protection for females is essential to recovery. Males are believed to mature sexually at 4.5 years, but larger, dominant males may preclude young adult males from siring many offspring (Hornocker 1962).

The time lapse from conception to birth of cubs is between 229 and 266 days (Banfield 1974). A delay in blastocyst implantation postpones embryonic development (following a mating season that extends from late May to mid-July) until late November or December, and is believed to be approximately 0-30 days after denning (Craighead et al. 1969) with birth occurring near February 1.

Mortality

Natural Mortality

The causes of natural mortality for grizzly bears or other bears are not well known. Bears do kill each other. It is known that adult males kill juveniles and that adults also kill other adults. Parasites and disease do not appear to be significant causes of natural mortality (Jonkel and Cowan 1971, Kistchinskii 1972, Mundy and Flook 1973, Rogers and Rogers 1976) but they may very well hasten the demise of weakened bears.

There are insufficient data to fully assess the effects of predation on younger bears by adult bears. If young bears are not killed directly by aggressive adults, as dispersing subadults they may be forced to choose submarginal home ranges or areas near human habitation equally dangerous to their survival.

Natural mortality during the denning period is not well documented. Several authors believe some bears die during denning, especially following periods of food shortages. However, few such deaths have been recorded.

Upon emergence from the den, bears move considerable distances from high, snow-covered elevations to lower elevations to reach palatable, emerging vegetation, or to feed on winter-killed or weakened ungulates on foothill winter ranges. This type of movement often occurs on the Rocky Mountain front region of Montana. This movement of bears to lower elevations often takes them near areas of human habitation, and may increase the incidence of human/bear conflicts. A similar movement often can occur in the fall due to ripening of fruit and berries at lower elevations. This type of movement occurs on the west front of the Mission Mountains in Montana (Servheen and Lee 1979).

Human-Caused Mortality

Human-caused mortality can be classified into six major categories. These categories include: (1) direct human/bear confrontations (hikers, backpackers, photographers, hunters, etc.); (2) attraction of grizzly bears to improperly stored food and garbage associated with towns, subdivisions, farms, hunter camps, campers, loggers, fishermen, backpackers, and other sources; (3) careless livestock husbandry, including the failure to dispose of dead livestock in a manner that minimizes grizzly interactions; (4) protection of livestock; (5) the eroding of grizzly bear habitat for economic values; and (6) hunting (lawful and illegal). The first five act to reduce space and increase the potential for human-bear conflicts.

Grizzly bear habitat steadily decreased during the initial westward movement of settlers. Bears were conditioned to avoid conflict with humans by the actions of those early settlers. In later years, bears have been attracted to carrion, waste products of construction camps, recreational camps, and to the sprawling residential areas that have invaded their habitat. Today, habitat degradation continues in many areas. Subdivisions, power line corridors, logging roads, recreational development, trails, sightseeing gondolas,

energy and mineral exploration or development, and simply more people everywhere degrade grizzly bear habitat by colocating grizzly bears and people. Bears are attracted to sources of food associated with human developments. Bear mortalities have resulted from bears feeding along railroad tracks at grain spill sites. This attraction of bears to human-related foods and the learning that human-use areas are productive places to seek food is called food conditioning. The result is "problem" or "nuisance" bears that have learned to cause damage to property, have learned to prey on livestock, and have become a threat to human lives. This often leads to illegal shooting or becomes a cause for the removal of the bear. High levels of necessary management removals or illegal shooting can lead to the eventual confinement of bears to ever-decreasing fragments of their former range and a decline in the total grizzly bear population.

Areas that provide high levels of human/bear contact that result in little or no negative experience for the bear may remove any barrier of fear or uncertainty the grizzly bear usually would exhibit toward humans. This loss of natural fear and avoidance of humans is called habituation, resulting in bears that begin to live in close proximity to people or human-use areas. Such habituated bears are not necessarily also food-conditioned but, as they spend more time in association with humans, they are more likely to obtain human-related food and become food-conditioned. These learned behaviors can be taught by females to their cubs, or learned by dispersing subadults that find a food source left by careless people. This transmission of behavior from mothers to cubs can be thought of as a cultural transmission of information through generations of bears. The end result of this learned behavioral pattern is usually the loss of these bears, because many eventually become a threat to human life or property. Left unchecked, the cultural transmission of the learned behaviors of habituation and food-conditioning can lead to a shift in the behavior of entire bear populations.

National parks provide a set of circumstances conducive to conflicts between humans and grizzly bears. As numbers of park visitors continue to increase in the habitat of the grizzly bear, the number of confrontations between park visitors and bears can be expected to increase proportionately. How this pattern can be reversed is not clear at the present time. Some biologists advocate an aversive conditioning program for problem bears to instill a fear of humans and an avoidance of areas used by people such as roadsides and heavily used trails. There is limited chance of successful aversive conditioning of bears that already have received a food reward. Such bears will often continue to seek out human-use areas. Limited aversive conditioning efforts on the Shoshone National Forest have resulted in two food-conditioned reproductive aged females surviving to produce at least one or two more wild litters each. The best chance for aversive conditioning success relates to those bears that have not received a food reward but are just beginning to explore and use areas close to human-use areas. Data indicate that under some conditions grizzly bears may be aversive conditioned successfully to avoid people, specific sites, and specific stimuli within their home ranges. Currently, available aversive-conditioning techniques are not cost or time effective, are difficult to apply, and are limited in their range of application.

There are numerous examples of people and grizzly bears coexisting compatibly through a relationship that can be expressed as tolerant but firm. These people, ranchers, outfitters, loggers, field personnel of wildlife agencies, Forest Service and BLM personnel, and many others, collectively spend tens of thousands of days and nights in grizzly bear habitat with relatively few problems. Most bears outside of national parks have apparently retained their wariness of humans. Some biologists feel that hunting of grizzly bears outside the parks has been a factor in preventing or reducing habituation. Perhaps fewer bear/human conflicts outside national parks is because bears were legally hunted or exposed to illegal shooting or because the ratio of bears to humans is lower outside the parks than it is inside the parks (Jonkel and Servheen 1977). After a population has been delisted, the State management authorities have the option to use sport hunting as one of the available management tools. This application may be especially valuable where bear-human conflicts

are high due to high local bear numbers. In any event, the behavioral makeup of the grizzly bear population must be given serious consideration for successful management. People who impair the bears' respect for humans by providing unnatural food sources, whether it be accidentally or intentionally, share an ethical responsibility for future acts of damage or violence committed by those grizzly bears, and for the eventual death of the bears when they must be removed by management agencies for safety reasons.

Habitat Conditions

Food

The broad historic distribution of grizzly bears suggests adaptive flexibility in food habits of different populations. Although the digestive system of bears is essentially that of a carnivore, bears are successful omnivores, and in some areas may be almost entirely herbivorous. Morphological adaptations include crushing molars and the greatest intestinal length relative to body length of any carnivore (Mealey 1975). Although grizzly bears in many areas are almost entirely herbivorous, they are lacking in multiple stomachs and a caecum and are therefore unable to digest cellulose. Bears feed on animal matter or vegetable matter that is highly digestible and high in starch, sugars, protein, and stored fat (Stebler 1972, Mealey 1975, Hamer et al. 1977).

Grizzly bears must avail themselves of foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive denning and post-denning periods. Herbaceous plants are eaten as they emerge, when crude protein levels are highest. These levels decline rapidly in many plant species as the plants mature (Mealey 1975, Hamer et al. 1977, Herrero 1978).

Grizzly bears are opportunistic feeders and will prey or scavenge on almost any available food including ground squirrels, ungulates, carrion, and garbage (Murie 1944, Hamer 1974). In areas where animal matter is less available, roots, bulbs, tubers, fungi, and tree cambium may be important in meeting protein requirements (Hamer 1974, Pearson 1975, Singer 1978). High quality foods such as berries, nuts, and fish are important in some areas (Cole 1972, Martinka 1972, Hamer et al. 1977).

The search for food has a prime influence on grizzly bear movements. Upon emergence from the den they seek the lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges where their food requirements can be met. Throughout late spring and early summer they follow plant phenology back to higher elevations. In late summer and fall, there is a transition to fruit and nut sources, as well as herbaceous materials. This is a generalized pattern, however, and it should be kept in mind that bears are individuals trying to survive and will go where they best can meet their food requirements.

Cover

The relative importance of cover to grizzly bears has been documented by Blanchard (1978) in a 4-year study in the Yellowstone ecosystem. Ninety percent of 2,261 aerial radio relocations of 46 instrumented grizzly bears were in forest cover too dense to observe the bear. Whether grizzly bears use forest cover because of an innate preference or to avoid humans is unknown (Blanchard 1978). The importance of an interspersion of open parks as feeding sites associated with cover is also recorded in Blanchard's study: "Only 1 percent of the relocations were in dense forest more than a kilometer from an opening."

Forest cover was found to be very important to grizzly bears for use as beds. Most beds were found less than a yard or two from a tree (Servheen and Lee 1979, Blanchard 1978). Blanchard further records only 16 of 233 beds observed (6.7 percent) were without immediate cover. Schallenberger and Jonkel (1980) found grizzly bears preferring forest in over 80 percent of their radio relocations.

Timber management programs may negatively affect grizzly bears by (1) removing thermal, resting, and security cover; (2) displacement from habitat during the logging period; and (3) increases in human/grizzly bear confrontation potential or disturbance factors as a result of road building and management. New roads into formerly unroaded areas may cause bears to abandon the area. Positive aspects of timber management programs include an increase in bear foods (e.g., forbs, berries, and grasses) in certain regions through vegetative manipulation (e.g., tree removal, riparian management, prescribed burning).

Denning

The unavailability of food, deep snow, and low, ambient air temperatures appear to make winter sleep essential to bears' survival (Craighead and Craighead 1972a, 1972b). When rodents and bats hibernate, they become periodically poikilothermic (Stringham, University of Tennessee, pers. comm. 1980). Hock (1960) defined hibernation: "...a periodic phenomenon in which body temperature falls to a low level approximating ambient; heart rate, metabolic rate and physiologic functions fall to a correspondingly minimum level..." By contrast, bears are homeo-hypothermic hibernators whose body temperature drops no more than 5°C (approx. 10 degrees F) and is maintained there indefinitely. With normal fat reserves, bears are capable of fasting for 6 months with only slight reductions in body temperature. They do exhibit a "... marked depression in heart rate and respiratory frequency, but a relatively slight drop in body temperature." (Craighead and Craighead 1972a). A number of authors have documented that day length and inclement weather influence the onset of winter sleep or hibernation.

Grizzly bears excavate dens. The den digging is probably instinctive. It starts as early as September or may take place just prior to entry in late November. Dens are usually dug on steep slopes where wind and topography cause an accumulation of deep snow and where the snow is unlikely to melt during warm periods. Elevations of dens vary geographically, but generally they are found at higher elevations well away from development or human activity. Denning habitat descriptions and activity have been described for grizzly bears in the Mission Mountains of Montana by Servheen and Klaver (1981). Finding an isolated area that will be well covered with a blanket of snow to minimize the escape of body-warmed air and one that will provide a secure environment for a 5-month sleep appears to be a factor favoring survival of the species (Craighead and Craighead 1972b, Pearson 1975). Once denning areas are located, they must be given prime consideration by land management agencies. Craighead and Craighead (1972b), Servheen and Klaver (1981), and others have recorded prehibernation lethargy in bears that may start several weeks prior to denning. Bears exhibit no overt defense of their dens and several have been reported to abandon them because of human disturbance.

Prehibernation lethargy, the consequences of disturbance factors to denning bears, and bear vulnerability during the predenning and denning periods must be considerations in planning land-use activities in identified denning habitat.

Past Distribution

Historically, the range of the brown bear included almost the entire coniferous and deciduous forest zones of Europe and Asia (Curry-Lindahl 1972, Servheen 1990). Brown bears still occur near both the northern and southern extremes of their original distribution in Eurasia, although their numbers are greatly reduced. They have been extirpated throughout vast areas. Though still numerous in the former USSR, the brown bear has disappeared from much of its range west of the former USSR due to destruction of habitat and heavy hunting pressure. The North African subspecies was exterminated a century ago. Local populations persist in Europe, and some are surprisingly abundant (Rumania, Yugoslavia). However, others are very small and their future is uncertain (Cowan 1972, Curry-Lindahl 1972, Servheen 1990).

In North America, the grizzly's historic range extended from the mid-plains westward to the California coast (Rausch 1963, Herrero 1972) and south into Texas and Mexico (Storer and Tevis 1955). The development of unfavorable environmental conditions in the wake of westward expansion and development caused a rapid distributional recession (Guilday 1968). Populations were present throughout most of Western North America during the 18th century (Storer and Tevis 1955), but the rapidity of local extinctions suggests that many of these also were of marginal status (Martinka 1974).

Between 1800 and 1975, grizzly populations in the lower 48 States receded from estimates of over 50,000 to less than 1,000 grizzly bears. At the time of the Lewis and Clark expedition, grizzly bears inhabited the Great Plains and flourished along rivers and streams (Wright 1909). As fur trapping, mining, ranching, and farming pushed westward, the grizzly was extirpated from much of the Great Plains. As the mountainous areas were settled, logging and recreational development contributed to the increase in human-induced mortality of grizzly bears. In most cases, bears that threatened or appeared to threaten man's early tenuous existence were eliminated. Livestock depredation control, habitat deterioration, commercial trapping, unregulated hunting, and protection of human life were leading causes of decline (Martinka 1976, Brown 1985). Conflicts between bears and livestock were common during the settling of the West. The attitude of the early American stockman was expressed by Bailey (1931): "The destruction of these grizzlies is absolutely necessary before the stock business . . . could be maintained on a profitable basis."

Grizzly bears were eliminated from Texas about 1890, and by 1922 the last of the California grizzly bears were gone (Storer and Tevis 1955) (fig. 1). They were last reported in Utah in 1923, Oregon 1931, New Mexico 1933, and Arizona 1935. Professional hunters/trappers hired by Federal and State agencies and stockmen's groups, and accelerated human settlement were responsible for a large part of the exterminations.

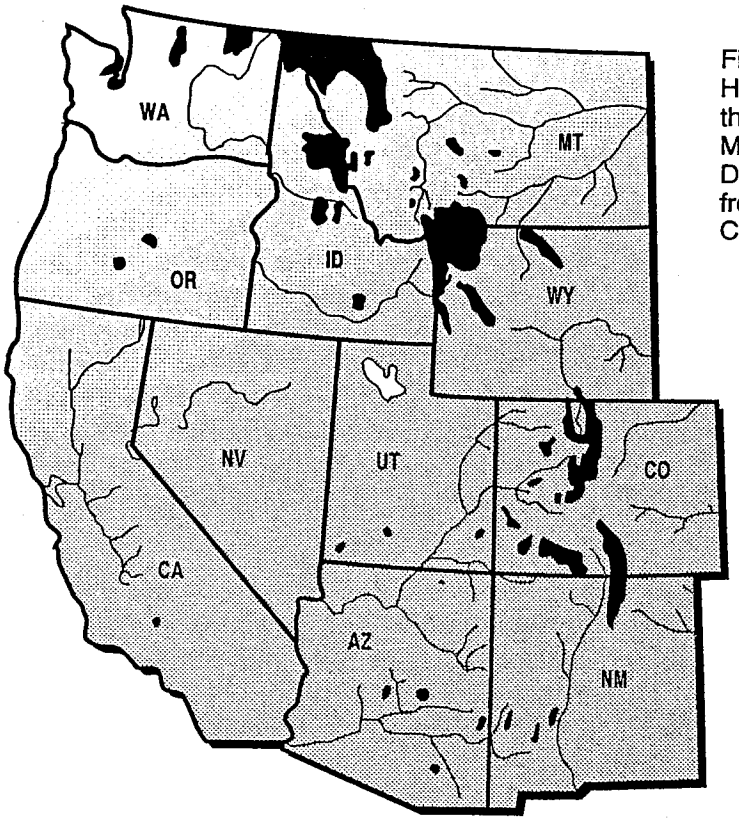


Figure 1.
Historical grizzly bear distribution in the conterminous 48 States, by C.H. Merriam in 1922 (from *Outdoor Life*, Dec. 1922; reprinted with permission from the Popular Science Publishing Company), *in* Earle F. Layser 1978.

Several ranchers raised in the foothills areas along the east and south borders of the NCDE have commented that populations appear to be greater in recent years than they were during the 1920's and 1930's. Howard Copenhaver, a rancher and outfitter living on the southern boundary of the NCDE for over 60 years, believes grizzly bear populations were at their lowest ebb during the early part of the century and extending into the 1920's and 1930's. He related that sheepmen were running their bands of sheep far into the mountains, and out of necessity hired hunters and trappers in addition to herders to protect them. "Seeing a track of a grizzly or black bear during the 1920's was something to write home about," states Copenhaver. He also stated that it is his opinion that grizzly bears in areas he is familiar with, have increased markedly over the last 30 years.

Throughout history, grizzly bears in marginal habitat have been vulnerable to over-kill because of their opportunistic feeding habits and consequent attraction to carrion, weakened domestic animals, garbage, and other food sources associated with people (Hamer 1974). However, many bear hunters and field research personnel would disagree on their susceptibility in wild habitat, as they have found them difficult to observe even fleetingly.

Fortunately, the scene of widespread eradication of grizzlies has disappeared today. A number of State management measures and public awareness have arrested or slowed the decline of grizzly populations in several areas. For instance, the MDFWP had implemented a number of management policies affording protection for grizzly bears in Montana prior to the 1975 Federal listing of grizzly bears as a threatened species (Dood et al. 1986). These protective measures included, but were not limited to, the abolition of baiting and use of hounds to hunt bears in 1921, the listing of bears as a game species in 1923, prohibiting the killing of cubs or females with cubs in 1947, a number of grizzly bear surveys, and regulated hunting seasons throughout the period from the 1920's to present. Additionally, several State wildlife agencies (Idaho, Montana, and Wyoming), Federal wildlife agencies, conservation groups, and landowners have developed cooperative education programs, private land management programs, and nuisance bear control efforts. Such programs foster local tolerance and positive attitudes critical to grizzly recovery in areas where humans and bears must coexist.

Since 1975, the grizzly was afforded threatened status under the Act. Much effort has been expended by various Federal and State land and wildlife agencies, tribal governments, and segments of the public to conserve the species. Currently, the two leading challenges in grizzly bear conservation are the reduction of human-caused mortality and the conservation of remaining habitat. In the two largest ecosystems, the YGBE and the NCDE, annual records of mortality, females with cubs, and distribution depict the success of efforts to protect grizzlies and their habitat. In the YGBE and NCDE, human-caused mortality has dropped to sustainable or nearly sustainable levels. This has been achieved through rigorous sanitation projects within and surrounding recovery zones, education and information programs, and increased law enforcement. In 1985, Federal and State agencies cooperated in the development of the Interagency Grizzly Bear Management Guidelines. The Guidelines detail protocol for nuisance bear management and also detail grizzly bear habitat management policies. Since the inception of the Guidelines, all agencies have worked to implement the policies stated in the Guidelines within and surrounding grizzly bear recovery zones.

Current Distribution/Status

In the conterminous 48 States, only five areas (fig. 2) in mountainous regions, national parks and wilderness areas of Washington, Idaho, Montana, and Wyoming (Hoak et al. 1981, Servheen 1990) currently contain either self-perpetuating or remnant populations. Grizzly bears are known to have existed in the recent past in two additional areas, the Bitterroot Mountains in Idaho and the San Juan Mountains in Colorado. These seven areas will be referred to as grizzly bear ecosystems.

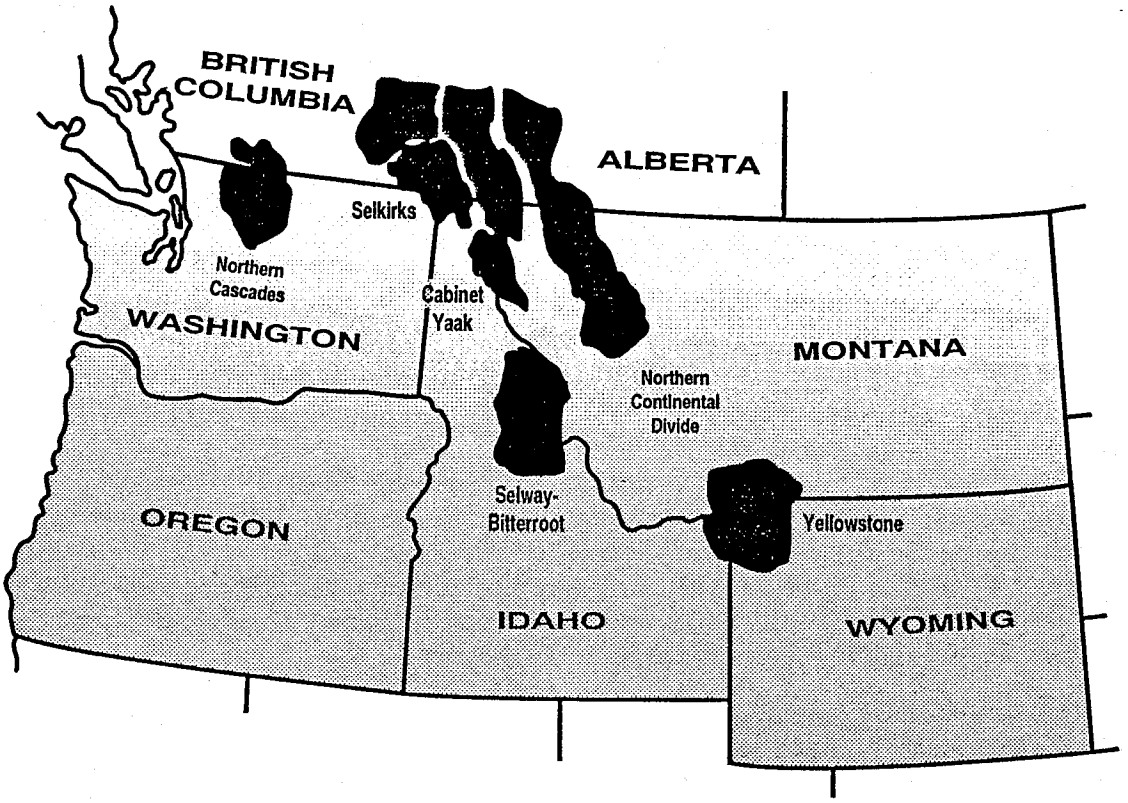


Figure 2. Present grizzly bear ecosystems in the conterminous 48 States, 1990 (the San Juan Mountains area of Colorado is not shown).

Although there have been reports of grizzly bears in the Sierra del Nido in Mexico, no hard evidence of their presence exists (Leopold 1967, Koford 1969). A grizzly bear was shot in the San Juan National Forest in Colorado in 1979. This adult female grizzly was killed by an archery hunter on the headwaters of the Navajo River (Hess, Colorado Division of Wildlife, pers. comm. 1980, Brown 1985). Field research during 1979-80, which entailed trapping in a portion of the San Juan ecosystem where the bear was shot, failed to determine the continued existence of grizzly bears in this area. This area is being considered now for further evaluation as an additional recovery area.

Grizzly bears presently occupy over 23,300 km^2 (9,500 mi^2) of mountainous terrain in and surrounding Yellowstone National Park. The YGBE (fig. 5, p. 39) includes Yellowstone National Park, Grand Teton National Park, John D. Rockefeller Mem4--orial Parkway, significant contiguous portions of the Shoshone, Bridger-Teton, Targhee, Gallatin, Beaverhead, and Custer National Forests, Bureau of Land Management lands, and over 222 km^2 (86 mi^2) of State and private lands in Montana, Wyoming, and Idaho. The minimum population estimate in this area is approximately 236 bears.

The NCDE (fig. 7, p. 59) contains 24,800 km^2 (9,600 mi^2) of occupied grizzly bear habitat. It includes Glacier National Park, parts of the Flathead and Blackfeet Indian Reservations, parts of five national forests (Flathead, Helena, Kootenai, Lewis and Clark, and Lolo), Bureau of Land Management lands, and a significant amount of State and private lands. Four wilderness areas (Bob Marshall, Mission Mountains, Great Bear, and Scapegoat) and one wilderness study area (Deep Creek North) are included. Population

estimates for this ecosystem vary from 549-813 bears (Dood et al. 1986). The area is contiguous to Canadian grizzly bear populations and interchange of bears has been documented. The most recent minimum population estimate for the NCDE is over 300 bears.

One important aspect of this ecosystem is that it embraces a narrow strip of the Great Plains along the eastern slopes of the Rocky Mountain front where grizzly bears still exist. These bears may be descendants of grizzly bears that once occupied the Plains, noted by Lewis and Clark in the early 1800's and painted by Charles Russell 100 years later.

The Cabinet/Yaak Ecosystem (CYE) (fig. 10, p. 81) in northwestern Montana and northeastern Idaho has over 5,100 km^2 (2,600 mi^2) of forested and mountainous habitat occupied by grizzly bears (fig. 10, p. 81). The population in the Cabinet Mountains portion of this area is thought to be less than 15 bears at present based on 5 years of intensive research in Canada and the U.S. There is a small yet unknown number of grizzly bears in the Yaak portion of the ecosystem. There are grizzly bears to the north of the U.S./Canada border, and interchanges of radio-collared bears across the border have been documented. Functional movement corridors for grizzly bears, with adequate cover, between the Cabinet Mountains population and population centers in the Yaak are undetermined currently, and no movement has been documented. However, black bears are known to have moved between the areas. Until further data are available, it is reasonable to assume that the Cabinets and the Yaak are connected by a viable movement corridor. Grizzlies in the area occur at such low densities that detection of specific movements is difficult.

The SE (fig. 11, p. 99) of northwestern Idaho, northeastern Washington, and southeastern British Columbia includes 2,800 km^2 (1,081 mi^2) in the U.S. portion and 2,270 km^2 (876 mi^2) in the British Columbia portion of the recovery zone. The grizzly bear population in the Selkirks is contiguous with Canadian populations. The Selkirk grizzly bear recovery zone is the only one of four recovery zones defined to date that includes part of Canada because the habitat in the U.S. portion is not of sufficient size to support a minimum population. The Selkirk Mountains run north-south across the border, the habitat is contiguous across the border, and radio-collared bears are known to move back and forth across the border. Therefore, the grizzlies north and south of the border are considered one population. Research and management is ongoing on both sides of the border in the Selkirk grizzly bear recovery zone. The population estimate for the entire ecosystem is unknown, but between the years 1985-1990, 26-36 bears were known to occur in a study area that composed approximately one-third of the ecosystem. As of October 1991, seven grizzly bears were wearing active radio-collars in this area. The criteria for population recovery will be applied and quantified within the entire recovery zone on both sides of the border. The management authorities in British Columbia concur with this approach.

The Bitterroot Ecosystem (BE) (fig. 12, p. 117) is centered in the Selway-Bitterroot Wilderness Area. Historic grizzly bear range includes National Forest lands surrounding this wilderness and the River of No Return Wilderness Area on both sides of the Salmon River. A 5-year habitat and population evaluation has been completed in this area (Davis and Butterfield 1991). It is unclear at this point as to whether grizzly bears in this area are permanent residents. However, the study confirms that the Bitterroot evaluation area contains sufficient amounts of quality habitat to warrant grizzly bear recovery (Servheen et al. 1991). Upon recommendation by the NW Ecosystems Management Subcommittee, the IGBC approved the Bitterroot evaluation area for grizzly bear recovery efforts. Specific boundaries of the Bitterroot grizzly bear recovery zone are to be determined by the end of 1993 by an interagency working group.

The North Cascades Ecosystem (NCE) (fig. 13, p. 119) is also contiguous to an area of low grizzly density in Canada. A 5-year habitat and population evaluation has been completed. Verified grizzly tracks were

documented in 1989 and 1990 (Almack et al. 1991). Additionally, habitat research confirms that the North Cascades evaluation area offers sufficient amounts of quality habitat to warrant grizzly bear recovery in the area (Servheen et al. 1991). Upon recommendation by the NW Ecosystems Management Subcommittee, IGBC approved the North Cascades evaluation area for grizzly bear recovery efforts. Specific boundaries of the North Cascades grizzly bear recovery zone are to be determined by the end of 1993 by an interagency working group.

Separate working groups composed of State and Federal agency biologists have been appointed for both the North Cascades and the Bitterroots. The working groups will develop a public involvement process, delineate recovery zone boundaries, and develop and implement recovery tasks and objectives for their respective recovery zones. Upon completion, the tasks and objectives for the North Cascades and Bitterroots will be added as separate chapters to this revised Grizzly Bear Recovery Plan. Development of these two chapters is underway.

Other areas throughout the historic range of the grizzly bear are being considered to determine their suitability for grizzly bear recovery. Areas to be considered must have the potential to provide adequate amounts of quality habitat, space, and isolation necessary to sustain a viable population of grizzly bears.

Legal Status

Protection afforded grizzly bears under the Act is extensive. The possession, transportation, taking, sale, and receipt of grizzly bears or parts thereof are covered under regulations found at 50 CFR 17.40. The term "take" includes, harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct.

Regulations found at 50 CFR 17.40 authorize certain exceptions to the Act. The regulations allow the taking of a grizzly bear in defense of human life, removal of nuisance bears by authorized Federal or State employees, or Federal or State research activities conducted under the authority of permits issued by the Director of the U.S. Fish and Wildlife Service. Any grizzly bear taken under the above situations must be reported to the U.S. Fish and Wildlife Service Division of Law Enforcement and appropriate State or Tribal officials, within 5 days.

Violation of the provisions of the Act can result in a fine of $50,000 and 1 year in prison for a criminal conviction and up to $10,000 in civil penalties. Criminal conviction also carries provisions for (1) modification, suspension or revocation of any lease, license, permit, or other agreement authorizing the use of Federal land, including the grazing of domestic livestock; (2) revocation of Federal hunting and fishing permits; and (3) forfeiture of all guns, traps, other equipment, vehicles, aircraft, and other means of transportation used in taking, possessing, selling, purchasing, offering for sale or purchase, transporting, delivery, receiving, carrying, shipping—in violation of the Act. This regulation currently prohibits the sale of any unlawfully taken grizzly bear, hide, claws, or parts thereof, and supersedes wildlife treaty rights relative to hunting, possession, or selling of grizzly bears except in accordance with Federal or State regulations. Rewards equal to one-half of the criminal or civil penalty or fine paid may be authorized to any person furnishing information that leads to a finding of civil violations or criminal convictions relating to any provision of the Act.

In addition to being listed as a threatened species under the Act, the grizzly bear receives protection against unregulated killing as a game species in Montana and Wyoming. In Colorado, Idaho, and Washington, the grizzly is included on State threatened or endangered species lists.

PART 2

NEEDS FOR RECOVERY

Needs for Recovery

Goal of the Recovery Plan

The goal of the revised recovery plan is to identify actions necessary for the conservation and recovery of the grizzly bear. It is believed that these actions ultimately will result in the removal of the species from "threatened" status in the conterminous 48 States. The species was listed as "threatened" in 1975 pursuant to the Act of 1973, as amended (87 Stat. 884, 16 U.S.C. 1531-1543). A threatened species is defined in the Act as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The purpose of the Act is to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved. Conserve, conserving, and conservation are defined within the Act as to use and the use of all methods and procedures that are necessary to bring any endangered or threatened species to a point at which the measures pursuant to this Act 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" (87 Stat. 884, 16 U.S.C. 1531-1543).

This plan defines a sequence of actions that will provide for the conservation and recovery of the grizzly bear in selected areas of the conterminous 48 States. Specific objectives of this plan are:

(1) Identify grizzly bear population goals that represent species recovery in measurable and quantifiable terms for the six to seven (pending outcome of decisions regarding the San Juans) ecosystems where the grizzly bear has suitable habitat.

(2) Provide a population monitoring approach that will allow determination of recovered levels.

(3) Identify population and habitat limiting factors that account for current populations existing at levels requiring threatened status under the Act.

(4) Identify management measures needed to remove population and habitat limiting factors so that populations will increase and sustain themselves at levels identified as the recovery goals.

(5) Establish recovered populations in each of the ecosystems where habitat is available to sustain a grizzly bear population.

The plan addresses seven areas in the conterminous 48 States where grizzly bears are known or thought to have been present in 1975. These seven grizzly bear ecosystems either presently have or recently had the potential to provide adequate space and habitat to maintain the grizzly bear as a viable and self-sustaining species. Additional areas will be considered for evaluation as grizzly bear recovery areas in the future.

One objective of the recovery plan (objective 5, above) is to recover grizzly bear populations in all of the ecosystems that are known to have suitable space and habitat. Grizzly bear populations occurred in five of the seven ecosystems as of 1990. The five areas known to contain grizzly bears are the YGBE, the NCDE, the SE, the CYE, and the North Cascades Ecosystem (NCE) (Almack et al. 1991). A 5-year study revealed no evidence of resident grizzly bears in the BE despite occasional reports of sightings and tracks (Davis and Butterfield 1991). However, results reveal that adequate suitable habitat exists to sustain a recovered

population (Servheen et al. 1991). Grizzly bear recovery zones have been established in the YGBE, NCDE, SE, and CYE. Recovery zones are currently being delineated for the NCE and BE. There is no firm evidence suggesting the recent presence of grizzlies in the San Juans. The lack of information in the San Juans is due in large part to limited reconnaissance and research efforts. Decisions concerning the status of the San Juans as an evaluation area are pending.

This recovery plan is not intended to provide precise details on all aspects of grizzly bear management. The recovery plan outlines steps that will facilitate the recovery of the species in the lower 48 States. The recovery plan is not a "decision document" as defined by the National Environmental Policy Act (NEPA). It does not allocate resources on public lands. The implementation of the recovery plan is the responsibility of Federal and State management agencies in areas where the species occurs. Implementation is done through incorporation of appropriate portions of the recovery plan into agency decision documents such as National Forest plans, National Park management plans, State game management plans and various State processes. Such documents are then subject to the NEPA process, State public review processes, and selection of alternatives.

Funds expended to achieve the goals and objectives of this recovery plan will be contingent upon appropriations, priorities, and budgetary constraints; a most important ingredient will be the degree of commitment exhibited by individuals in supervisory and management capacities toward conserving the grizzly bear. Inadequate funding or lack of full cooperation by individuals, groups, or agencies will only waste dollars and eventually increase the cost of recovery or increase the costs for tasks that will be necessary to prevent extinction of small populations. A concerted, unified recovery effort, coordinating the resources of Federal and State agencies and a supportive public, is the most effective approach to ensure that the grizzly bear will be present in all remaining ecosystems in the future.

Requirements for Recovery

Two separate requirements must be met before the population within an ecosystem can be delisted. These are: (1) attainment of the population demographic parameters for that ecosystem within the monitoring period specified; and (2) as a requirement of the U.S. Fish and Wildlife Service, the development and completion of an interagency conservation strategy that will ensure that adequate regulatory mechanisms will continue to be present after delisting. Adequate regulatory mechanisms are those regulations, policies, and guidelines that will ensure that the grizzly bear population and the habitat of the species within the recovery zone will be conserved after delisting.

The interagency conservation strategy is necessary to ensure the existence of adequate regulatory mechanisms. Such a strategy will list legal authorities, and detail policy, management programs, and the continued commitment of management agencies to maintain a high standard of management after delisting of the grizzly within that ecosystem. The conservation strategy document will be prepared by an interagency team led by the U.S. Fish and Wildlife Service. The conservation strategy will (1) describe and summarize the habitat and population management that will exist and apply to the grizzly and grizzly habitat after the status of the grizzly is changed within that ecosystem and the species is no longer listed under the Act; and (2) demonstrate the adequacy, continuity, and continued agency application of population and habitat management regulatory mechanisms in order to ensure that the grizzly will not need to be relisted. All agencies will agree to implement the standards in the conservation strategy by signing the document. The ecosystem-specific standards and criteria in the conservation strategy will replace the recovery plan once the species is delisted in an ecosystem. Implementation of the conservation strategy after delisting is the responsibility of the involved agencies and will be necessary to maintain the standard of management required to conserve and maintain a viable population.

Grizzly bear populations may be listed, recovered, and delisted separately. For change in status of any grizzly population, the U.S. Fish and Wildlife Service would publish a proposed rulemaking in the *Federal Register*. This proposed rulemaking would detail the status of the population relating to the five factors in sec. 4.(a)(1) of the Act, and the rationale for changing the status of the population. These factors are: (1) the present and or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting its continued existence. After publication of this proposed rule, there would be a public comment period and, because the grizzly bear is a species of much public interest, there also would be public hearings on the proposed rule. After the public comment period and the public hearings, the U.S. Fish and Wildlife Service would publish a final rule providing a decision on whether the status of the population is being changed.

The U.S. Fish and Wildlife Service requires that a conservation strategy specific to an ecosystem be completed prior to any process to delist the grizzly population within that ecosystem in order to ensure that adequate regulatory mechanisms will continue to conserve the grizzly bear and its habitat. This conservation strategy will be referenced in the *Federal Register* proposing a change of status for that population.

Perspective on Areas of Recovery

Grizzly bear distribution has been reduced to less than 2 percent of historical range in the lower 48 States (fig. 2). The remaining populations are separated into six or seven fragments of once contiguous range. The 1982 recovery plan referenced these areas as "occupied habitat," and also made reference to the existence of grizzly bears in each of these areas within the past 10 years as a criterion for their inclusion as inhabited areas. The term "occupied habitat" has proved to be unworkable because of lack of definition and the fact that all areas where grizzly bear records occur in the recent past can be considered "occupied" in some sense. In order to clarify this situation, this revised recovery plan will use the term "recovery zone" to refer to designated regions within each of the grizzly bear ecosystems. The term "occupied habitat" will no longer be used.

Recovery zones have been established to identify the areas needed for recovery of the species within the 48 conterminous States. A recovery zone is defined as the area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured. All areas within the recovery zone will be managed as either Management Situation I, II, or III under the Interagency Grizzly Bear Guidelines (U.S. Forest Service 1986) (Appendix A) hereafter referred to as the Guidelines. Each recovery zone will include an area large enough and of sufficient habitat quality to support a recovered grizzly bear population. Recovery zones are divided into areas designated as Bear Management Units (BMU's). The BMU's are areas that are used for habitat evaluation and population monitoring. Detailed large-scale maps of each recovery zone and respective BMU's are available in the local offices of State and Federal wildlife and land management agencies in that ecosystem.

Boundaries of recovery zones as described in this recovery plan are subject to change as new biological information becomes available. The following criteria provides the basis for action by the U.S. Fish and Wildlife Service, acting in cooperation with involved State and Federal agencies through IGBC management subcommittees and the IGBC, to change the boundaries of recovery zones:

1. Any additions to the existing recovery zones should be based on biological data indicating that the area in question contains natural resources and/or concentrated natural foods of moderate or higher value to grizzly bears on a seasonal basis, where the occurrence of female grizzly bears who live primarily within the zone has been verified. These resources must attract grizzly bears who live most of the year within the zone to the area outside the zone.

2. The area and number of bears in question must be significant enough to indicate that the recovery zone line needs modification to ensure the recovery and survival of the population in that ecosystem. The significance of the area and/or number of bears affected should be based upon the best biological judgment available.

3. All actions involving the changes of recovery zone boundaries, including elimination of areas from a zone, will be based on the best biological data. The U.S. Fish and Wildlife Service is committed to use the best available biological data to facilitate recovery of the species and will continue to consider changes as data become available.

It is recognized that grizzly bears occasionally will move and even reside permanently in areas outside recovery zones. Bears can and are expected to exist outside recovery zone lines in many areas. However, only the area within the recovery zone will be managed primarily for grizzly habitat. Bears residing within the recovery zone are crucial to recovery goals and hence to delisting. The mere presence of bears outside a recovery zone does not warrant changes in the boundary line. Resources must exist outside the line that are important to those bears living primarily within the zone. An example of a legitimate change in a recovery zone would be the addition of a tract of important seasonal habitat outside the zone that occurs in limited supply within the recovery zone in that area.

Bears both inside and outside the recovery zone are listed as threatened under the Act and are protected under provisions of the Act against illegal killing. Management efforts such as pursuit, capture, and relocation will not be directed against grizzly bears outside the recovery zone if such bears do not come into conflict with people or domestic livestock or do not represent a demonstrable threat to humans. It is recognized that such areas are not primarily managed for grizzly bear use. Bears outside the zone that come into conflict with humans will be captured and relocated into the recovery zone according to the nuisance bear criteria in the Guidelines (U.S. Forest Service 1986). Capture and removal of nuisance bears outside the recovery zone by authorized agency action is necessarily more lenient than within the recovery zone.

Perspective on Monitoring Methods

Significant information is now available on grizzly bear food habits, general habitat use, movements, mortality, and the effects of human activities. Less success has been achieved in developing techniques to determine densities or total numbers of bears in large ecosystems. The various approaches available to monitor grizzly bear populations are reviewed in detail by Harris (1986) and by Dood et al. (1986). The achievement of recovery requires adequate methods of population monitoring. Significant efforts have gone into the consideration of monitoring methods that are indicative of population status. The monitoring methods described in this plan attempt to demonstrate the presence of a minimum population rather than estimate total or actual bear numbers.

As was stated in the 1982 recovery plan, it is most difficult to determine the total population of any secretive, wide-ranging species that occupies rugged, mountainous terrain. Because of this difficulty, current grizzly bear recovery targets do not include specific grizzly bear numbers. Instead, the targets in this recovery plan are measurable parameters that can be used to indicate population status. Indicators of population status

can be used to make assumptions about population size. Assumptions have been minimized as much as possible to avoid contentions about the basis of such assumptions. Additionally, monitoring methods detailed in the MDFWP Grizzly Bear EIS (Dood et al. 1986) provide parallel approaches that supply the public with added confidence in the health of the population.

It is recognized that optimal management for the survival of remaining large, wide-ranging carnivores should include maximizing numbers of animals and range. For all ecosystems, the approach for developing a population goal has been to maximize the number of bears that could be expected to survive within the available space. This approach seeks to minimize risk to the survival of each population through achieving the maximum number of bears that can be supported by the available habitat while remaining sensitive to the social concerns of people living in these areas. The greater the number of bears and the greater the extent of their range, the lower the risk to the survival of these populations. Given the current geographic distribution of grizzly bears in the U.S. and the existing human activities within this range, this plan seeks to maximize grizzly bear numbers and distribution in remaining habitat in coordination with and consideration of the existing human factors.

The population monitoring methods and recovery targets in this revised recovery plan are significantly different than those in the 1982 recovery plan. The methods outlined in this revised recovery plan do not rely on the grizzly bear population dynamics data for the Yellowstone ecosystem (from 1959-67, as described by Craighead et al. 1974) that were the basis for the recovery targets in the 1982 plan. Since 1982, significant research efforts on the threatened grizzly bear populations in the lower 48 States, along with research in Canada and Alaska, have resulted in revised recovery targets.

In this recovery plan, the basis for recovery in each population is a combination of indicators that can be monitored to demonstrate the status of the population. Three basic parameters were chosen as the key indicators of population status. The three key indicators are: (1) sufficient reproduction to offset the existing levels of human-caused mortality; (2) adequate distribution of breeding animals throughout the area; and (3) a limit on total human-caused mortality, which is related to the previous two parameters. Additional indicators can and will be monitored as they are developed and become available, but currently the determination of population status will be based on the combination of the three key indicators. Any additions to the types of parameters monitored will be completed as an interagency effort based on new information and techniques as available.

The development of a population monitoring system requires balance between precision and cost. High precision requires intrusive monitoring of the population at relatively high cost. Low precision usually also is low in cost but produces data with wide, sometimes questionable, confidence. The optimum monitoring system should be repeatable and nonintrusive (it should not require continuous capture and handling of animals). The optimum system should not require exorbitant expense or highly trained and specialized personnel whose time is solely devoted to grizzly bear monitoring.

Appropriate and monitorable population parameters that indicate minimum population status can serve as an alternative to point estimates of population size. With these objectives, limitations, and assumptions in mind, a system has been developed to monitor three key parameters: (1) the number of unduplicated females with cubs seen annually, (2) the distribution of females with young or family groups throughout the ecosystem, (3) the annual number of known human-caused mortalities.

Other factors also can be monitored to increase confidence in the information, but these three parameters will be the key criteria used to judge the status of the population.

The MDFWP employs a system to monitor a number of population parameters as detailed in the State Grizzly Bear EIS (Dood et al. 1986) and Grizzly Bear Management Program. This system monitors other factors than the parameters outlined in this recovery plan. This type of State management plan for the grizzly bear is an example of the type of detail that specific management programs can add to the requirements in this recovery plan.

Rationale

Females With Cubs

In order to demonstrate adequate reproduction and to estimate an average minimum population size, a target number of unduplicated females with cubs of the year must be attained as a running 6-year average. Six-year averages account for two breeding cycles, based on an average 3-year breeding interval. The number of unduplicated females with cubs will be used to indicate whether the population is large enough to sustain existing levels of human-caused grizzly bear mortality. An interagency team of biologists should carefully screen reports of females with cubs according to methods described by Knight and Blanchard (1993) (Appendix F), to judge the credibility of the sightings and eliminate duplicate reports.

The purpose of this number is to demonstrate that a known minimum number of adult females are alive to reproduce and offset existing mortality in the ecosystem. The 6-year average number of unduplicated females with cubs is not adequate to characterize population trend or precise population size (Knight and Blanchard 1993). Any attempt to use this parameter to indicate trends or precise population size would be an invalid use of these data. However, this number can be used to derive a minimum population estimate.

Annual efforts in reporting unduplicated females with cubs for this purpose should be as consistent as possible, but it is recognized that such effort is difficult to standardize. However, the purpose of this target is to ensure a minimum number of adult females rather than estimate trajectories of change in the population. Therefore, annual variation in amount of effort expended to locate females with cubs becomes less important. If intensive effort demonstrates large numbers of adult females present, then this further ensures that the population is above the minimum level necessary to sustain existing man-caused mortality. If insufficient effort is expended to locate adult females, recovery criteria that otherwise may have been met will not be achieved.

Occupancy

The target of occupancy by females with young is designed to demonstrate adequate distribution of the reproductive cohort within the recovery zone. Assuming that successful reproduction is an indicator of habitat sufficiency, distribution of reproducing females across the recovery zone also provides evidence of adequate habitat management. Adequate distribution of family groups indicates future occupancy of these areas because grizzly bear offspring, especially female offspring, tend to occupy habitat within or near the home range of their mother after weaning.

Mortality

The sustainable mortality level is directly related to the number of unduplicated females with cubs, the prime indicator of population level. Harris (1985) suggests that grizzly bear populations can sustain 6 percent human-caused mortality without population decline. However, to facilitate recovery and to account for the unknown, unreported, human-caused mortality that occurs, the known human-caused mortality level should be no more than 4 percent of the minimum population estimate, and no more than 30 percent of this known human-caused mortality can be females. The most recent 3-year sum of unduplicated females with cubs for each ecosystem can be used to calculate the minimum population of bears for that ecosystem. This method applies the proportion of adult females in a population to the minimum number of adult females

known to be alive (Knight et al. 1988, Appendix C). This mortality management method allows annual recalculation of the mortality limits for each ecosystem and annual adjustment of the mortality limits based on population monitoring.

Recovery targets for the three key parameters of a minimum number of females with cubs, the distribution of family groups, and the limit for annual known human-induced mortality have been identified for the YGBE, NCDE, CYE, and SE recovery zones. These targets were developed by the IGBC management subcommittees involving all State and Federal agencies involved in grizzly bear management in each area. Recovery actions are defined in this recovery plan for each of these populations.

Recovery zones and targets for the North Cascades and Bitterroot grizzly bear recovery zones will be determined by interagency biological working groups and approved by IGBC management subcommittees during the recovery plan process for those areas. No decisions have been made on the management for grizzly bears in the San Juan area of Colorado.

Effective Habitat

Bear researchers agree that the most crucial element in grizzly recovery is securing adequate effective habitat for bear populations. Today grizzlies remain only in large tracts of relatively undisturbed land. A clear relationship exists between habitat loss and fragmentation, in addition to persecution by humans and the loss of grizzly populations. Effective habitat is defined as that which provides all the components necessary for the survival of the species. Food, cover, denning habitat, solitude, and space are all important constituents of effective habitat (Craighead et al. 1982).

Diversity characterizes prime grizzly habitat, and is essential to provide a wide range of vegetation types required to produce a varied food supply. Effective grizzly habitat contains an abundance of many kinds of natural foods, vegetal and animal, so that stochastic changes in the abundance of some food items are offset by the presence and availability of other items. Diversity also provides required resting, denning, and social areas and space.

Movements of grizzly bears may exceed 60 airline miles and their home ranges can encompass up to 1,000-1,500 mi^2 (2,590-3,885 km^2), thus space is essential to bears. Because grizzlies can conflict with humans and their land uses, bear habitat must provide some areas isolated from development or from areas otherwise highly impacted by humans. Sanitation is important even in remote areas, as grizzly bears are omnivorous and are attracted to "artificial" human-related food sources. Sanitary disposal of garbage and other edibles is required to avoid food conditioning and eventual habituation of bears to human presence around such attractants.

Grizzly populations require some level of safety from human depredation and competitive use of habitat that includes roading, logging, mining, human settlement, grazing, and recreation. Habitat management policies such as fire suppression also can be viewed as competitive use because it may have long-term adverse effects on grizzly habitat. Grizzlies know no competitors that restrict their use of habitat except man, and it appears that they have not evolved behavioral adaptations to contend with the scope of current human influences.

Competitive use of habitat encompasses all factors that lead eventually to increased negative impact of human activity on grizzly populations. Roads probably pose the most imminent threat to grizzly habitat today (Appendix B). The management of roads is one of the most powerful tools available to balance the

needs of people with the needs of bears. It is strongly recommended that road management be given the highest priority within all recovery zones.

The impacts of logging, mining, livestock grazing, and many forms of recreation in grizzly habitat can be mitigated through well-designed management programs. But the presence of open roads in grizzly habitat often leads to increased bear/human contact and conflict, and can ultimately end in grizzly mortality. Accidental shooting, poaching, and habituation through direct human contact and/or food reward all increase with the use of even secondary, unpaved roads by humans. Additionally, the disturbance generated by heavy traffic on paved roads and/or highways in grizzly habitat may create barriers to grizzly movements.

Habitat Monitoring

Habitat monitoring is critical to the survival of grizzly bears. Monitoring trends in effective habitat require continual updating of habitat information. Both natural and human influences that affect habitat effectiveness must be monitored. Examples of human activities that could be monitored to assess habitat effectiveness and the changes in habitat due to human activities include miles of open road and total road miles per BMU or forest compartment; cover/no-cover ratios; backcountry use days; and vehicle use on open roads.

In the past, human activities that impacted grizzly habitat, including forestry, recreation, and grazing, were evaluated on a case-by-case basis. Today efforts are being made to assess impacts in a regional context. Cumulative Effects Analysis (CEA) implemented through the Cumulative Effects Model (CEM) is an "assessment of how the combination of natural processes and events, and man's activities cause resources and environmental conditions in an area to change over time" (Christensen 1982, Weaver et al. 1986). Combinations of human and natural influences on grizzly habitat are being examined through the use of the CEA.

Measuring the effectiveness of habitat can be achieved through CEA and use of the CEM (U.S. Forest Service 1990). The grizzly bear CEM is currently being developed by the U.S. Forest Service, State agencies, and corporate landholders. Development of the CEM requires five phases (1) data base compilation, (2) software development, (3) testing/validation, (4) development of mortality routine, and (5) threshold development. Currently, data bases are being compiled for each recovery zone and will be incorporated into the model to assess the cumulative impacts of natural changes in habitat as well as the impacts of management prescriptions on habitat conditions. Data bases will be continually upgraded. In the YGBE, a substantial data base has been compiled and the CEM is ready to begin the testing/validation phase. The IGBST will be conducting the testing and validation in the YGBE using their grizzly bear data base.

Once complete, application of the CEM in each ecosystem every 5 years by the land management agencies would allow reassessment of effective habitat and indicate trends in habitat effectiveness. This type of monitoring tracks habitat effectiveness over time, and should be incorporated into current agency land management programs throughout grizzly range. The incorporation of Geographic Information Systems (GIS) technology into CEM marks a tremendous advancement in the ability to monitor and analyze habitat trends. Continuous upgrading of the GIS data bases will facilitate habitat monitoring. Information from various U.S. Forest Service and BLM projects already is available and will be a constant source of habitat-related information.

Because much grizzly habitat has been permanently lost to human use, existing habitat in recovery zones suitable areas should be managed to improve its flexibility to accommodate grizzly populations in the face of natural changes such as fire or prolonged drought. For instance, prescribed burning of specific types of forested and open areas can increase the berry production in shrubfields. In contrast, fire suppression during drought periods may protect critical riparian areas or already productive shrubfields. Also, if predicted global climate changes eventually occur, already marginal grizzly habitat in areas such as Yellowstone National Park may be rendered unsuitable for grizzly occupancy. Manipulation of portions of habitat to maintain effective grizzly habitat may help sustain grizzly populations during periods of stress.

ASSUMPTION: This plan recognizes that Management Situations I, II, and III (U.S. Forest Service 1986), are most frequently applied within recovery zones and adequately provide for grizzly bear survival and recovery if fully applied with a commitment to recovery the species. The plan specifically recognizes that areas designated as Management Situation I provide adequate and necessary conservation measures for grizzly bears, and also recognizes that provisions are made for reclassification of other areas to Management Situation I if grizzly bear use and habitat values indicating need are documented.

Management Situation I (MS1) areas are those that contain grizzly population centers and/or habitat that is needed for the survival and recovery of the species. The needs of the grizzly bear will be given priority over other management considerations. Land uses that can affect grizzly bears and/or their habitat will be made compatible with grizzly needs, or such uses will be disallowed or eliminated.

Management Situation II (MS2) areas are those that do not contain grizzly population centers although grizzlies do occur, and highly suitable habitat components do not generally occur. The needs of the grizzly bear will be given consideration where feasible. Management would accommodate grizzly populations and/or habitat use if feasible, but not to the extent of exclusion of other land uses. Human-bear conflict minimization will be given high priority. In cases where the importance of the habitat resources for recovery has not yet been determined, other uses may prevail to the extent that they do not preclude the possibility of eventual restratification to MS1.

Management Situation III (MS3) areas are those that contain no suitable habitat for grizzlies, and their presence is possible but infrequent. Grizzly use of such areas will be discouraged. Management within these areas will encourage measures that minimize the potential for human-bear conflict. Examples include towns or other residential areas, established campgrounds, or highways.

Island Populations and Grizzly Bears

Grizzly bear habitat and populations were once continuous and contiguous throughout the Rocky Mountains. Grizzly numbers, habitat, and distribution were reduced through the actions of humans. Present grizzly range south of Canada consists of five to seven largely discontinuous populations; known grizzly populations in the YGBE and BE are isolated from all other U.S. and Canadian ecosystems; the NCDE population is probably largely discontinuous with the CYE; and no interchange of grizzlies is known to occur between the CYE and the SE. Four populations, those in the NCE, SE, CYE, and NCDE, are contiguous with Canadian populations. However, bear populations in Canada immediately north of the CYE and in the Canadian portions of the SE and NCE are small. Continuing human development in areas in Canada north of these ecosystems is threatening to isolate these grizzly populations from other bear populations in British Columbia. It is widely accepted in conservation biology that island populations of any species are subject to high rates of extinction and that these rates are directly related to the size of the island. Wide ranging mammals are particularly sensitive to the detrimental effects of insular distribution.

The term isolate or island population indicates any discrete ecological unit that is insulated from other similar units (Wilcox 1980). Larger areas have more habitat and greater habitat diversity to offer all species or any particular species. Reduction of natural habitat and fragmentation into disjunct insular parcels has negative effects on natural ecosystems and the species that live within them (Wilcox 1980). Island populations share definable physical and biological properties and require special management.

Loss and fragmentation of natural habitat is particularly relevant to the management and survival of grizzly bears. Grizzlies are large animals with great metabolic demands requiring extensive home ranges. Their low densities, low reproductive rate, individualistic behavior, and association with riparian habitat that is also used extensively by man cause grizzlies to be more vulnerable to extirpation than many other species. Grizzly bears in isolated habitats require careful management involving all the principles of island population management and conservation biology.

Ideally, preserving linkage between populations is a more legitimate long-term conservation strategy than are attempts to manage separate island populations. Linkage zones are areas between currently separated populations that provide adequate habitat for low densities of individuals to exist and move between two or more larger areas of suitable habitat. The existence of individuals and habitats within linkage zones could act to provide a connection between larger populations. Linkage zones enhance the viability of populations that are separated by some distance by facilitating the exchange of individuals and maintaining demographic vigor and genetic diversity.

A consideration in future grizzly bear management is the possibility of linkage between the existing island populations. Many intervening areas between existing grizzly bear recovery zones are largely roaded, developed, or contain agricultural lands that are unlikely to be crossed by grizzly bears without the chance of confrontation with humans. Major highways exist between virtually all grizzly bear recovery zones. It is unknown whether adequate security and cover presently exist to provide for an interchange of grizzly bears between grizzly bear ecosystems.

Linkage Zone Assessment

One objective of the recovery plan is to identify specific management measures needed to remove population and habitat limiting factors so that populations will increase and sustain themselves at levels identified as the recovery goals. One factor that may affect the sustainability of grizzly bear populations in the future is the ability of individual animals to move between ecosystems. Accurate information is necessary to assess the potential for this type of movement in linkage zones between existing adjacent grizzly bear recovery zones. The approximate distances between ecosystems are listed below and presented in fig. 3.

(1)	Cabinets—Bitterroots	37 air miles
(2)	NCDE—Bitterroots	45 air miles
(3)	Bitterroots—Yellowstone	240 air miles
(4)	Selkirks—Cabinets	14 air miles
(5)	Cabinets—NCDE	35 air miles
(6)	North Cascades—nearest Canadian population	Unknown

In order to adequately assess the capacity for linkage, the Service initiated a 5-year process to assess the linkage potential between the various ecosystems. This process will be led by the U.S. Fish and Wildlife Service in cooperation with the States, provinces, and the various land management agencies. This evaluation also will address linkage potential between existing areas in Canada. Studies of linkage zones

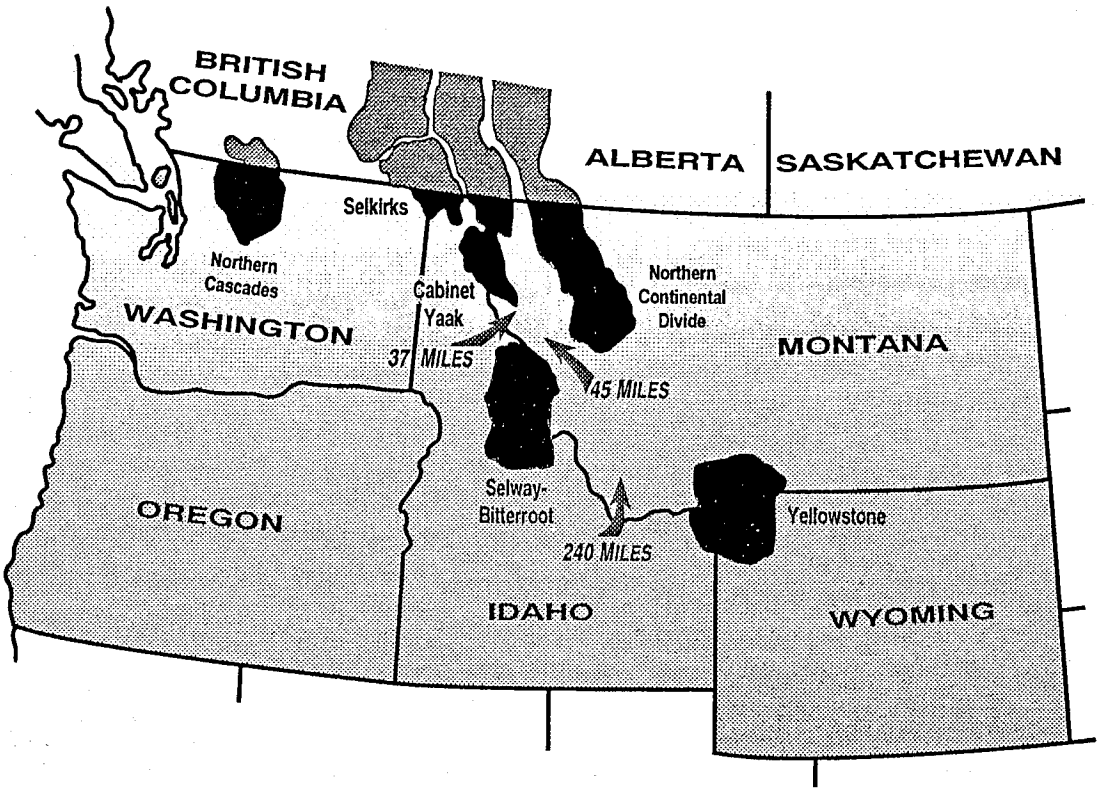


Figure 3. Proposed linkage zone assessment areas and distances between existing ecosystems.

will incorporate the use of GIS technology involving landscape ecology and spacial analysis. GIS provides an excellent means to bring together all the various types of information on land use, human activity, topography, vegetation, and other factors that will influence possible linkage. Some of the information layers that will be used in this analysis within linkage zones include:

(1) topography
(2) vegetation/cover classes
(3) ownership: Federal, State, provincial, county, private
(4) human settlements/residences
(5) human population density
(6) roads, highways/road density
(7) resource extraction industry activities/timber, mining
(8) recreation activities

GIS and associated technology can visually depict and analyze the extent of habitat alteration and disturbances between ecosystems. At this time, very little is known about the potential for linkage zones. At the completion of the 5-year evaluation effort, a report will be available to the IGBC on the potential for linkage between existing ecosystems. This report will be the basis for future actions regarding the linkage zone question. Linkage zones are desirable for recovery, but are not essential for delisting at this time.

Future land management activities within these areas may be critical to maintaining their utility as linkage zones. It is essential that existing options for carnivore movement between existing ecosystems be maintained while the evaluation of linkage zones is underway. Management strategies that limit human-induced mortality and address access management will facilitate the maintenance of the potential of these zones during the 5-year evaluation period. On public lands, management prescriptions similar to big game summer range prescriptions that address access management would likely conserve any existing potential of these areas for linkage until completion of the 5-year evaluation process.

Population Viability Management

A relationship exists between the amount of space available and the number of grizzly bears that can be sustained in any area. Although the absolute carrying capacity for grizzly bears in any region is unknown at this time, the recovery plan establishes a minimum population goal for each recovery zone. For each recovery zone, goals are based in part on research information on density, habitat use, and home range from that specific ecosystem when available, or from reasonable extrapolations of information from other ecosystems if information is lacking. In each grizzly bear recovery zone, minimum population goals are established at levels that ensure a population of bears that is (1) adequately distributed throughout the zone, (2) reproducing, and (3) can sustain existing levels of human-caused mortality. Larger ecosystems therefore will have higher population goals than smaller ecosystems.

Research data (Grizzly Bear Compendium, 1987, Table 11, pp. 52-53, and Kasworm and Manley 1988) show that the average density of grizzly bears in areas studied in the NCDE, YGBE, and CYE averages approximately 76 km^2/bear (29 mi^2/bear). Recent research in the Selkirk Mountains estimates a density of 70.9 km^2/bear within a composite range (Weilgus et al. 1993). Based on these average densities, 90 bears is a reasonable expectation for the both the Selkirk and Cabinet/Yaak recovery zones. These populations are subsets of a much larger population of grizzly bears that is shared between the U.S. and Canada. Both the Cabinet/Yaak and Selkirk recovery zones are contiguous with occupied Canadian habitat to the north. This plan will use a minimum of 90 bears as a minimum population goal in the two small ecosystems contiguous with Canada, the Cabinet/Yaak and Selkirks. It is important to note that no isolated grizzly bear population will be considered recovered at 90 bears, and no population is expected to get as low as 90 bears. The Cabinet/Yaak and Selkirks females with cubs targets indicate a minimum number of at least 90 bears. Both bear populations are contiguous with larger populations to the north in Canada. The targets of a minimum of 90 bears pertain to only the recovery zones for these two ecosystems. All other grizzly bear ecosystems have larger recovery zones and higher targets.

Larger recovery zones such as the YGBE and the NCDE can and will sustain larger populations. In these larger areas, the minimum population expected for recovery is the number of bears required for adequate distribution of reproducing females throughout the ecosystem, and sufficient numbers to sustain the existing levels of human-caused mortality.

It is important to recognize the limitations of the minimum expected population level of 90 bears in an isolated population. One minimum viable population (MVP) estimate for grizzly bears was determined to be 50-90 bears in an isolated population with no immigration, based on computer simulation models using the best available data (Shaffer and Samson 1985). These simulation models assume sufficient secure habitat throughout the projection period. An MVP recovery objective for an isolated population would mean maintaining grizzly bears on the threshold of survival. Any type of increase in bear-human conflict potential or significant change in habitat quality could plunge that population over the brink to extinction. Catastrophe, either biological or physical, can seldom be predicted. Also, there is no provision in the MVP

calculations for the potential detrimental effects of loss of genetic diversity in an isolated population over time due to inbreeding within the population. Current knowledge of bear biology is inadequate to attempt to manage populations of such small size.

These limitations have resulted in the conclusion that little reliance for long-term viability can be placed on isolated populations of 50-90 grizzly bears. The expected number of 90 bears is applied to the Selkirks and Cabinet/Yaak populations; however, neither population is isolated as they are both contiguous with grizzly populations in Canada. Continued cooperative efforts between the U.S. and Canada will promote the conservation of the grizzly populations in these areas.

Recovered populations for the Bitterroots and North Cascades are likely to be in the range of 200 to 400 bears, based on the need for larger populations as detailed above and on the size of the recovery zones in these areas. The number of bears expected will depend on the relationship between the size of the area determined to be within the recovery zones and the habitat capability of the area.

Management of Genetic Diversity

There is a concern about the potential deterioration in genetic variation in isolated grizzly bear populations (Allendorf and Servheen 1986) because of potential harmful effects on development, reproduction, survival, and growth rate. A review of the impacts of loss of genetic diversity and the need to maintain sufficient population size to ensure fitness and evolutionary potential is presented by Soule (1980). Reduction in grizzly bear range has resulted in elimination of historic levels of gene flow throughout the southern portion of grizzly bear range. Little evidence is available to indicate that there are locally adapted subpopulations in the remaining range in western Montana, northwestern Wyoming, and Idaho. Except for the San Juans, all ecosystems were likely contiguous approximately 100 years ago. The San Juans were historically contiguous with other bear populations in the western U.S., however it is unknown when the San Juan ecosystem became isolated due to the elimination of adjacent grizzly bear populations. The contiguous nature of the San Juans in recent times is unknown. The Yellowstone ecosystem was likely cutoff from the other ecosystems 60-80 years or six to eight generations ago.

Simulations have demonstrated that the effective population size (Ne) for existing small grizzly bear populations does not approach sufficient numbers to avoid detrimental loss of genetic variation in the short term (Harris 1985, Harris and Allendorf 1989). Although no detrimental effects due to genetic constraints have been reported in the Yellowstone grizzly population, it is considered sound management to consider proactive management measures to ensure minimal loss of genetic variation in this isolated population. Detrimental effects due to genetic problems such as decreased survival of young or lowered litter size could be falsely attributed to other factors. Additionally, effects such as intrauterine mortality or mortality of cubs prior to emergence from the den likely would never be detected.

Where feasible, proactive management programs that ensure minimal loss of genetic variation can be assumed to be a sound approach to conservation. Because the absolute minimum number of animals necessary to avoid serious loss of genetic diversity in grizzly bear populations is unknown, it is suggested that proactive enhancement of genetic diversity be implemented in isolated small populations (Harris 1985). Because the Yellowstone recovery zone population is the only population presently known to be isolated from other grizzly populations in the U.S. or Canada, it is the only population for which genetic management is believed prudent at this time. Simulations (Harris 1985) to determine the required number of animals and the interval of placement establish that one animal should enter the breeding population each generation. Generation time for grizzly bears is estimated to be 10 years (Harris and Allendorf 1989).

Bears placed into the ecosystem should be monitored to confirm their survival and entry into the breeding population. Connections between the grizzly bear ecosystems probably existed as recently as 100 years ago. This factor reduces the probability that artificial movement of bears for genetic management between Yellowstone and other areas could result in hybridization between different co-adapted gene complexes. Such hybridization can result in outbreeding depression.

The specific techniques necessary for maximum success in placing grizzly bears from one population into another and having them enter the breeding population are as yet unknown. Placement of bears for demographic purposes is presently being tested in the Cabinet Mountains portion of the Cabinet/Yaak area (Servheen et al. 1987). The results of this work, along with considerations of the most appropriate sex and age classes for maximizing the success of genetic management, will be the basis for placement of one breeding animal per generation into the Yellowstone area population. Placement of bears into the Yellowstone grizzly population will be an experimental effort that must be evaluated to determine its effectiveness over time.

Ecosystem Management and Benefits to Other Species

The management of grizzly bears and grizzly bear habitat has the potential to benefit many other species. The grizzly is a species that inhabits many diverse landscapes within the larger remaining wild habitats in the northern Rocky Mountains. The present range of the grizzly also encompasses the majority of the remaining range of the endangered Rocky Mountain wolf (*Canis lupus*), and the wolverine (*Gulo*), as well as the Rocky Mountain populations of lynx (*Lynx*), and fisher (*Martes pennanti*). Grizzly bear habitat management also will benefit elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus*). Benefits of grizzly bear habitat management include access management, silvicultural management, maintenance of linkage between habitat regions, and sanitation standards that secure human-caused attractants. These aspects of grizzly bear management aid in the maintenance of diverse and healthy animal and plant communities. Grizzly bear habitat management complements or is often analogous to sound forest management.

The grizzly bear has been called an umbrella species—one whose needs and range encompass those of a wide variety of other species. Because the grizzly has one of the largest average home ranges of any mammal species and because it occupies a variety of habitats from valley bottom riparian zones to alpine mountain tops, it is perhaps the best example of an umbrella species in the Rocky Mountains. Grizzly bear management will offer benefits to many other flora and fauna. Prudent wildlife habitat management, including grizzly bear habitat management, has the potential to diminish the number of plant and animal species that may require eventual protection under the Act.

Human Social Factors in Grizzly Bear Recovery

The present status of the grizzly bear is largely a result of social belief systems in the American West that were intolerant of grizzly bears and other large carnivores, and the economic factors that led to the doctrine that any natural feature that might inhibit economic gain could and should be controlled. Thus, the recovery of the grizzly bear must rely heavily on the understanding of existing social perceptions of grizzly bears and the means to influence these perceptions. Decisions concerning the economic utilization of grizzly bear habitat for commodity production and land development and the economic base of the communities in these areas are directly related to the conservation and survival of the grizzly bear in these areas. Such economic decisions must include consideration of the impacts of each decision on the survival of the grizzly bear. Kellert (1986) has summarized the importance of this link between economics and species survival:

"The primary need is to ensure that considerations of species preservation are not perceived and treated apart from fundamental socioeconomic decisions. Indeed, the exclusion of such environmental assessments from most societal evaluations may historically have been the most significant factor in the process leading to the decline and endangerment of many species. To regard any economic system as environmentally separate, independent, and superior is, in other words, to invite species degradation and decline."

The future of the grizzly bear will depend on integrating, as Kellert (1986) states: "the socioeconomic and utilitarian values of the general [local] population into the establishment and management of preservation programs." This implies that local communities must be owners of the concept of grizzly bear conservation. Value systems that are imposed on local communities will not foster support for the conservation of the grizzly. Local values and traditions must be integrated into grizzly bear preservation to enhance local support. A management system that seeks to integrate all biological, social, valuational, and institutional forces toward a common effort involving grizzly bear conservation (fig. 4) will have the highest chance of success.

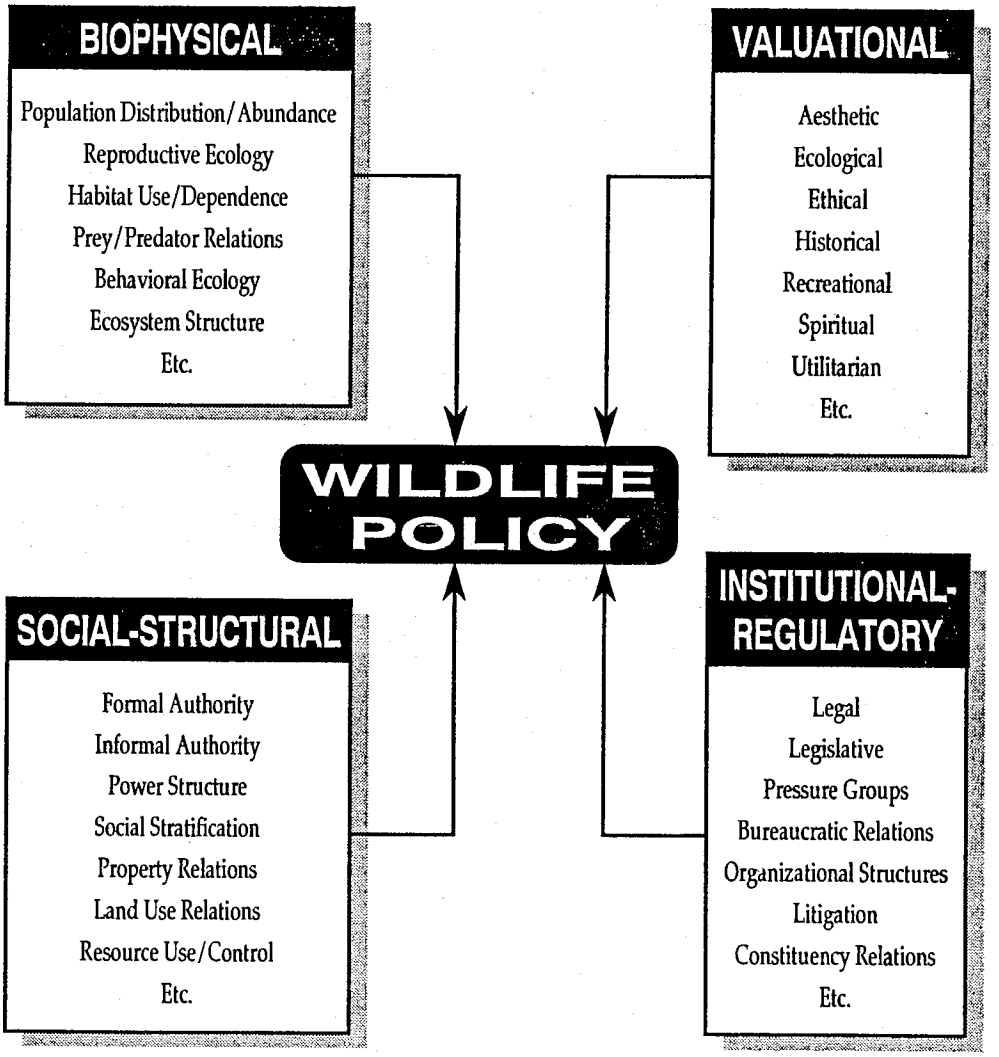


Figure 4. Major variables and important forces in wildlife policy implementation

Social tolerance can increase effective habitat in areas where bears and humans must coexist, whether it be in backcountry wilderness or in areas of human settlement on the edges of wild lands. Kellert (1985) and Decker and Purdy (1988) emphasized the importance of social attitudes for conservation of any species. Gaining the support and confidence of people who live in or near grizzly habitat is one of the greatest challenges to grizzly bear recovery. Efforts which address the attitudes and concerns of the local public serve to foster tolerance and positive attitudes toward grizzly bears in communities throughout grizzly bear habitat. These efforts include intensive education programs concerning grizzly bears, cooperative and consistent nuisance bear control programs, proactive livestock and garbage management projects that reduce bear attractants on private land, and the maintenance of personal contact between citizens and State and Federal wildlife biologists who live and work together in local communities and rural areas near grizzly habitat. The continuation and/or implementation of these cooperative efforts by State, Federal, and provincial wildlife and land management agencies, local governments, conservation groups, and private citizens, is critical to the recovery of grizzly bears in all ecosystems.

Social concerns are often best addressed by integrating local concerns into management actions. In areas where segments of the public perceive grizzly bear management as additional, unnecessary restrictions on local economies and livelihoods, the implementation of grizzly bear recovery actions involves disputes concerning the positions of the parties involved (table 1). In such cases, it may be useful to approach the issue from the discussion of the interests of the parties as illustrated in table one. When discussions focus on interests, the resolution of the conflicts may be greatly facilitated because the interests of the parties may be much more compatible than the positions appear to be. This approach is also useful in understanding and integrating the concerns of the local public into grizzly bear management actions, thus fostering local support and ownership of grizzly bear recovery activities.

The Position V. Interest Matrix

	Agencies	Commodity Interest
Position	Limit roads limit road use provide security areas more public education introduce bears	Maintain forest access no restrictions more timber sales eliminate recovery effort eliminate bears
Interest	increase bear security increase habitat security increase bear survival better distribution more reproduction	healthy local economy economic security safety in the forest recreational opportunity reliable timber output

Table 1. This matrix demonstrates how discussions based on different positions can lead to continuing conflict. Discussions based on different interests will allow realization of common ground and thereby resolution of conflicting positions.

Summary

Recovery plans are scheduled for periodic reviews. This revision is a 10-year revision of the 1982 recovery plan. This plan will be reviewed every 5 years and will be further revised as necessary. Therefore, this plan is not a final plan on behalf of grizzly bears. The best scientific information and knowledge available was used to develop this plan as a guide to increase the present numbers of bears, to effect recovery, and to preserve the ecosystems upon which this species depends. This plan is intended to be dynamic and will be revised as future research indicates that changes are needed.

The test of time will determine the validity of the methods employed to conserve grizzly bears in the conterminous U.S. Human impacts in North America over the past 200 years and their cumulative effects on grizzly bears are history. The fact that grizzly bears still survive in these six areas speaks of their tenacity and resiliency. The remaining areas of suitable habitat will support a finite number of bears. Each year, more people move into grizzly habitat and the surrounding areas, and these areas experience increased and varied impacts from human activities such as mineral and energy development, recreation, grazing, logging, and subdivisions. If left unchecked and without long-range planning, these impacts will reduce the capacity of the habitat for grizzly bears. Much has been accomplished by State, provincial, Federal, and tribal agencies, conservation groups, and private citizens to reduce negative impacts of human activity on grizzly bears. If grizzly bears and people are to coexist in the lower 48 States, the continuation of these ongoing efforts to minimize the effects of human actions on bears and bear habitat is imperative.

PART 3

RECOVERY

Recovery

The plan addresses seven areas in the conterminous 48 States where grizzly bears are known or thought to have been present in 1975. These seven areas occur in the states of Montana, Wyoming, Idaho, Washington, and Colorado. These seven grizzly bear ecosystems either have or recently had the potential to provide adequate space and habitat to maintain the grizzly bear as a viable and self-sustaining species. These populations will be judged to be viable when they meet the demographic recovery targets and it can be demonstrated that adequate regulatory mechanisms exist to ensure continued population and habitat management after delisting.

The overall goal of the plan is to remove the grizzly bear from threatened status in each of the ecosystems in the 48 conterminous States. This will be achieved by:

(1) meeting the demographic recovery goals of:

(a) For the YGBE, 15 females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone; 16 of 18 BMU's occupied by females with young from a running 6-year sum of verified sightings and evidence, and within the Plateau and Henry's Lake BMU's, a study will be initiated in 1993 to determine the potential and present habitat capability of these BMU's to support females with cubs; and no two adjacent BMU's shall be unoccupied; and known human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved.

(b) For the NCDE, 10 females with cubs inside Glacier National Park (GNP) and 12 females with cubs outside GNP over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada; 21 of 23 BMU's occupied by females with young from a running 6-year sum of verified sightings and evidence, with no two adjacent BMU's unoccupied; and known human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Furthermore, recovery cannot be achieved without occupancy in the Mission Mountains portion of this ecosystem.

(c) For the CYE, six females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada; 18 of 22 BMU's occupied by females with young from a running 6-year sum of verified sightings and evidence; and known human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Presently, grizzly bear numbers are so small in this ecosystem that the mortality goal shall be zero known human-caused mortalities.

(d) For the SE, six females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, *including* Canada; 7 of 10 BMU's on the U.S. side occupied by females with young from a running 6-year sum of verified

sightings and evidence; and known human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Presently, grizzly bear numbers are so small in this ecosystem that the mortality goal shall be zero known human-caused mortalities.

(e) Specific goals for the NCE and BE currently are being developed and will be appended to this plan when finalized.

(2) demonstrating the existence of adequate regulatory mechanisms for population and habitat management through the development of a conservation strategy for each ecosystem.

Step-Down Outline

1. Establish the population objective for recovery and identify limiting factors.

    11. Determine population conditions at which the species is viable and self-sustaining for each ecosystem.

        111. Determine population monitoring methods and criteria.

        112. Establish reporting procedures and systems to gather and evaluate information on populations.

    12. Determine current population conditions.

    13. Identify the human-related population limiting factors if present populations differ from desired.

        131. Identify sources of direct mortality.

        132. Identify sources of indirect mortality.

        133. Determine effects of human activities on bears and bear habitat, and incorporate the results into management plans and decisions on human activities.

2. Redress population-limiting factors.

    21. Manage sources of direct mortality.

        211. Reduce illegal killing.

            2111. Coordinate State, Federal, and tribal law enforcement efforts.

            2112. Reduce illegal killing by big game hunters and mistaken-identity killing by black bear hunters.

            2113. Investigate and prosecute illegal killing of grizzly bears.

2114. Reduce accidental mortality.

21141. Increase efforts to clean up carrion and other attractants in association with roads, human habitation, and developed areas within recovery zones.

21142. Reduce losses due to mishandling of bears during research and management actions through development of a bear handling manual.

21143. Reduce losses due to predator and rodent control.

21144. Ensure that control of nuisance bears is accomplished according to 50 CFR 17.40 and the Guidelines.

21145. Reduce losses by developing and implementing public education and awareness programs.

212. Appoint a grizzly bear mortality coordinator.

22. Identify and reduce sources of indirect mortality.

221. Make domestic livestock grazing compatible with grizzly bear habitat requirements.

222. Make timber harvest and road building compatible with grizzly bear habitat requirements.

223. Make mining and oil and gas exploration and development compatible with grizzly bear habitat requirements.

224. Make recreation on Federal lands compatible with grizzly bear habitat needs.

225. Coordinate with State and county governments to make land-development and land-use decisions within the recovery zones compatible with grizzly bear habitat needs.

226. Monitor the cumulative effects of management actions in grizzly bear habitat.

23. Coordinate, monitor, and report activities relating to redressing population limiting factors, and monitor compliance with the recovery plan.

3. Determine the habitat and space required for the achievement of the grizzly bear population goal.

31. Define the recovery zone within which the grizzly bear will be managed.

32. Identify agency management stratifications within the Recovery Zone including the delineation of BMU's and Management Situations I, II, or III as defined in the Interagency Grizzly Bear Guidelines.

33. Conduct research to determine extent of grizzly bear range.

34. Conduct research to determine habitat use, food habits, home range size, and seasonal habitat preference, and incorporate into habitat management programs.

35. Conduct research to determine the relationship between habitat values, physiological condition of bears, and the ability of the habitat to sustain a population density necessary to achieve viable population size.

36. Conduct research to determine the effects of various road densities on grizzly bear habitat use and human-caused bear mortality.

37. Conduct research on the effects of habitat fragmentation caused by human activities in order to assess the possibility of linkage between grizzly bear ecosystems and between habitat tracts within ecosystems.

38. Evaluate the applicability of population viability analyses to grizzly bear recovery.

4. Monitor populations and habitats.

41. Monitor populations before, during, and after recovery.

411. Develop and conduct an intensive monitoring system to measure the annual number of females with cubs, family groups, and number of human-caused mortalities.

12. Develop a system of responsibilities to collate, analyze, and report annual information on population data.

413. Standardize observation report forms and methods, and develop training methods for all persons involved in reporting sightings of females with cubs and family groups.

414. Monitor relocated bears in order to assess the success of nuisance bear management.

42. Monitor habitats before, during, and after recovery.

421. Develop and apply the CEA process to allow monitoring of effects of management actions over a large geograhpic area of habitat.

422. Complete habitat mapping of the recovery zones and digitize these data so they are available for use by the CEA.

423. Establish a threshold of minimal habitat values to be maintained within each CEA unit in order to ensure that sufficient habitat is available to support a viable population.

424. Apply CEA to each BMU to ensure habitat quality is sufficient for maintenance of a viable population and to monitor changes in habitat as a result of human activity.

425. Report activities successfully used to manage habitat.

426. Develop a conservation strategy to outline habitat and population monitoring that will continue in force after recovery.

5. Manage populations and habitats.

51. Manage populations and habitats prior to recovery on Federal lands.

511. Refine procedures for aversively conditioning or relocating nuisance grizzly bears.

512. Develop and test procedures to relocate bears between areas for demographic or genetic purposes.

513. Apply Interagency Grizzly Bear Management Guidelines prior to recovery that maintain or enhance habitats.

52. Manage populations and habitats on private and State lands by developing and applying management guidelines prior to recovery that maintain or enhance habitats. Recommend land use activities compatible with grizzly bear requirements for space and habitat; minimize the potential for human/bear conflicts.

53. Develop and implement a conservation strategy for each ecosystem that outlines all habitat and population regulatory mechanisms in force after recovery.

6. Develop and initiate appropriate information and education programs.

61. Evaluate public attitudes toward grizzly bear management, habitat protection and maintenance, land use restrictions, mitigating measures, relocation of bears, hunting, nuisance bear control actions, and habitat acquisition or easement.

62. Formulate ways to improve public attitudes about grizzly bears and the grizzly bear recovery program.

7. Implement the recovery plan through appointment of a Recovery Coordinator.

8. Revise appropriate Federal and State regulations to reflect current situations and initiate international cooperation.

81. Revise Federal and State regulations as necessary.

82. Coordinate and exchange information and expertise with Canada and other countries concerning bear research and management.

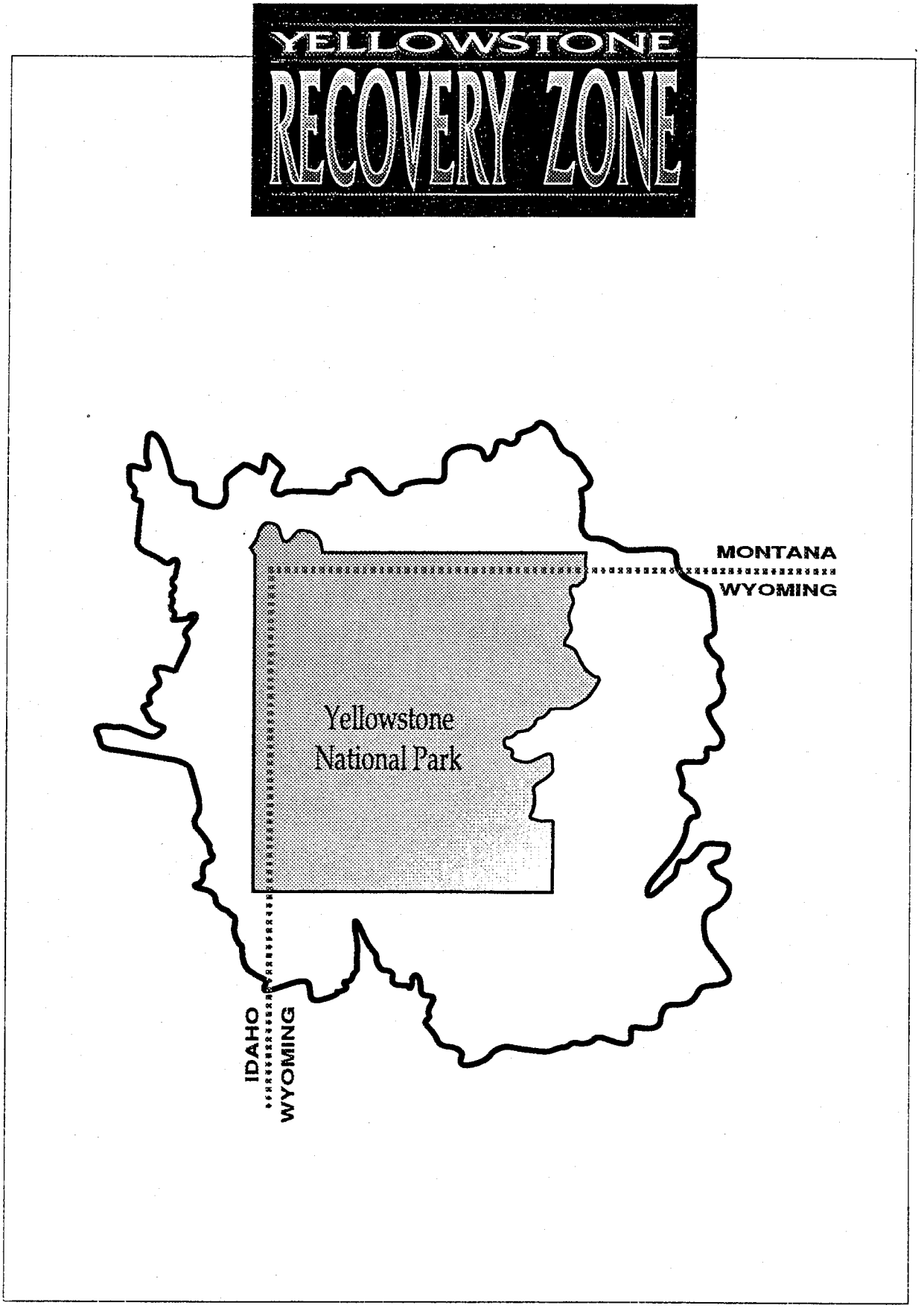

YELLOWSTONE
RECOVERY ZONE
MONTANA
WYOMING
Yellowstone
National Park
IDAHO
WYOMING

Figure 5.

Yellowstone Grizzly Bear Recovery Zone

Subgoal: For the Yellowstone Grizzly Bear Recovery Zone (YGBE), 15 females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone; 16 of 18 BMU's occupied by females with young from a running 6-year sum of observations, and within the Plateau and Henry's Lake BMU's, a study will be initiated in 1993 to determine the capability of these BMU's to support females with young; no two adjacent BMU's shall be unoccupied; and known, human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved.

Establish the Population Objective for Recovery and Identify Limiting Factors. (Y1)

The population objective for the YGBE was based on data accumulated since 1975 on food habits, distribution, bear/human conflicts, home range, and density. Consideration of limiting factors included information on annual fluctuation in food sources, adult female survivorship, levels of human-caused mortality, and ongoing conflicts in the ecosystem, as well as demographic concerns. The goals detailed in this chapter are based on the best available scientific information on the population and are believed necessary for the population to be viable and as self-sustaining as possible in this ecosystem. These goals will be revised as necessary or as new information becomes available.

Recovery targets for the YGBE grizzly bear recovery zone were developed using the following assumptions and data:

(1) Recovery of the YGBE population depends upon verification that the population meets the criteria for a recovered population. A recovered population is defined as one that:

   (a) can sustain the existing level of known and estimated unknown, unreported human-caused mortality that exists within the ecosystem; and

   (b) is well distributed throughout the ecosystem.

(2) The target for the minimum number of unduplicated females with cubs on a running 6-year average is 15 verified reports, both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone. The target was derived using the following facts and assumptions about the grizzly bear population in the YGBE:

   (a) A running 6-year average of unduplicated females with cubs is based on a 3-year reproductive cycle and will allow at least 2 years when each adult female alive can be reported with cubs. A running 6-year tally will stabilize the average and make it less sensitive to differences in levels of annual reporting effort and sightability.

   (b) On average, 33 percent of adult females (at least 5 years old) will be with cubs each year. This is based on an average 3-year reproductive interval for adult female grizzly bears. The 6-year average number of females with cubs can be multiplied by three to estimate the minimum number of adult females in the population.

(c) The reporting efficiency for females with cubs is high in the YGBE compared to other ecosystems. This is due to a large amount of open habitat where bears are visible, a national park in the center of the recovery zone, and no regulated hunting of grizzly bears since 1974, resulting in less wary bears. These factors result in a higher level of sightings of females with cubs as compared to sightings in other ecosystems. It is recognized that not all females with cubs are seen and that the number reported each year represents only a known minimum number. However, a maximally conservative approach is warranted because the YGBE contains an isolated population of bears. Therefore, a sighting efficiency correction factor is not applied to the Yellowstone data and the unduplicated females with cubs actually seen are assumed to be the minimum number of females with cubs alive in the ecosystem. The calculated minimum number of females with cubs will underestimate the actual number.

(d) The grizzly population in the YGBE is assumed to be 44 percent adults and 56 percent subadults (Knight and Blanchard, unpublished data).

(e) The M:F sex ratio in the YGBE of adults and subadults is 51:49 (Knight et al. 1988, Appendix C).

(f) The proportion of adult females in the population is 28.40 percent (using methods in Knight et al. 1988, Appendix C, and Knight et al. 1993, Appendix D).

The target of least 15 unduplicated females with cubs indicates a minimum population average of at least 158 bears (using methods in Knight et al. 1988): 15 females with cubs seen x 3 = 45 total adult females; and 45 divided by .2840 (the proportion of adult females in the population) = a minimum of 158 grizzly bears in the YGBE:

$$\frac{45}{.2840} = 158 \text{ grizzly bears}$$

(3) Human-caused grizzly mortalities will continue at some long-term rate due to inevitable interactions between bears and people throughout the 9,500 mi^2 (24,605 km^2) ecosystem. These mortality levels are likely to increase as the bear population increases and human-bear interactions increase.

(4) Unknown, unreported, human-caused mortality occurs each year at some level.

(5) Known human-caused mortality for grizzly bears in the YGBE averaged (from Craighead et al. 1988, and Knight et al. 1989, 1990, 1991, 1992, 1993):

Year	Known Human-Caused Mortality		
	All bears	All females	Adult females
1987	3	2	
1988	6	2	
1989	2	0	
1990	9	6	4
1991	0	0	0
1992	4	1	0
TOTAL	24	11	4 (3 Year Sum)
6-Year Average	4 /Year	2 /Year	

(6) There is a relationship between sustainable human-caused mortality, recruitment of animals into the population, and the number of unduplicated females with cubs. Therefore, estimates of the number of females with cubs is important for managing mortality.

(7) The calculation of the annual mortality limit is based on the more conservative number of adult females known to be alive for the past 3 years. The following YGBE minimum population estimate for the fall of 1992 was calculated using the assumptions listed above (items 2c-2f) and methods in Knight et al. (1988, Appendix C): The latest number of known adult females is the sum of the unduplicated females with cubs 1990-1992: 24 + 24 + 23 = 71, minus the 4 known adult female mortalities during this 3-year period, which yields a minimum of 67 adult females alive as of January 1993 (Knight et al. 1993). The number of adult females can be used with the method in Knight et al. (1988) to estimate the minimum population size as follows:

$$\text{Total Population} = \frac{\text{67 adult females present}}{\text{proportion adult females in population}}$$

$$\text{The minimum calculated population is } \frac{67}{2840} = 236 \text{ grizzly bears}$$

(8) The maximum human-caused mortality level that can be sustained without population decline by a grizzly bear population with the above-assumed characteristics is 6 percent, applied to the entire population, and no more than 30 percent of these mortalities should be females (Harris 1984).

(9) The present minimum population estimate is 236 (see item 7 above) which could sustain a maximum human-caused mortality level of 6 percent or:

$$236 \times 0.06 = 14 \text{ human-caused bear mortalities}$$

(10) In order to facilitate recovery of the population, and to allow for both error in minimum population estimates and for unknown unreported mortality, the known human-caused mortality limit for the YGBE population is set at 4 percent of the most recent population estimate based on the 3-year sum of females with cubs. No more than 30 percent of this mortality limit may be females. The annual known human-caused mortality limit will be set by calculating the minimum population estimate for the year and setting the mortality limit for that year at 4 percent of this average.

The lead for compiling these annual calculations shall be the Recovery Coordinator of the U.S. Fish and Wildlife Service working in cooperation with other agencies. Management should seek to ensure that known, human-caused mortality does not exceed this limit. In order to account for changes in population size, the mortality limit will be calculated annually using the most recent 3-year sum of females with cubs as described in item 7 (above). This mortality level is conservative because:

(a) it is applied to a minimum population estimate that is based on only those females with cubs actually seen in the YGBE. It is recognized that the actual population size is higher than the minimum estimate; and

(b) according to Harris (1984), a grizzly bear population using assumptions for interior Rocky Mountain areas can sustain 6 percent human-caused mortality without experiencing a decline in that population.

For the present YGBE population estimate, a 4 percent known human-caused mortality limit is equivalent to:

$236 \times 0.04 = 9$ human-caused bear mortalities
$9 \times 0.30 = 3$ human-caused female bear mortalities

(11) The 4 percent known, human-caused mortality limit for 1993 is nine bears (see item 10). The current 6-year average of annual, known, human-caused mortality is 4 bears (see item 5 above), or 1.7 percent of the minimum population estimate of 236 bears. This is below the limit of 4 percent.

The known, human-caused female mortality limit for 1993 is 30 percent of nine, or three females annually (see item 10). The current 6-year average of annual, known, human-caused female mortality is two (see item 5). This is 22 percent of 9, which is below the limit of 30 percent.

Human-caused grizzly mortality in the YGBE appears to be within sustainable levels at this time.

Determine Population Conditions at which the Species is Viable and Self-sustaining. (Y11)

Reevaluate and refine population criteria as new information becomes available. The grizzly bear population in the YGBE will be viable when monitoring efforts indicate that recruitment and mortality are at levels supporting a stable to increasing population, and reproducing females are distributed throughout the recovery zone. The population will be judged as meeting recovery population requirements when, as determined through systematic monitoring throughout the recovery zone, it meets each of the following criteria:

(a) The average number of unduplicated female grizzly bears with cubs-of-the-year is a minimum of 15 annually on a running 6-year average.

(b) The distribution of family groups of grizzly bears represented by female grizzly bears accompanied by cubs, yearlings, or 2-year olds is reported in 16 of the 18 BMU's, on a running 6-year sum of observations with no two adjacent BMU's unoccupied. This is equivalent to verified evidence of at least one female grizzly bear female with young at least once in each BMU over a 6-year period. The distribution is indicated by verified sightings or verified evidence such as tracks. The Plateau and Henry's Lake BMU's will be the focus of a study started in 1993 to determine their past and present habitat potential for occupancy by females with young. Considerations of recovery for the Yellowstone population will be suspended until the potential for occupancy within the Plateau and Henry's Lake BMU's by females is understood as determined by completion of the special study.

(c) The known human-caused mortality level does not exceed 4 percent of the average of the previous 3 years minimum population estimate based on the unduplicated number of females with cubs, minus known, adult female deaths (see Y1.). In addition, the known, human-caused female mortality shall be no more than 30 percent of the total known mortality limit.

Other parameters may be monitored to evaluate the status of the YGBE population, however, the primary parameters that will be used to judge the status of the population for achievement of recovery and delisting will be the three parameters detailed above: unduplicated females with cubs, distribution of females with young, and annual human-caused mortality.

Determine Population Monitoring Methods and Criteria. (Y111)

The maintenance of a secure and robust grizzly bear population will require careful, continuous monitoring. This monitoring should provide data to reasonably ensure that the population is secure. The greater the number of parameters monitored, the greater the assurance that the information is representative of the status of the population.

With this in mind, a system has been developed to monitor a wide range of parameters, with three being of primary importance. These include: unduplicated number of females with cubs seen annually, the distribution of females with young throughout the ecosystem, and the annual number of known human-caused mortalities. Other factors should also be monitored to increase confidence in the information, but these three parameters will be the key criteria used to judge the status of the population.

The target of distribution by females with young is designed to demonstrate adequate dispersion of the reproductive cohort within the recovery zone. Distribution of reproducing females will also provide evidence of adequate habitat management, assuming that successful reproduction is an indicator of habitat sufficiency. Lastly, adequate distribution of family groups indicates future occupancy of these areas because grizzly bear offspring, especially females, tend to occupy habitat within or near the home range of their mother after weaning.

The YGBE has a wide variety of habitat values. The distribution of bears, especially females with cubs, is directly related to the habitat values within any area. Areas of higher quality habitat are more likely to support higher densities of bears than areas of lower quality habitat. The recovery criterion of distribution of family groups of bears is measured within the BMU's. However, these BMU's were not originally delineated for measurement of the distribution of females with young. The BMU's were used as the area measurement for distribution of family groups because they already existed and their names and boundary lines were well known by management authorities.

Using BMU lines for measurement of the distribution of females with young has a disadvantage in that each area has a different overall value as bear habitat. The probability of seeing evidence of grizzly bears, especially females with young, is directly related to the habitat values of an area. This leads to different probabilities of expecting to see family groups of bears in each BMU.

In order to apply reasonably the distribution criteria to the BMU's, each was subjectively judged by the IGBST on overall habitat value with the expectation of seeing family groups. The result of this review was that two BMU's, the Plateau and Henry's Lake BMU's, had low habitat value, and thus a lower probability of seeing grizzly bear family groups relative to the other 16 BMU's. Because of the lower probability of seeing family groups in these areas, further habitat evaluation is necessary before a firm decision is made on the requirements for occupancy within these areas. A study should be initiated in 1993 to evaluate the habitat and the methods of locating female grizzly bears with cubs in the Plateau and Henry's Lake BMU's. At the end of this study, a final decision should be made as to the requirements for occupancy in these areas. During the interim period, efforts should continue to find evidence of occupancy by reproducing females in these areas.

All other BMU's had a reasonable probability of seeing family groups and the standard of 6 years of cumulative reports should be applied to these 16 BMU's. The recovery criteria for these remaining 16 BMU's will be evidence of family groups within each running 6-year period.

Establish Reporting Procedures and Systems to Gather and Evaluate Information on Populations. (Y112)

All cooperating agency personnel should report females with cubs, and females with young, on the standard form as stated in the Guidelines (U.S. Forest Service 1986). Agency personnel should be assigned to and responsible for one or more BMU's to ensure consistency in the collection of reporting information. It should be the responsibility of such personnel to submit an annual report of the number of verified females with cubs for their respective BMU's to the appropriate reporting point by December 1 for compilation.

To eliminate duplicate reports, all sightings and track data should be reviewed by agency representatives at an annual meeting. Methods for eliminating duplicate reports should follow Knight and Blanchard (1993). A running 6-year average of unduplicated females with cubs will be calculated using the annual report data. All unduplicated females with cubs outside the recovery zone line but within 10 airline miles of the line shall be counted as part of the total number seen within the recovery zone.

Additionally, verified observations of females with young and verified evidence such as tracks should be plotted annually for a running 6-year cumulative total for determination of occupancy in all BMU's.

Determine Current Population Conditions. (Y12)

The present grizzly bear population in the YGBE is described by the following population characteristics (IGBST data):

Annual average unduplicated females with cubs (1987-1992 6-yr. avg.) (fig. 6)	19.8
Annual average known, human-caused female deaths (1987-1992 6-yr. avg.)	1.8
Annual average known human-caused deaths (1987-1992 6 yr. avg.)	4.0
Number BMU's w/family groups (1987-1992 running sum)	16 of 18
Plateau and Henry's Lake BMU's (1983-1992 running sum)	1 of 2

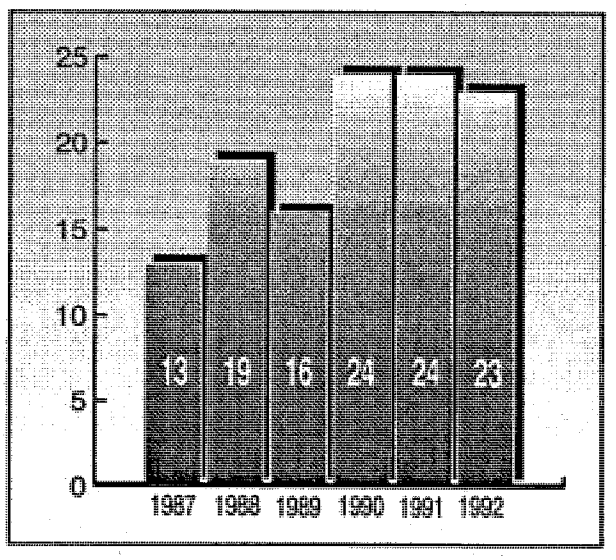


Figure 6.
Unduplicated females with cubs in the Yellowstone Ecosystem, 1987-1992. Average=19.8.

Identify the Human-related Population Limiting Factors if Present Populations Differ from Desired. (Y13)

Mortality from direct and indirect sources both within and surrounding the recovery zone must continue to be addressed if populations are to be recovered. Several programs are currently conducted by State wildlife agencies and through cooperative efforts of State and Federal agencies. These programs have been successful in managing mortality and should continue into the future.

Identify Sources of Direct Mortality. (Y131)

Sources of direct mortality include poaching, vandal killing, and malicious killing. Accidental killings are a result of mistaken identity by black bear hunters. Private citizen control by livestock operators, apiarists, outfitters, hunter defense of quarry, and resort operators for protection of property also results in direct mortality. Accidental deaths result from road kills (automobiles, trains, etc.) or handling error when bears are captured for management or research. Direct mortality also occurs during agency control of nuisance bears for livestock conflicts, other property damage, or life-threatening situations. Live removal of a grizzly to a zoo or another ecosystem as part of nuisance bear management is also considered a mortality because individual relocated bears are no longer part of the population. Mortality occasionally results from actions of private citizens for self-defense or defense of others.

Identify Sources of Indirect Mortality. (Y132)

Sources of indirect mortality are those actions that bring bears and people into conflict such as road use, land development, and recreation. These actions include, but are not limited to, road construction, livestock grazing operations, timber harvest mining, water development, and energy exploration/development, recreation, and human development of conflicting enterprises, (subdivisions, dog kennels, fish farms, pig farms, boneyards, garbage dumps, etc.).

Determine Effects of Human Activities on Bears and Bear Habitat, and Incorporate the Results into Management Plans and Decisions on Human Activities. (Y133)

Complete research to document the effects of activities such as timber harvest, road use, oil and gas exploration, and recreation on behavior, physiological condition, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities of grizzly bears. Revise the Guidelines as necessary as this information is obtained.

Redress Population Limiting Factors. (Y2)

Develop ways to minimize actions that limit populations within and surrounding the recovery zone. Continue State and cooperative interagency efforts to manage mortality.

Manage Sources of Direct Mortality. (Y21)

The recommended annual unmanaged human-induced grizzly bear mortality goal, within and surrounding the recovery zone, for expediting species recovery is zero. This mortality goal will not be achieved because some level of human-bear conflict is inevitable within the ecosystem. Reaching the recovery goal will be facilitated if all human-caused mortality within and outside the recovery zone does not exceed 4 percent of the population estimate based on the most recent 3-year sum of observations of females with cubs, and no more than 30 percent of this mortality limit is female. This level of human-caused mortality is below the theoretical tolerance limits of 6 percent human-caused

mortality that is sustainable in a grizzly population having the characteristics of those in the lower 48 States (see Y1. above).

Known, human-caused mortalities in excess of the level sustainable at a given number of unduplicated females with cubs could result in population decline, while mortalities below this level would likely result in population increase. As the grizzly population increases, the number of sustainable known human-induced mortalities also increases. The known number of females with cubs is used to calculate what is believed to be a minimum population estimate; therefore, the projected number of sustainable mortalities (less than 4 percent of this minimum population) is conservative.

Reduce Illegal Killing. (Y211)

Use all methods possible to minimize illegal kills.

Coordinate State, Federal, and Tribal Law Enforcement Efforts. (Y2111)

Provide a concerted law enforcement effort by designating a specially trained law enforcement team coordinated by the U.S. Fish and Wildlife Service to minimize the illegal kill of grizzly bears. One or more persons representing the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, States of Montana, Wyoming, and Idaho should be appointed. Each member should receive specialized training to work on illegal kills of grizzly bears. The team should be trained initially by the IGBST and other biologists in such matters as distribution, home ranges of identifiable bears, movements by season, mating habits, current location of radio-marked bears and other biological information that may be helpful to the team. Representatives from the U.S. Forest Service and Bureau of Land Management should be encouraged to attend in order to assist more ably in gathering field evidence.

All incidents of grizzly bear kills, suspected illegal activities, and rumors of kills should be communicated between the enforcement team, their respective agencies, and the IGBST on a daily basis or as often as is practical.

The Enforcement Team Leader should keep all members of the enforcement team and the IGBST informed, and should organize coordination meetings as needed. Special emphasis should be directed at covert operations that may be operating commercially.

The Enforcement Team should operate through an interstate, interagency agreement under the direction of the U.S. Fish & Wildlife Service.

It is imperative that the group leader establish a line of communication and rapport with all field personnel, field office staff, and local law enforcement agencies so that he/she may be notified immediately of a violation or threat of a violation.

Public assistance should be solicited in reporting suspected or known illegal kills. Persons furnishing information that leads to a finding of civil violation or a conviction of a criminal violation of 50 CFR 17.40 regarding grizzly bears, can be rewarded up to one half of the fine or civil penalty.

States having toll free numbers for reporting violations or for information should publicize their numbers as means of reporting grizzly problems and grizzly bear deaths.

Reduce Illegal Killing by Big Game Hunters and Mistaken Identity Killing by Black Bear Hunters. (Y2112)

The State conservation agencies should continue to make information about handling and storing game available to big game hunters, to reduce the likelihood of the carcass being claimed by a grizzly. Information should continue to be provided to all black bear hunters to assist them in distinguishing between black and grizzly bears. State agencies should issue special warnings to black bear hunters using areas frequented by grizzly bears. Black bear hunting regulations should be modified as appropriate to reduce or eliminate areas of significant conflicts or time periods of conflict. Special attention should be given to evaluate and eliminate as necessary bear baiting in recovery zones.

Investigate and Prosecute Illegal Killing of Grizzly Bears. (Y2113)

The special enforcement team should investigate accidental grizzly bear kills and recommend prosecution when appropriate.

Reduce Accidental Deaths. (Y2114)

Minimize those activities that result in attraction of bears to sites of conflict and management mistakes that might result in losses.

Increase Efforts to Clean up Carrion and Other Attractants in Association with Roads, Human Habitation, and Developed Areas within Recovery Zones. (Y21141)

All agencies should evaluate and improve warning signs along highways and roads in high-use grizzly bear areas. All agencies should increase efforts to clean up carrion and other attractants along highways and other routes within occupied grizzly bear range.

Reduce Losses Due to Mishandling of Bears During Research and Management Actions through Development of a Bear Handling Manual. (Y21142)

To reduce losses due to mishandling of bears, (e.g., an overdose of immobilizing drugs or improper handling), only experienced personnel certified by a sponsoring unit having the required permits and knowledge in the application of capture techniques, immobilizing drugs, transportation of drugged animals, and scientific data collection should handle grizzly bears. Only the safest, most effective drugs available should be used. A detailed manual for trapping, immobilizing, transporting, and handling grizzly bears has been prepared for use by all agencies as a training and reference manual.

Reduce Losses Due to Predator and Rodent Control. (Y21143)

Agencies responsible for licensing, conducting, or in any way overseeing predator or rodent damage control programs using toxic substances in occupied grizzly bear habitat should use the most selective (but effective) rodenticide available, and use it in lowest effective dosage. Poison bait should be used only under the onsite supervision of a certified applicator. Poisoning within grizzly bear habitat should be delayed as long as possible into July to minimize the potential for grizzly bears to consume poisoned rodents or bait.

Agency control on Federal lands should be in accordance with 50 CFR 17.40. For grizzly bears involved in livestock conflicts, animal damage control officers should follow the Guidelines and other interagency agreements.

Ensure that Control of Nuisance Bears is Accomplished According to 50 CFR 17.40 and the Guidelines. (Y21144)

All management control actions should be carried out according to the Guidelines. The only legal citizen control of a grizzly bear is that related to self-defense or defense of others. The law enforcement team should carefully investigate every case of grizzly bear mortality alleged to be self-defense or defense of others.

Reduce Losses by Developing and Implementing Public Education and Awareness Programs. (Y21145)

Accidental mortalities and nuisance bear mortalities are often the result of lack of information about the effects of human behavior on grizzly bears such as sanitation in residential areas and back-country areas as well as the behavior of back-country visitors. Agencies should cooperate in the development and implementation of public education programs.

Appoint a Grizzly Bear Mortality Coordinator. (Y212)

The U.S. Fish and Wildlife Service has appointed an employee of MDFWP as grizzly bear mortality coordinator to tabulate annual bear mortality for this ecosystem and ensure that all cooperating agencies and the public have current mortality data. The coordinator should maintain key contacts with all agencies and keep detailed records of all conditions surrounding each grizzly bear death. A standard form, meeting the needs of all agencies, should be prepared.

Identify and Reduce Sources of Indirect Mortality. (Y22)

Ongoing human actions in grizzly habitat contribute to bear-human conflicts that often result in bear deaths. Management of these activities in consideration of the needs of bears will reduce indirect mortality.

Make Domestic Livestock Grazing Compatible with Grizzly Bear Habitat Requirements. (Y221)

Encourage consideration of grizzly habitat needs regarding grazing on State and private lands. On Federal lands the Guidelines should be applied to make grazing operations compatible with grizzly bear spacial and seasonal habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines as a cooperative extension effort.

Make Timber Harvest and Road Building Compatible with Grizzly Bear Habitat Requirements. (Y222)

Strongly encourage consideration of grizzly habitat needs relating to timber harvest and road building on State and private lands. On Federal lands, the Guidelines should be applied, and road density guidelines should be phased in to make timber operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines as a cooperative extension effort.

Make Mining and Oil and Gas Exploration and Development Compatible with Grizzly Bear Habitat Requirements. (Y223)

Encourage consideration of grizzly habitat needs and road density guidelines relating to mining and oil and gas exploration on State and private lands. On Federal lands, the Guidelines should be applied and road density guidelines phased in to make mining and energy operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Recreation on Federal Lands Compatible with Grizzly Bear Habitat Needs. (Y224)

On Federal lands, the Guidelines should be applied and road density guidelines should be phased in to make recreation activities compatible with grizzly bear spacial and habitat requirements.

Coordinate with State and County Governments to Make Land Development and Land Use Decisions within the Recovery Zones Compatible with Grizzly Bear Habitat Needs. (Y225)

Land management agencies, State regulatory agencies, county commissioner, and county zoning boards should be encouraged to give consideration to the needs of grizzly bears in any actions requiring their approval. When homes, summer homes, cabins, camps, farm operations, etc., with attendant dog kennels, pig farms, garbage dumps, and livestock carcass disposal sites are allowed to invade the habitat occupied by grizzly bears, they will directly or indirectly effectively reduce the space and habitat necessary for the bears survival. For private lands not subject to the above restrictions, wildlife managers should give consideration to purchase, lease, or easement if habitat components are necessary to survival of the species.

Monitor the Cumulative Effects of Management Actions in Grizzly Bear Habitat. (Y226)

Determine the cumulative effects of all or any combination of the actions described above (Y221-Y225) that may adversely impact grizzly bears through application of the cumulative effects model on an ongoing basis. Past adverse impacts on the bears and their habitat must be a major consideration in the evaluation of any new action. New actions must be evaluated on a regional basis to avoid the cumulative effects of several well planned individual actions impacting bears from too many directions simultaneously. Historical records indicate that at some point in time, probably associated with the degree of stress, grizzly bears will no longer use certain portions of their former range; therefore, each new action has the potential of being "the last straw," from the standpoint of the bear, and every effort must be made to evaluate each new action with respect to former and future actions.

Coordinate, Monitor, and Report Activities Relating to Redressing Population Limiting Factors and Monitor Compliance with the Recovery Plan. (Y23)

This should be accomplished through the activities of the Coordinator and the management subcommittees of the IGBC. Actions should be taken by the management committees as necessary to address needs and to ensure implementation of the recovery plan and the application of the Guidelines.

Determine the Habitat and Space Required for the Achievement of the Grizzly Bear Population Goal. (Y3)

Careful definition of the recovery zones will allow agencies and the public to know where grizzly bears and grizzly habitat will be managed. Information on range and the biology of bears as well as the nature and quality of habitat is necessary to ensure that habitat is properly managed and that the habitat delineated has sufficient quality and quantity to support a viable population.

Define the Recovery Zone within which the Grizzly Bear will be Managed. (Y31)

The recovery zone for the Yellowstone ecosystem was delineated by members of the YGBE Management Subcommittee of the IGBC (fig. 5). The recovery zone was defined on the basis of the best available information on bear and bear habitat distribution and needs for a viable, well distributed population. Present boundaries will be defined as the YGBE and should be corrected and revised as new data become available.

Changes in the recovery zone lines can be made by a committee appointed by the ecosystem management subcommittee consisting of representatives of the State wildlife agency, the U.S. Fish and Wildlife Service, and the involved land management agencies. Additions to the recovery zone line require that a significant area of seasonally important habitat exist outside the existing recovery zone line that is used by grizzly bears that live primarily within the recovery zone. The area to be added must have significant value to the survival of the bears within the recovery zone. Changes in the recovery zone lines should be made using the best biological information available.

It is recognized that grizzly bears will occur outside the recovery zone lines and that the mere presence of bears outside the recovery zone line is not sufficient reason for changing the line. The area to be added must be of significant biological value to bears residing inside the line. These values must be demonstrated by habitat mapping and bear movement data. Any changes to the recovery zone line should be approved by the ecosystem management subcommittee and the IGBC and should be appended to the recovery plan. Changes in the line should be finalized and effective upon approval by the IGBC.

Identify Agency Management Stratifications within the Recovery Zone Including the Delineation of BMU's and Management Situations I, II, or III as Defined in the Guidelines. (Y32)

The BMU's should be defined on the basis of units suitable for application of the CEA. Management situations should be defined according to the Guidelines. Correct delineation of the management situation areas within the recovery zone as necessary as new information becomes available.

Conduct Research to Determine the Extent of Grizzly Bear Range. (Y33)

This research is ongoing by the IGBST and cooperating agencies.

Conduct Research to Determine Habitat Use, Food Habits, Home Range Size, and Seasonal Habitat Preference, and Incorporate into Habitat Management Programs. (Y34)

These data should be used to ensure that habitat values are available within the grizzly bear recovery zone and that ongoing management actions do not significantly degrade these habitat values. Information on behavior, physiological condition, population distribution, density, food habits, home

range, reproduction, survivorship, and denning activities has been gathered since 1975 by the IGBST, and prior to that time by the Craighead research team. These data are presented in peer-reviewed journals and in the annual reports of the IGBST. Additional research is carried out by State, private, and university cooperators.

It is crucial that this information on the grizzly bears' biological requirements be correlated with habitat conditions. Of particular relevance are habitat factors relating to ecosystem dynamics that may limit the range or food availability of bears. These factors can include climate change, fire effects, and plant phenology, habitat availability changes, and growth patterns of major food species. These factors are particularly important in the YGBE because the grizzly population there is an island population. The immediate effects of habitat dynamics may be more severe than in populations that are contiguous with larger areas of habitat. Detailed information on these factors should be gathered as soon as possible and annual recording of patterns should be initiated in order to recognize habitat dynamics changes as they might occur. This research and habitat evaluation should be undertaken by the IGBST and cooperating agencies. Results should be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so. One area of special concern is the effect of fire management in grizzly bear habitat. Natural fires can improve grizzly bear habitat by increasing the quality and quantity of food sources. Fire suppression can reduce food availability and reduce habitat quality.

Conduct Research to Determine the Relationship Between Habitat Values, Physiological Condition of Bears, and the Ability of the Habitat to Sustain a Population Density Necessary to Achieve Viable Population Size. (Y35)

Information on physiological condition of grizzly bears has been gathered since 1975 by the IGBST, and prior to that time by the Craighead research team. These data are presented in referenced journals and in the annual reports of the IGBST. Additional research is carried out by State, private, and university cooperators. This research and habitat evaluation should be undertaken by the IGBST and cooperating agencies. Results should be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research to Determine the Effects of Various Road Densities on Grizzly Bear Habitat Use and Human-caused Bear Mortality. (Y36)

This research is being conducted by cooperating agencies. Results should be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research on the Effects of Habitat Fragmentation Caused by Human Activities, such as Modification of Cover Type, Road Building, and Human Residences, in order to Assess the Possibility of Linkage between Grizzly Bear Ecosystems and between Habitat Tracts within Ecosystems. (Y37)

This research is being conducted by the U.S. Fish and Wildlife Service in cooperation with various Federal and State land management agencies, local governments, and the public. Results may be useful to developing long-term cooperative land management planning to include both public and private sectors.

Evaluate the Applicability of Population Viability Analyses (PVA) to Grizzly Bear Recovery. (Y38)

The PVA are based on theoretical biological models of a species reproduction, survival, and genetic interchange and stability through time. The PVA studies have been utilized sometimes in identifying possible population numbers that may contribute to long-term species survival. The applicability of a PVA study to grizzly bear recovery should be evaluated.

Monitor Populations and Habitats. (Y4)

Population monitoring is necessary to determinate the status of the population and to assess the success of conservation efforts associated with recovery. An increasing population validates ongoing management efforts, while a decreasing population indicates a failure to address problems facing the population.

Monitor Populations Before, During, and After Recovery. (Y41)

Develop and apply techniques to ensure the population is carefully monitored.

Develop and Conduct an Intensive Monitoring System to Measure the Annual Number of Females with Cubs, Family Groups, and Number of Human-caused Mortalities. (Y411)

The method is detailed in Y11 and Y111.

Develop a System of Responsibilities to Collate, Analyze, and Report Annual Information on Population Data. (Y412)

The system is detailed in Y112.

Standardize Observation Report Forms and Methods, and Develop Training Methods for all Persons Involved in Reporting Sightings of Females with Cubs and Family Groups. (Y413)

Reporting system detailed in Y112. Training methods should involve identification materials to enable all individuals involved to be able to identify the bear species seen or to be able to report unknown species. Training methods should be distributed to all agency reporting personnel and should be formally presented in training sessions to seasonal and staff personnel at the beginning of each year in order to ensure quality observation data.

Monitor Relocated Bears in Order to Assess the Success of Nuisance Bear Management. (Y414)

Efforts to monitor relocated bears should continue in the YGBE.

Monitor Habitats Before, During, and After Recovery. (Y42)

Develop and apply techniques to ensure the habitat is carefully monitored.

Develop and Apply the CEA Process to Allow Monitoring of Effects of Management Actions over a Large Geographic Area of Habitat. (Y421)

The CEA should be completed, thoroughly evaluated, and refined. If applicable, it can be applied to assist in judging the suitability of ongoing management actions. Development of CEA requires five phases: (1) data base compilation, (2) software development, (3) testing/validation, (4) development of mortality submodel, and (5) development of thresholds. Biologists' interpretation of data and output should be a continual part of the CEA. The CEA is currently at the testing/

validation stage where data bases are complete. Results of CEA testing and validation in the YGBE will facilitate its use in other grizzly bear ecosystems.

Complete Habitat Mapping of the Recovery Zone and Digitize these Data so they are Available for use by the CEA. (Y422)

Habitat mapping should be standardized and completed in a format compatible with the CEA. Updating of these habitat maps should be programmed every 5 years, or as necessary.

Establish a Threshold of Minimal Habitat Values to be Maintained within each CEA Analysis Unit in order to Ensure that Sufficient Habitat is Available to Support a Viable Population. (Y423)

The threshold value or series of values are the benchmarks used in conjunction with the CEA to judge that ongoing actions in grizzly habitat have not degraded the value and/or availability of the habitat to bears. The objective of determining thresholds is not to establish and maintain minimal values, but to establish a measure of the level of ongoing change in the habitat. Management should attempt to manage habitat above threshold values. Maintenance of habitat values above the threshold values allows greater environmental flexibility for bears and will benefit recovery.

Threshold values are unknown at this time. Development of the threshold values should be based on the best available biological data on the habitat needs and biology of the grizzly bear. Such values should be based on the assumption that environmental diversity is necessary for bear survival, especially in years of food shortage due to environmental conditions (i.e., years of berry crop failure or pinenut crop failure).

Apply CEA to Each BMU to Ensure Habitat Quality is Sufficient for Maintenance of a Viable Population and to Monitor Changes in Habitat as a Result of Human Activity. (Y424)

As CEA becomes applicable in the YGBE, it should be applied every 5 years to each BMU to monitor changes in habitat quality and availability as a result of human activities and natural processes such as fire and plant succession. Deviations below the desired threshold level will require reanalysis of human activities in the BMU to ensure reattainment of the threshold level. Primary responsibility for CEA application lies with the ecosystem data base coordinator.

Report Activities Successfully Used to Manage Habitat. (Y425)

This should be completed as part of the ongoing business of the management agencies, the YGBE Management Subcommittee, and the Recovery Coordinator.

Develop a Conservation Strategy to Outline Habitat and Population Monitoring that will Continue in Force after Recovery. (Y426)

Development of a conservation strategy is underway for the YGBE. This conservation strategy should detail the habitat and population monitoring structures in the YGBE that will be in place after removal of the species from the threatened species list. The conservation strategy should ensure that proper habitat and population monitoring will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy should be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Manage Populations and Habitat. (Y5)

Apply the best management techniques to ensure recovered populations.

Manage Populations and Habitats Prior to Recovery on Federal Lands. (Y51)

Refine Procedures for Relocating or Aversively Conditioning Nuisance Grizzly Bears. (Y511)

Develop and coordinate procedures to expedite the relocation of nuisance bears and review and update interagency agreements. Relocate bears within 24 hours and continue search for new release areas. Research and develop methods to deal with problem bears and test and develop aversive conditioning of bears, if possible. Evaluate the effects of relocated nuisance bears on resident bears in relocation areas. Refine the Guidelines as necessary.

Develop and Test Procedures to Relocate Bears between Areas for Demographic or Genetic Purposes. (Y512)

Develop and coordinate interagency agreements and procedures for the introduction of one grizzly bear into the breeding population in the Yellowstone area every 10 years for maintenance of genetic diversity. This procedure is a proactive strategy to minimize the possibility of loss of genetic diversity in this ecosystem. The time interval of every 10 years is based on computer simulations that indicate that adding one bear every generation (10 years for grizzly bears) to the breeding population of the YGBE will limit the loss of genetic diversity. However, more than one bear may need to be transplanted every 10 years. Using nuisance bears for this purpose should not be permitted. Ecosystems with larger populations that are not isolated breeding units should be sources of suitable bears. Responsibility for this effort lies with the Coordinator and the IGBST in cooperation with cooperating State and Federal agencies and universities.

Apply Interagency Grizzly Bear Management Guidelines Prior to Recovery that Maintain or Enhance Habitats. (Y513)

By applying the Guidelines, agencies should ensure that land use activities are conducted in a manner that is compatible with grizzly bear requirements for space and habitat and that minimizes the potential for human/bear conflicts. Ensure that road density guidelines are phased within grizzly bear habitat.

Manage Populations and Habitats on Private and State Lands. (Y52)

Develop and apply management guidelines prior to recovery that maintain or enhance habitats. Recommend land use activities compatible with grizzly bear requirements for space and habitat; minimize potential for human/bear conflicts. Implement cooperative efforts with State lands agencies and private landowners to incorporate standards similar to the Guidelines and road density guidelines in order to ensure that management actions will be sensitive to grizzly bear habitat needs. Cooperative efforts between county, State, and Federal land management agencies will facilitate this.

Develop and Implement a Conservation Strategy for each Ecosystem that Outlines all Habitat and Population Regulatory Mechanisms in Force after Recovery. (Y53)

Demonstrate the existence of adequate regulatory mechanisms after recovery. Provide guidelines for the continuation of habitat and population management upon recovery of the grizzly bear population in the ecosystem through the creation of a YGBE Conservation Strategy. This strategy presently is being developed for the YGBE. This conservation strategy should detail the habitat and population management structures in the YGBE that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population management will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy should be finalized and signed by all agencies prior to consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Develop and Initiate Appropriate Information and Education Programs. (Y6)

Managing human-induced mortalities is a major factor in effecting the recovery of the grizzly bear. Therefore, it is crucial to the recovery effort that the public understand reasons for actions in order to generate favorable or tolerant attitudes toward the bear. The IGBC has appointed an information and education (I&E) subcommittee to develop education programs and disseminate information. Private conservation organizations interested in the recovery of grizzly bears could be of assistance by including appropriate information in their publications and news releases.

Evaluate Public Attitudes toward Grizzly Bear Management, Habitat Protection and Maintenance, Land Use Restrictions, Mitigating Measures, Relocation of Bears, Hunting, Nuisance Bear Control Actions, and Habitat Acquisition or Easement. (Y61)

Public attitudes are a major part of the success or failure of grizzly bear recovery efforts. Understanding of these attitudes and the basis for public sentiment is important. Carefully designed research surveys by qualified scientists experienced in such sampling should be initiated. The management subcommittee members should formulate the basic questions and attitudes of interest. The data will be useful in designing public outreach programs to foster public support for recovery programs.

Formulate Ways to Improve Public Attitudes about Grizzly Bears and the Grizzly Bear Recovery Program. (Y62)

Agencies should use the data on public attitudes to formulate public relations and I&E programs through the respective I&E offices of each agency and the I&E subcommittee of the IGBC. Agencies having the authority and responsibility for grizzly bear control actions should institute and carry out I&E programs to inform citizens having problems with grizzly bears of the appropriate procedures and contacts for assistance.

Implement the Recovery Plan through Appointment of a Recovery Coordinator. (Y7)

The Service has appointed a Recovery Coordinator to collate all relevant information on grizzly bears and to coordinate and stimulate compliance and action to implement the recovery plan. The Coordinator should submit progress reports and conduct workshops and meetings as necessary. This position provides a central focus for the accumulation, exchange, and dissemination of information, and a central point for multi-agency coordination that should aid in the judicious use of resources and materially enhance the recovery effort.

Revise Appropriate Federal and State Regulations to Reflect Current Situations and Initiate International Cooperation. (Y8)

Ensure consistent, up-to-date regulations and maintain international cooperation and communication with all other countries where brown bears are being managed.

Revise Federal and State Regulations as Necessary. (Y81)

Federal and State regulations should be periodically revised to ensure regulatory adequacy. The Coordinator should initiate revision of Federal regulations through the *Federal Register* and Code of Federal Regulations (CFR). Federal regulations that may need periodic revision include special rules codified in the CFR and national forest and national park regulations, such as those regarding sanitation. The Coordinator should also assist States in regulation revisions as necessary. State regulations that may need periodic revision include regulations on the taking of bears and management of hunting. Hunting of grizzly bears should be evaluated as a management tool to relieve population pressures where such pressures are demonstrated.

Coordinate and Exchange Information and Expertise with Canada and other Countries Concerning Bear Research and Management. (Y82)

This will increase information exchange of state-of-the-art bear research and management, will promote international cooperation, and improve management and recovery efforts. All IGBC member agencies and the Coordinator should exchange information and expertise with Canada and other countries managing bears concerning recovery activities. This exchange will promote international cooperation and improve management and recovery efforts. International cooperation is important to the success of the grizzly bear recovery effort.

International communication on bears and bear management is necessary to the success of the recovery effort. Many of the management problems and considerations facing the threatened grizzly bears in the United States, such as insular populations, small population size, conflicts with timber harvest and livestock grazing, genetic concerns relating to small population size, movement of bears from one area to another, management of hunting, and public attitudes, are also facing many of the other species of bears in Europe and Asia. Sharing of information on management approaches and techniques will facilitate recovery in the United States as well as assisting managers and researchers in other countries. The Recovery Coordinator should facilitate cooperation and international communication and provide information gained to managers and researchers as necessary.

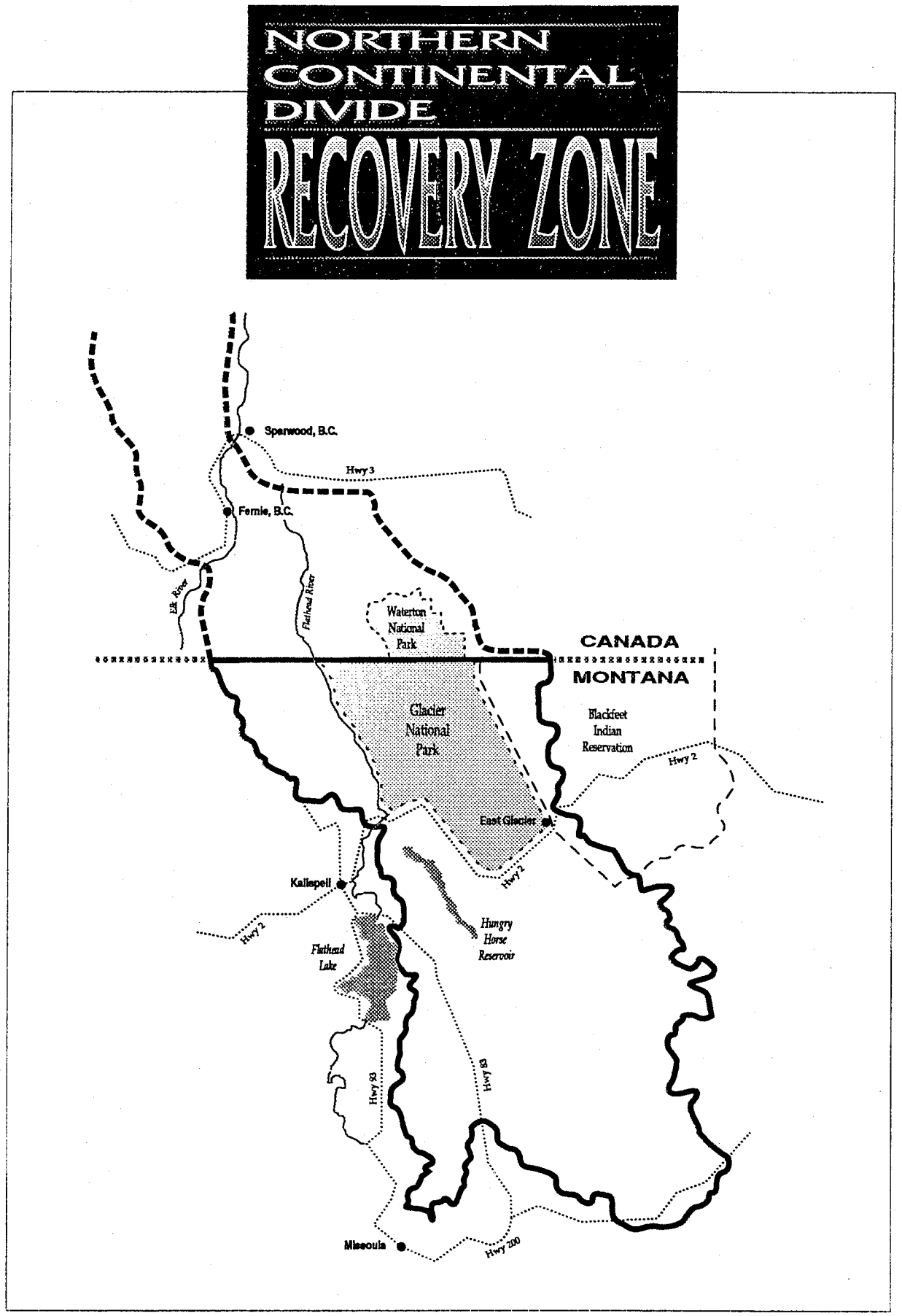

NORTHERN
CONTINENTAL
DIVIDE
RECOVERY ZONE
Sparwood, B.C.
Hwy 3
Fernie, B.C.
Elk River
Flathead River
Waterton National Park
CANADA
MONTANA
Glacier National Park
Blackfeet Indian Reservation
Hwy 2
East Glacier
Kalispell
Hwy 2
Hungry Horse Reservoir
Flathead Lake
Hwy 93
Hwy 83
Missoula
Hwy 200

Figure 7.

Northern Continental Divide Grizzly Bear Recovery Zone

Subgoal: For the Northern Continental Divide Grizzly Bear Recovery Zone (NCDE), 10 females with cubs inside Glacier National Park (GNP) and 12 females with cubs outside GNP over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada; 21 of 23 BMU's occupied by females with young from a running 6-year sum of observations with no two adjacent BMU's unoccupied; and known, human-caused mortality not to exceed 4 percent of the population estimates based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Furthermore, recovery in the NCDE cannot be achieved without occupancy in the Mission Mountains portion of this ecosystem.

Establish the Population Objective for Recovery and Identify Limiting Factors. (N1)

The population objective for the NCDE was based on data accumulated since 1975 on food habits, distribution, bear/human conflicts, home range, and density. Consideration of limiting factors included information on annual fluctuation in food sources, adult female survivorship, levels of human-induced mortality, and ongoing conflicts in the ecosystem, as well as demographic concerns. The goals detailed in this chapter are based on the best available scientific information on the population, and are believed necessary for the population to be viable and self-sustaining in this ecosystem. These goals will be revised as necessary or as new information becomes available.

Recovery targets for the NCDE grizzly bear recovery zone were developed using the following assumptions and data:

(1) Recovery of the NCDE population depends upon verification that the population meets the criteria for a recovered population. A recovered population is defined as one that (a) can sustain the existing level of known and unknown, unreported, human-caused mortality that exists in the NCDE, and (b) is well distributed throughout the recovery zone in the NCDE.

(2) The target for the minimum number of unduplicated females with cubs on a running 6-year average is 12 outside of GNP and 10 inside the GNP. Verified evidence of females with cubs within the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada, will be included. Both targets must be attained to meet recovery objectives. The following facts and assumptions about the grizzly bear population in the NCDE were used to determine the targets:

   (a) A running 6-year average of unduplicated females with cubs is based on a 3-year reproductive cycle and will allow at least 2 years when each adult female alive can be reported with cubs. A running 6-year tally will stabilize the average and make it less sensitive to changes in annual reporting levels and sightability.

   (b) On average, 33 percent of adult (at least 5 years old) females will be with cubs each year. This is based on an average 3-year reproductive interval for adult females. The 6-year average number of females with cubs can be multiplied by three to estimate the minimum number of adult females in the population.

(c) The reporting efficiency for females with cubs is 60 percent. Thus, of all females with cubs in the NCDE in a given year, on average 60 percent will be detected/seen and reported (based on average reporting of females on the Rocky Mountain Front, Montana, Aune and Kasworm 1989). This is a conservative estimate of females with cubs. Because of the forested nature of much of the NCDE, the reporting efficiency is most likely lower than 60 percent. Therefore, the calculated minimum number of females with cubs will underestimate the actual number. This process is designed to err on the side of the bear.

(d) The grizzly population in the NCDE is assumed to be 50 percent adults and 50 percent subadults (Grizzly Bear Compendium, 1987, pp. 47-59).

(e) The sex ratio of both adults and subadults is assumed to be 1:1 (Grizzly Bear Compendium, 1987, pp. 47-59).

(f) The proportion of adult females in the population is similar to that in the Yellowstone area at approximately 28.40 percent (Knight et al. 1988, Appendix C, and Knight et al. 1993, Appendix D).

The target of 12 unduplicated females with cubs outside GNP is sufficient to indicate a minimum population of at least 211 bears (using method of Knight et al. 1988) although it is recognized that bears do move between GNP and the rest of the NCDE:

12 females with cubs seen divided by 0.6 (sightability correction factor) = 20 total females with cubs; 20 x 3 = 60 adult females outside GNP; 60 divided by 0.2840 (the assumed proportion of adult females in population) = a minimum of 211 grizzly bears outside GNP.

The target of 10 unduplicated females with cubs inside GNP indicates that the population in GNP contains at least 180 bears:

10 females with cubs seen divided by 0.6 (sightability correction factor) = 17 total females with cubs; 17 x 3 = 51 adult females in GNP; and 51 divided by 0.2840 (assumed proportion of adult females in population) = a minimum of 180 grizzly bears inside GNP.

The combined targets of unduplicated females with cubs in the NCDE both inside and outside GNP would indicate a minimum population of at least 391 grizzlies:

211 + 180 = 391 grizzly bears

(3) Human-caused grizzly mortalities will continue at some long-term rate due to inevitable interactions between bears and people throughout the 9,600 mi^2 (24,864 km^2) ecosystem. These mortality levels are not likely to decline significantly and will probably increase as the population increases and bear-human interactions increase.

Annual human-caused grizzly bear mortality varies (Dood et al. 1986, Dood and Pac 1988, Pac and Dood 1989, 1992). However, the average annual nonhunting mortality has remained almost constant since 1975, indicating that these kills are not likely to decline from present levels despite further intensive management.

(4) Unknown, unreported, human-caused mortality occurs each year at some level.

(5) Known, human-caused, nonhunting mortality for grizzly bears in the NCDE averaged nine bears per year from 1987-1992 (Dood et al. 1986, Dood and Pac 1988, Pac and Dood 1989, 1992, GNP, unpubl. data). Total human-caused mortality averaged 11 bears per year. Most human-caused mortality occurs outside GNP (Dood et al. 1986, Dood and Pac 1988, Pac and Dood 1989, 1992). The average number of human-caused mortalities inside GNP was 0.56 per year from 1974 to 1991 (GNP, unpublished data). The following table summarizes all known, human-caused, grizzly mortalities, including hunting, during the past 6 years:

Year	Known Human-Caused Mortality		
	All bears	All females	Adult females
1987	15	9	
1988	5	1	
1989	14	4	
1990	12	5	2
1991	9	7	0
1992	13	8	3
TOTAL	68	34	5 (3 Year Sum)
6-Year Average	11 /YEAR	6 /YEAR	

In 1986, grizzly bear hunting quotas for the NCDE were revised to reflect a more conservative management program. In 1991, grizzly bear hunting was suspended. Hunting mortality averaged 2.5 grizzlies annually from 1986 to 1991:

Date	Hunting Kills	Non-Hunting Kills
1975-1985	10.2/yr	8.4/yr
1986-1991	2.5/yr	8.5/yr

(6) There is a relationship between the sustainable human-caused mortality level, recruitment of animals into the population, and the number of unduplicated females with cubs. Therefore, the estimate of number of females with cubs is important to managing mortality.

(7) Calculation of an annual mortality limit is based on the more conservative number of adult females known to be alive for the past 3 years. The following NCDE minimum population estimate for 1992 is calculated using the assumptions listed above (items 2c-2f) and methods from Knight et al. (1988, Appendix C):

The latest *minimum* number of known adult females in the NCDE is the sum of the number of unduplicated females with cubs seen both outside and within GNP during 1990-1992: 14 + 21 + 22 = 57, minus 5 adult female mortalities known to have occurred during this 3-year period, yielding 52 adult females alive as of January 1992. This number can then be divided by the 60 percent sightability factor to equal a minimum number of 87 adult females alive in the population as of fall of 1992.

This number can be used to estimate the minimum population size for 1993 using the method from Knight et al. (1988, Appendix C):

$$\text{Total population} = \frac{\text{87 adult females present}}{\text{proportion adult females in population}}$$

$$\text{The minimum calculated population is } \frac{87}{.2840} = 306 \text{ grizzly bears}$$

(8) The maximum human-caused mortality level that can be sustained without population decline by a grizzly bear population with the above-assumed characteristics is 6 percent when no more than 30 percent of these mortalities are females (Harris 1984).

(9) The present minimum population estimate is 306 bears (item 7 above) that could sustain a maximum human-caused mortality level of 6 percent or:

306 x 0.06 = 18 human-caused bear mortalities

(10) In order to facilitate recovery of the population, and to allow for both error in minimum population estimates and for unknown unreported mortality, the maximum known human-caused mortality limit for the NCDE population is set at 4 percent of the population estimate based on most recent 3-year sum of females with cubs. No more than 30 percent of this mortality limit may be females. The actual known human-caused mortality limit will be set each year by calculating the minimum population estimate for the year and setting the limit for that year at 4 percent of this average.

The lead for completion of these annual calculations shall be the Coordinator of the U.S. Fish and Wildlife Service working in cooperation with other agencies. Management should seek to ensure that known, human-caused mortality does not exceed this limit. In order to account for changes in population size, the mortality limit will be calculated annually using the most recent 3-year sum of females with cubs as described in item 7 (above). This mortality level is conservative because

(a) it is applied to a minimum population estimate that is based on the number of females with cubs seen in the NCDE, corrected by a conservative sightability factor (as detailed N1). It is recognized that the actual population size is higher than the minimum estimate; and

(b) according to Harris (1985), a grizzly bear population can sustain 6 percent human-caused mortality without experiencing a decline in that population.

For the present NCDE population estimate within and outside GNP of 306 bears, a 4 percent limit of known human-caused mortality is equivalent to:

306 x 0.04 = 12 total known human-caused bear mortalities, or
12 x 0.30 = 4 known human-caused female bear mortalities.

(11) The 4 percent known, human-caused mortality limit for 1993 is 12 bears (see item 10). The current 6-year average, annual, known, human-caused mortality is 11 bears (see item 5), or 3.8 percent of the present minimum population estimate of 289 bears. This is below the limit of 4 percent.

The known, human-caused female mortality limit for 1993 is 30 percent of 12, or 4 bears (see item 10). As of 1993, the 6-year average known, human-caused female mortality is 6 (see item 5). This is 50 percent of the limit of 12 known mortalities and therefore exceeds the female mortality limit of 30 percent.

Total human-caused grizzly mortality in the NCDE appears to be at or very near sustainable levels as of 1993, however female grizzly mortality exceeds the mortality limits. These figures are based on conservative population and mortality rate estimates.

Determine Population Conditions at which the Species is Viable and Self-sustaining. (N11)

Reevaluate and refine population criteria as new information becomes available. The grizzly bear population in the Northern Continental Divide Grizzly Bear Recovery Zone will be viable when monitoring efforts indicate that recruitment and mortality are at levels supporting a stable to increasing population, and reproducing females are distributed throughout the recovery zone. The population will be judged as meeting recovery population requirements when, as determined through systematic monitoring throughout the recovery zone, it meets each of the following criteria:

(a) The number of unduplicated females with cubs is a minimum of 12 outside GNP and a minimum of 10 inside GNP annually on a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada.

(b) The distribution of family groups of grizzly bears represented by female grizzly bears accompanied by cubs or yearlings or 2-year olds is reported in 21 of the 23 BMU's on a running 6-year sum of observations. This is equivalent to verified evidence of at least one female grizzly bear with young within 21 of 23 BMU's over a 6-year period. Furthermore, no two adjacent BMU's can be unoccupied over a 6-year period. Recovery for the NCDE population cannot be achieved without occupancy within the Mission Mountains portion of this ecosystem. The Rattlesnake BMU should undergo an analysis of its habitat potential for occupancy by females with young. This study should be done as soon as possible.

(c) The known human-caused mortality level does not exceed 4 percent of the average of the previous 3 years minimum population estimate based on the unduplicated number of females with cubs minus known, adult female deaths (see N1.). In addition, the known, human-caused female mortality shall be no more than 30 percent of the total known mortality limit.

Other parameters may be monitored to evaluate the status of the NCDE population; however, the primary parameters that will be used to judge the status of the population for achievement of recovery and delisting will be the three parameters detailed above: unduplicated females with cubs, distribution of females with young, and annual known human-caused mortality.

Determine Population Monitoring Methods and Criteria. (N111)

The maintenance of a secure and robust grizzly bear population will require careful, continuous monitoring. This monitoring should provide data to reasonably ensure that the population is secure. The greater the number of parameters monitored, the greater the assurance that the information is representative of the status of the population.

With this in mind, a system has been developed to monitor a wide range of parameters, with three being of primary importance. These include: unduplicated number of females with cubs seen annually, the distribution of females with young throughout the ecosystem, and the annual

number of known human-caused mortalities. Other factors also should be monitored to increase the confidence in the information, but these three parameters will be the key criteria used to judge the status of the population.

The target of distribution by females with young is designed to demonstrate adequate dispersion of the reproductive cohort within the recovery zone. Distribution of reproducing females also will provide evidence of adequate habitat management assuming that successful reproduction is an indicator of habitat sufficiency. Lastly, adequate distribution of family groups indicates future occupancy of these areas because grizzly bear offspring, after weaning, and especially female offspring, tend to occupy habitat within or near the home range of their mother.

Establish Reporting Procedures and Systems to Gather and Evaluate Information on Populations. (N112)

All cooperating agency personnel should report females with cubs and females with young on the standard form as stated in the Guidelines (U.S. Forest Service 1986). Agency personnel should be assigned to and responsible for one or more BMU's to ensure consistency in collection of reporting information. It should be the responsibility of such personnel to report the annual number of valid, verified females with cubs for their respective BMU's to the appropriate reporting point by December 1 each year for compilation.

To eliminate duplicate reports, all sightings and track data should be reviewed by agency representatives at an annual meeting. Methods to eliminate duplicate reports should follow Knight and Blanchard (1993). A running 6-year average of unduplicated females with cubs should be calculated using the annual report data. All unduplicated females with cubs within the United States outside the recovery zone line but within 10 airline miles of the line shall be counted as part of the total number seen within the recovery zone during that year. Additionally, observations of females with young should be plotted annually for a running 6-year cumulative total for determination of occupancy.

Determine current population conditions. (N12)

The present grizzly bear population in the Northern Continental Divide Grizzly Bear Ecosystem, is described by the following population characteristics:

Annual average unduplicated females w/cubs (1987-1992, 6 yr. avg.) (fig. 8)	
Inside GNP	11.3
Outside GNP	13.3
Annual average known, human-caused female deaths (1987-1992 6 yr. avg.)	5.7
Annual average known, human-caused deaths (1987-1992 6 yr. avg., M + F) (fig. 9)	11.3
Number of BMUs w/family groups (1987-1992 running sum)	21 of 23

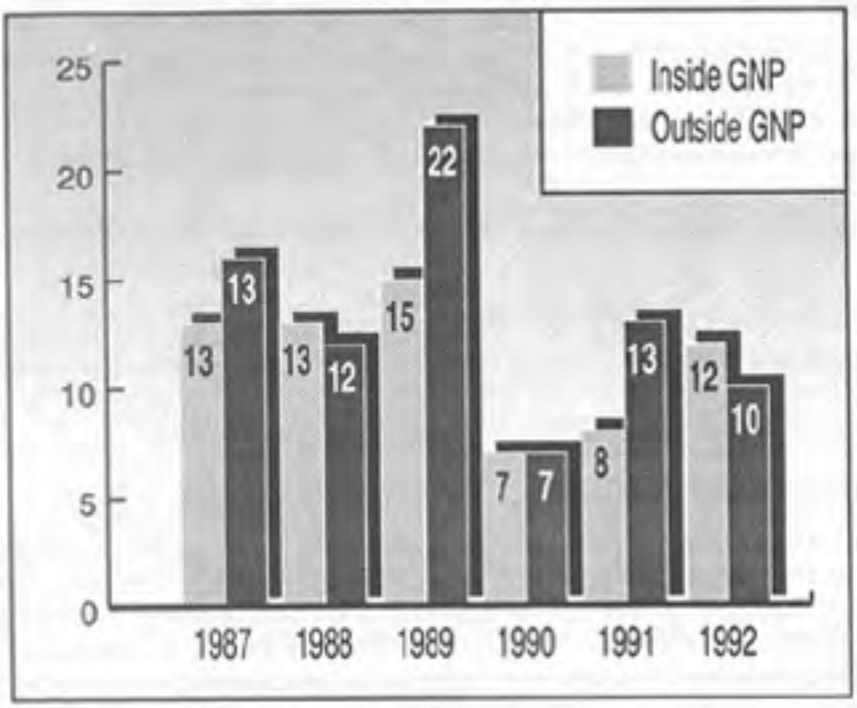


Figure 8.
Unduplicated females with cubs in the NCDE, 1987-1992. Average=11.3 inside GNP; 12 outside GNP.

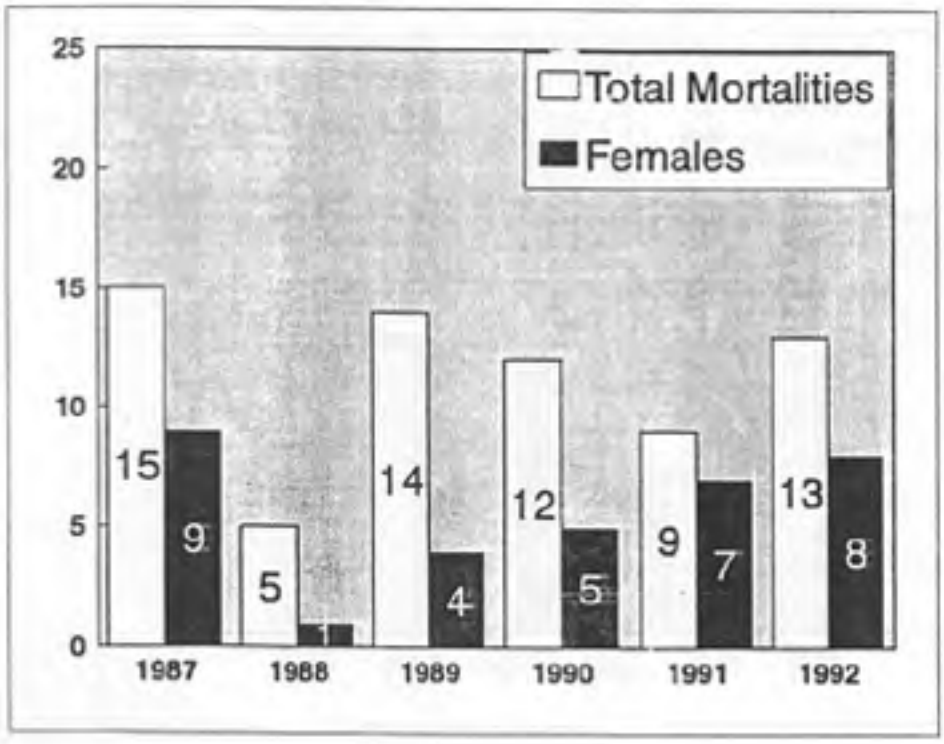


Figure 9.
Known Human-caused mortalities in the NCDE. Average 1987 to 1992=11.3. Includes legal hunt mortalities during 1987-1991.

Gather Information on Behavior, Physiological Condition, Population Distribution, Density, Food Habits, Home Range, Reproduction, Survivorship, and Denning Activities. (N121)

This information has been gathered since 1975 by researchers from the Montana Department of Fish, Wildlife, and Parks, the U.S. Fish and Wildlife Service, National Park Service, BLM, BIA, Tribal authorities, the U.S. Forest Service, British Columbia Wildlife Branch, and university researchers. These data are presented in refereed journals and in annual project reports.

Identify the Human-related Population Limiting Factors if Present Populations Differ from Desired. (N13)

Mortality from direct and indirect sources both within and outside the recovery zone must continue to be addressed if populations are to be recovered. Several programs are currently conducted by the MDFWP and through cooperative efforts of State and Federal agencies. These programs have been successful in managing regulated mortality and in limiting unregulated mortality.

Identify Sources of Direct Mortality. (N131)

Identified sources of direct mortality include poaching, killing by vandals, and malicious killing. Accidental killings are a result of mistaken identity by black bear hunters. Control by livestock operators, apiarists, outfitters, hunter defense of quarry, and resort operators for protection of property also results in direct mortality. Accidental deaths result from road kills (automobiles, trains, etc.) or handling error when bears are captured for management or research. Direct mortality also occurs during agency control of nuisance bears for livestock conflicts, other property damage, or life-threatening situations. Live removal of a grizzly to a zoo or another ecosystem as part of nuisance bear management is also considered a mortality because individual relocated bears are no longer part of the population. Mortality occasionally results from actions of private citizens for self-defense or defense of others.

Identify Sources of Indirect Mortality. (N132)

Identified sources of indirect mortality are those actions that bring bears and people into conflict such as road use, land development, and recreation. These actions include but are not limited to road construction, livestock grazing operations, timber harvest, mining, water development, and energy exploration/development, recreation, and human development of conflicting enterprises, (subdivisions, dog kennels, fish farms, pig farms, boneyards, garbage dumps, etc.).

Determine Effects of Human Activities on Bears and Bear Habitat and Incorporate the Results into Management Plans and Decisions on Human Activities. (N133)

Complete research to document the effects of activities such as timber harvest, road use, oil and gas exploration, and recreation on behavior, physiological condition, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities. Revise the Guidelines as necessary as this information is obtained.

Redress Population Limiting Factors. (N2)

Develop ways to minimize actions that limit populations. Continue State and cooperative interagency programs currently being conducted to manage mortality.

Manage Sources of Direct Mortality. (N21)

The recommended annual unmanaged human-induced grizzly bear mortality goal, within and surrounding the recovery zone, for expediting species recovery is zero. This mortality goal will not be achieved because some level of human-bear conflict is inevitable in the ecosystem. Reaching recovery goals will be facilitated if all human-caused mortality within and outside the recovery zone does not exceed 4 percent of the estimated population based on the most recent 3-year sum of females with cubs, and no more than 30 percent of the mortality limit is female (see N1 above).

Known, human-caused mortalities in excess of the level sustainable at a given number of unduplicated females with cubs could result in population decline, while mortalities below this level would likely result in population increase. As the grizzly population increases, the number of sustainable known, human-induced mortalities also increases. The known number of females with cubs is used to calculate what is believed to be a minimum population estimate; therefore, the projected number of sustainable mortalities (less than 4 percent of this minimum population) is conservative.

Reduce Illegal Killing. (N211)

Use all methods possible to minimize illegal mortality.

Coordinate State, Federal, and Tribal Law Enforcement Efforts. (N2111)

Provide a concerted law enforcement effort by designating a specially trained law enforcement team coordinated by the U.S. Fish and Wildlife Service to minimize the illegal kill of grizzly bears. One or more persons representing the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and the State of Montana should be appointed. Each member should receive specialized training to work on illegal kills of grizzly bears. The team should be trained by biologists in such matters as distribution, home ranges of identifiable bears, movements by season, mating habits, current location of radio-marked bears, and other biological information that may be helpful to the team. Representatives from the U.S. Forest Service and Bureau of Land Management should be encouraged to attend in order to assist more ably in gathering field evidence.

All incidents of grizzly bear kills, suspected illegal activities, and rumors of kills should be communicated between the enforcement team and their respective agencies on a daily basis or as often as is practical.

The Enforcement Team Leader should keep all members of the enforcement team informed and should organize coordination meetings as needed. Special emphasis should be directed at covert operations that may be operating commercially.

The Enforcement Team should operate through an interstate, interagency agreement under the direction of the U.S. Fish & Wildlife Service.

It is imperative that the team leader establish a line of communication and rapport with all field personnel, field office staff, and local law enforcement agencies so he/she may be notified immediately on a violation or threat of a violation.

Public assistance should be solicited in reporting suspected or known illegal kills. Persons furnishing information that leads to a finding of civil violation or a conviction of a criminal violation of 50 CFR 17.40 regarding grizzly bears, can be rewarded up to one half of the fine or civil penalty.

States having toll-free numbers for reporting violations or for information should publicize their numbers as means of reporting grizzly problems and grizzly bear deaths.

Reduce Illegal Killing by Big Game Hunters and Mistaken Identity Killing by Black Bear Hunters. (N2112)

The MDFWP should continue to make information about handling and storing game available to big game hunters to reduce the likelihood of the carcass being claimed by a grizzly. Information should continue to be provided to all black bear hunters to assist them in distinguishing between black and grizzly bears. Montana should issue special warnings to black bear hunters using areas frequented by grizzly bears. Black bear hunting regulations should be modified as appropriate to reduce or eliminate areas of significant conflicts or time periods of conflict.

Investigate and Prosecute Illegal Killing of Grizzly Bears. (N2113)

The special enforcement team should investigate accidental grizzly bear kills and recommend prosecution when appropriate.

Reduce Accidental Deaths. (N2114)

Minimize those activities that result in attraction of bears to sites of conflict and management mistakes that might result in losses.

Increase Efforts to Clean up Carrion and other Attractants in Association with Roads, Human Habitation, and Developed Areas within Recovery Zones. (N21141)

All agencies evaluate and improve warning signs along highways and roads in high-use grizzly bear areas. All agencies should increase efforts to clean up carrion and other attractants along highways and other routes within occupied grizzly bear range.

Reduce Losses due to Mishandling of Bears during Research and Management Actions through Development of a Bear Handling Manual. (N21142)

To reduce losses due to mishandling of bears (e.g., an overdose of immobilizing drugs or improper handling), only experienced personnel that are certified by a sponsoring unit having the required permits and knowledge in the application of capture techniques, immobilizing drugs, transportation of drugged animals, and scientific data collection should handle grizzly bears. Only the safest, most effective drugs available should be used. A detailed manual for trapping, immobilizing, transporting, and handling grizzly bears has been prepared for use by all agencies as a training and reference manual.

Reduce Losses due to Predator and Rodent Control. (N21143)

Agencies responsible for licensing, conducting, or in any way overseeing predator or rodent damage control programs using toxic substances in occupied grizzly bear habitat should use the most selective (but effective) rodenticide available, and use it in

lowest effective dosage. Poison bait should only be used under the onsite supervision of a certified applicator. Poisoning within grizzly bear habitat should be delayed as long as possible into July to minimize the potential for grizzly bears to consume poisoned rodents or bait.

Agency control on Federal lands should be in accordance with 50 CFR 17.40. For grizzly bears involved in livestock conflicts, animal damage control officers should follow the Guidelines and other interagency agreements.

Ensure that Control of Nuisance Bears is Accomplished According to 50 CFR 17.40 and the Guidelines. (N21144)

All management control actions should be carried out according to the Guidelines. The only legal citizen control of a grizzly bear is that related to self-defense or defense of others. The law enforcement team should carefully investigate every case of grizzly bear mortality alleged to be self-defense or defense of others.

Reduce Losses by Developing and Implementing Public Education and Awareness Programs. (N21145)

Accidental mortalities and nuisance bear mortalities are often the result of lack of information about the effects of human behavior on grizzly bears such as sanitation in residential areas and back-country areas, as well as the behavior of back-country visitors. Agencies should cooperate in the development and implementation of public education programs.

Appoint a Grizzly Bear Mortality Coordinator. (N212)

The U.S. Fish and Wildlife Service has appointed an employee of MDFWP as grizzly bear mortality coordinator to tabulate annual bear mortality for this ecosystem and ensure that all cooperating agencies and the public have current mortality data. The coordinator should maintain key contacts with all agencies and keep detailed records of all conditions surrounding each grizzly bear death. A standard form meeting the needs of all agencies should be prepared.

Identify and Reduce Sources of Indirect Mortality. (N22)

Ongoing human actions in grizzly habitat contribute to bear-human conflicts that often result in bear deaths. Management of these activities in consideration of the needs of bears should reduce indirect mortality.

Make Domestic Livestock Grazing Compatible with Grizzly Bear Habitat Requirements. (N221)

Encourage consideration of grizzly habitat needs regarding grazing on State and private lands. On Federal lands, the Guidelines should be applied to make grazing operations compatible with grizzly bear spacial and seasonal habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines as a cooperative extension effort.

Make Timber Harvest and Road Building Compatible with Grizzly Bear Habitat Requirements. (N222)

Encourage consideration of grizzly habitat needs and road density guidelines relating to timber harvest and road building on State and private lands. On Federal lands, the Guidelines should

be applied and road density guidelines should be phased in to make timber operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Mining and Oil and Gas Exploration and Development Compatible with Grizzly Bear Habitat Requirements. (N223)

Encourage consideration of grizzly habitat needs and road density guidelines relating to mining and oil and gas exploration on State and private lands. On Federal lands or lands where subsurface rights are under Federal jurisdiction, the Guidelines should be applied, and road density guidelines should be phased in to make mining and energy operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Recreation on Federal Lands Compatible with Grizzly Bear Habitat Needs. (N224)

On Federal lands, the Guidelines should be applied, and road density guidelines should be phased in to make recreation activities compatible with grizzly bear spacial and habitat requirements.

Coordinate with State and County Governments to make Land Development and Land Use Decisions within the Recovery Zones Compatible with Grizzly Bear Habitat Needs. (N225)

Land management agencies, State regulatory agencies, county commissioner, and county zoning boards should be encouraged to give consideration to the needs of grizzly bears in any actions requiring their approval. When homes, summer homes, cabins, camps, farm operations, etc., with attendant dog kennels, pig farms, garbage dumps, and livestock carcass disposal sites are allowed to invade the habitat occupied by grizzly bears, they should directly or indirectly effectively reduce the space and habitat necessary for the bears survival. For private lands not subject to the above restrictions, wildlife managers should give consideration to purchase, lease, or easement if habitat components are necessary to survival of the species.

Monitor the Cumulative Effects of Management Actions in Grizzly Bear Habitat. (N226)

Determine the cumulative effects of all or any combination of the actions described above (N221-N225) that may adversely impact grizzly bears through application of the cumulative effects model on an ongoing basis. Past adverse impacts on the bears and their habitat must be a major consideration in the evaluation of any new action. New actions must be evaluated on a regional basis to avoid the cumulative effects of several well planned individual actions impacting bears from too many directions simultaneously. Historical records indicate that at some point in time, probably associated with the degree of stress, grizzly bears will no longer use certain portions of their former range. Therefore, each new action has the potential of being "the last straw" from the standpoint of the bear, and every effort must be made to evaluate each new action with respect to former and future actions.

Coordinate, Monitor, and Report on Activities Relating to Redressing Population Limiting Factors and Monitor Compliance with the Recovery Plan. (N23)

This should be accomplished through the activities of the Coordinator and the management subcommittees of the IGBC. Actions should be taken by the management committees as necessary to address needs and to assure implementation of the recovery plan and the application of the Guidelines.

Determine the Habitat and Space Required for the Achievement of the Grizzly Bear Population Goal. (N3)

Careful definition of the recovery zones should allow agencies and the public to know where grizzly bears and grizzly habitat will be managed. Information on range and the biology of bears as well as the nature and quality of habitat is necessary to ensure that habitat is properly managed and that the habitat delineated has sufficient quality and quantity to support a viable population.

Define the Recovery Zone within which the Grizzly Bear will be Managed. (N31)

The recovery zone for the NCDE was delineated by members of the Northern Continental Divide Management Subcommittee of the IGBC (fig. 7). The recovery zone was defined on the basis of the best available information on bear and bear habitat distribution and needs for a viable, well distributed population. Present boundaries will be defined as the Northern Continental Divide Grizzly Bear Recovery Zone and should be corrected and revised as new data become available.

Changes in the recovery zone lines can be made by a committee appointed by the ecosystem management subcommittee consisting of representatives of the State wildlife agency, the U.S. Fish and Wildlife Service, and the involved land management agencies. Additions to the recovery zone line require that a significant area of seasonally important habitat exist outside the existing recovery zone line that is used by grizzly bears that live primarily within the recovery zone. The area to be added must have significant value to the survival of the bears within the recovery zone. Changes in the recovery zone lines should be made using the best biological information available.

It is recognized that grizzly bears will occur outside the recovery zone lines and that the mere presence of bears outside the recovery zone line is not sufficient reason for changing the line. The area to be added must be of significant biological value to bears residing inside the line. These values must be demonstrated by habitat mapping and bear movement data. Any changes to the recovery zone line should be approved by the ecosystem management subcommittee and the IGBC, and should be subsequently added to the next draft of the recovery plan. Changes in the line should be finalized and effective upon approval by the IGBC.

Identify Agency Management Stratifications within the Recovery Zone including the Delineation of BMU's and Management Situations I, II, or III as Defined in the Guidelines. (N32)

The BMU's should be defined on the basis of units suitable for application of the CEM. Management situations should be defined according to the Guidelines. Correct delineation of the management situation areas within the recovery zone as necessary as new information becomes available.

Conduct Research to Determine the Extent of Grizzly Bear Range. (N33)

This research is being conducted by cooperating agencies.

Conduct Research to Determine Habitat Use, Food Habits, Home Range Size, and Seasonal Habitat Preference, and Incorporate into Habitat Management Programs. (N34)

These data should be used to ensure that habitat values are available within the grizzly bear recovery zone and that ongoing management actions do not significantly degrade these habitat values. Information on behavior, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities has been gathered since 1975 by researchers from the MDFWP, the U.S. Fish and Wildlife Service, National Park Service, BLM, Bureau of Indian Affairs (BIA), Tribal authorities, the U.S. Forest Service, British Columbia Wildlife Branch, and university researchers. These data are presented in referenced journals and in annual project reports. It is crucial that this information on the grizzly bears' biological requirements be correlated with habitat conditions. Of particular relevance are habitat factors relating to ecosystem dynamics that may limit the range or food availability of bears. These factors can include climate change, fire effects, and plant phenology, habitat availability changes, and growth patterns of major food species. Detailed information on these factors should be gathered as soon as possible and annual recording of patterns should be initiated in order to recognize habitat dynamics changes as they might occur. This research and habitat evaluation should be undertaken by the IGBST and cooperating agencies. Results should be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so. One area of special concern is the effect of fire management in grizzly bear habitat. Natural fires can improve grizzly bear habitat by increasing the quality and quantity of food sources. Fire suppression can reduce food availability and reduce habitat quality.

Conduct Research to Determine the Relationship between Habitat Values, Physiological Condition of Bears, and the Ability of the Habitat to Sustain a Population Density Necessary to Achieve Viable Population Size. (N35)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research to Determine the Effects of Various Road Densities on Grizzly Bear Habitat Use and Human-caused Bear Mortality. (N36)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research on the Effects of Habitat Fragmentation Caused by Human Activities, such as Modification of Cover Type, Road Building, and Human Residences, in order to Assess the Possibility of Linkage between Grizzly Bear Ecosystems and between Habitat Tracts within Ecosystems. (N37)

This research is being conducted by the U.S. Fish and Wildlife Service in cooperation with various Federal and State land management agencies, local governments, and the public. Results may be useful to developing long-term cooperative land management planning to include both public and private sectors.

Evaluate the Applicability of PVA to Grizzly Bear Recovery. (N38)

The PVA are based on theoretical biological models of a species reproduction, survival, and genetic interchange and stability through time. The PVA studies sometimes have been utilized in identifying possible population numbers that may contribute to long-term species survival. The applicability of a PVA study to grizzly bear recovery should be evaluated.

Monitor Populations and Habitats. (N4)

Population monitoring is necessary to determine the status of the population and to assess the success of conservation efforts associated with recovery. An increasing population validates ongoing management efforts, while a decreasing population indicates a failure to address problems facing the population.

Monitor Populations Before, During, and After Recovery. (N41)

Develop and apply techniques to ensure the population is carefully monitored.

Develop and Conduct an Intensive Monitoring System to Measure the Annual Number of Females with Cubs, Family Groups, and Number of Human-caused Mortalities. (N411)

The method is detailed in N11 and N111.

Develop a System of Agency Responsibilities to Collate, Analyze, and Report Annual Information on Population Data. (N412)

The system is detailed in N112.

Standardize Observation Report Forms and Methods, and Develop Training Methods for all Persons involved in reporting Sightings of Females with Cubs and Family Groups. (N413)

Reporting system is detailed in N112. Training methods should include identification materials to enable all individuals involved to identify and report the bear species seen, and to report unknown species. Training methods should be distributed to all agency reporting personnel and should be formally presented in training sessions to seasonal and staff personnel at the beginning of each year in order to ensure quality observation data. The need for the consistency of at least a minimum effort should be emphasized.

Monitor Relocated Bears in Order to Assess the Success of Nuisance Bear Management. (N414)

Efforts to monitor relocated bears should continue within the NCDE.

Monitor Habitats Before, During, and After Recovery. (N42)

Develop and apply techniques to ensure the habitat is carefully monitored.

Develop and Apply the CEA Process to allow Monitoring of Effects of Management Actions over a Large Geographic Area of Habitat. (N421)

The CEA should be completed, thoroughly evaluated, and refined. If applicable, it can be applied to assist in judging the suitability of ongoing management actions. Development of CEA requires five phases: (1) data base compilation, (2) software development, (3) testing/validation, (4) development of mortality submodel, and (5) development of thresholds. Biologists' interpretation of data and output should be a continual part of the CEA. The CEA is currently at the testing/

validation stage where data bases are complete. Results of CEA testing and validation in the YGBE will facilitate its use in other grizzly bear ecosystems.

Complete Habitat Mapping of the Recovery Zone and Digitize these Data so they are Available for Use by the CEA. (N422)

Habitat mapping should be standardized and completed in a format compatible with the CEA. Updating of these habitat maps should be programmed every 5 years, or as necessary.

Establish a Threshold of Minimal Habitat Values to be Maintained within each CEA Analysis Unit in Order to Ensure that Sufficient Habitat is Available to Support a Viable Population. (N423)

The threshold value or series of values should be used in conjunction with the CEA to judge that ongoing actions in grizzly habitat have not degraded the value and/or availability of the habitat to bears. The objective of determining thresholds is not to establish and maintain minimal values, but to establish a measure of the level of change ongoing in the habitat. Agencies should attempt to manage habitat above threshold values to allow greater environmental flexibility for bears and to benefit recovery.

Threshold values are unknown at this time. Development of the threshold values should be based on the best available biological data on the habitat needs and biology of the grizzly bear. It should be based on the assumption that environmental diversity is necessary for bear survival, especially in years of food shortage due to environmental conditions (i.e., years of berry crop failure or pinenut crop failure).

Apply CEA to each BMU to Ensure Habitat Quality is Sufficient for Maintenance of a Viable Population and to Monitor Changes in Habitat as a Result of Human Activity. (N424)

As CEA becomes applicable in the NCDE, it should be applied every 5 years to each BMU to monitor changes in habitat quality and availability as a result of human activities and natural processes such as fire and plant succession. Deviations below the desired threshold level will require reanalysis of human activities in the BMU to ensure reattainment of the threshold level. Primary responsibility for CEA application lies with the ecosystem data base coordinator.

Report Management Activities Successfully used to Manage Habitat. (N425)

This should be completed as part of the ongoing business of the management agencies, the NCDE Management Subcommittee, and the Recovery Coordinator.

Develop a Conservation Strategy to Outline Habitat and Population Monitoring that will Continue in Force after Recovery. (N426)

Development of a conservation strategy is underway for the NCDE. This conservation strategy should detail the habitat and population monitoring structures that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population monitoring will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy should be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Manage Populations and Habitat. (N5)

Apply the best management techniques to ensure recovered populations.

Manage Populations and Habitat Prior to Recovery on Federal Lands. (N51)

Refine Procedures for Relocating or Aversively Conditioning Nuisance Grizzly Bears. (N511)

Develop and coordinate procedures to expedite the relocation of nuisance bears, and review and update interagency agreements. Relocate bears within 24 hours and continue search for new release areas. Research and develop methods to deal with problem bears and test and develop aversive conditioning of bears, if possible. Evaluate the effects of relocated nuisance bears on resident bears in relocation areas. Refine the Guidelines as necessary.

Develop and Test Procedures to Relocate Bears between Areas for Demographic or Genetic Purposes. (N512)

Develop and coordinate interagency agreements and procedures for the introduction of one or more grizzly bears into the breeding population in the Yellowstone area every 10 years for maintenance of genetic diversity. The NCDE could be a source for bears suitable for relocation into the YE. This procedure is a proactive strategy to minimize the possibility of loss of genetic diversity in the YE. Sources of such bears should be ecosystems with larger populations that are not isolated breeding units. Using nuisance bears for this purpose should not be permitted. The NCDE Management Subcommittee should address the use of NCDE bears for this Yellowstone placement effort and initiate a review and position document on this need.

Apply Interagency Grizzly Bear Management Guidelines prior to Recovery that Maintain or Enhance Habitats. (N513)

By applying the Guidelines, agencies should ensure that land use activities are conducted in a manner that is compatible with grizzly bear requirements for space and habitat and minimizes the potential for human/bear conflicts. Ensure that road density guidelines are phased within grizzly bear habitat.

Manage Populations and Habitats on Private and State Lands. (N52)

Develop and apply management guidelines prior to recovery that maintain or enhance habitats. Recommend land use activities compatible with grizzly bear requirements for space and habitat; minimize potential for human/bear conflicts. Implement cooperative efforts with State lands agencies and private landowners to incorporate standards similar to the Guidelines and road density guidelines in order to ensure that management actions will be sensitive to grizzly bear habitat needs. Cooperative efforts between State and Federal land management agencies will facilitate this process.

Develop a Conservation Strategy that Outlines all Habitat and Population Regulatory Mechanisms in Force after Recovery. (N53)

Develop and implement conservation strategy that outlines all existing habitat and population regulatory mechanisms for each ecosystem. Demonstrate the existence of adequate regulatory mechanisms that will remain after recovery goals are reached. Provide guidelines for the continuation of habitat and population management upon recovery of the grizzly bear population in the ecosystem

through the creation of an NCDE conservation strategy. A conservation strategy is being developed currently for the NCDE. This conservation strategy should detail the habitat and population management structures in the NCDE that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population management should remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy should be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Develop and Initiate Appropriate Information and Education Programs. (N6)

Managing human-induced mortalities is a major factor in effecting the recovery of the grizzly bear. Therefore, it is crucial to the recovery effort that the public understand reasons for actions in order to generate tolerant or positive attitudes toward the bear. The IGBC has appointed an I&E subcommittee to develop education programs and disseminate information. Private conservation organizations interested in the recovery of grizzly bears provide valuable assistance when they include appropriate information in their publications and news releases.

Evaluate Public Attitudes toward Grizzly Bear Management, Habitat Protection and Maintenance, Land Use Restrictions, Mitigating Measures, Relocation of Bears, Hunting, Nuisance Bear Control Actions, and Habitat Acquisition or Easement. (N61)

Public attitudes are a major part of the success or failure of grizzly bear recovery efforts. Understanding of these attitudes and the basis for public sentiment is important. Carefully designed research surveys by qualified scientists experienced in such sampling should be initiated. The management subcommittee members should formulate the basic questions and attitudes of interest. The data will be useful in designing public outreach programs to foster public support for recovery programs.

Formulate Ways to Improve Public Attitudes about Grizzly Bears and the Grizzly Bear Recovery Program. (N62)

Agencies should use the data on public attitudes to formulate public relations and I&E programs through the respective I&E offices of each agency and the I&E subcommittee of the IGBC. Agencies having the authority and responsibility for grizzly bear control actions should institute and carry out I&E programs to inform citizens having problems with grizzly bears of the appropriate procedures and contacts for assistance.

Implement the Recovery Plan through Appointment of a Recovery Coordinator. (N7)

The Fish and Wildlife Service has appointed a Recovery Coordinator to collate relevant information on grizzly bears and to coordinate and stimulate compliance and action to implement the recovery plan. The Coordinator should submit progress reports and conduct workshops and meetings as necessary. This position provides a central focus for the accumulation, exchange, and dissemination of information, and a central point for multi-agency coordination that will aid in the judicious use of resources and materially enhance the recovery effort.

Revise Appropriate Federal and State Regulations to Reflect Current Situations and Initiate International Cooperation. (N8)

Ensure consistent, up-to-date regulations and maintain international cooperation and communication with all other countries where brown bears are being managed.

Revise Federal and State Regulations as Necessary. (N81)

The Recovery Coordinator should initiate the revision of Federal regulations when necessary through the *Federal Register* and CFR. The Recovery Coordinator should assist States in regulation revisions as necessary to ensure that regulations provide the State management authority with the ability to control bear mortality. Such authority is necessary to ensure that adequate regulatory mechanisms exist. These regulations include CFR regulations and national forest and national park regulations regarding sanitation. State regulations involved include regulations on the taking of bears and management of hunting. Hunting of grizzly bears should be evaluated as a management tool to relieve population pressures where such pressures are demonstrated.

Coordinate and Exchange Information and Expertise with Canada and other Countries Concerning Bear Research and Management. (N82)

This will increase information exchange of state-of-the-art bear research and management, and will promote international cooperation and improve management and recovery efforts. All IGBC member agencies and the Coordinator should exchange information and expertise concerning recovery activities with Canada and other countries managing bears. International cooperation is critical to the success of the grizzly bear recovery effort. Four grizzly populations span the U.S./Canada border and the cooperation and involvement of Canadian management authorities will facilitate conservation of grizzlies in the U.S. Management authoriiies from British Columbia and Alberta need to be full participants in all aspects of the recovery program. Research conducted in Canada on grizzly bears is applicable to situations in the U.S.; cooperation in funding such research, cooperative efforts involving personnel from both countries, and sharing of research results is vital. Joint U.S./Canadian management of bears and bear habitat is necessary for the four ecosystems that lie along the U.S./Canada border. Cooperative international management plans should be developed for each ecosystem along the border incorporating concerns about the continued maintenance of habitats and populations. Such plans currently are being developed by MDFWP and wildlife agencies in British Columbia and Alberta.

International communication on bears and bear management is necessary to the success of the recovery effort. Many of the management problems and considerations facing the threatened grizzly bears in the U.S. such as insular populations, small population size, conflicts with timber harvest and livestock grazing, genetic concerns relating to small population size, movement of bears from one area to another, management of sport hunting, and public attitudes are also facing many of the other species of bears in Europe and Asia. Sharing of information on management approaches and techniques will facilitate recovery in the U.S. as well as assist managers and researchers in other countries. The Recovery Coordinator should facilitate cooperation and international communication and provide information gained to managers and researchers as necessary.

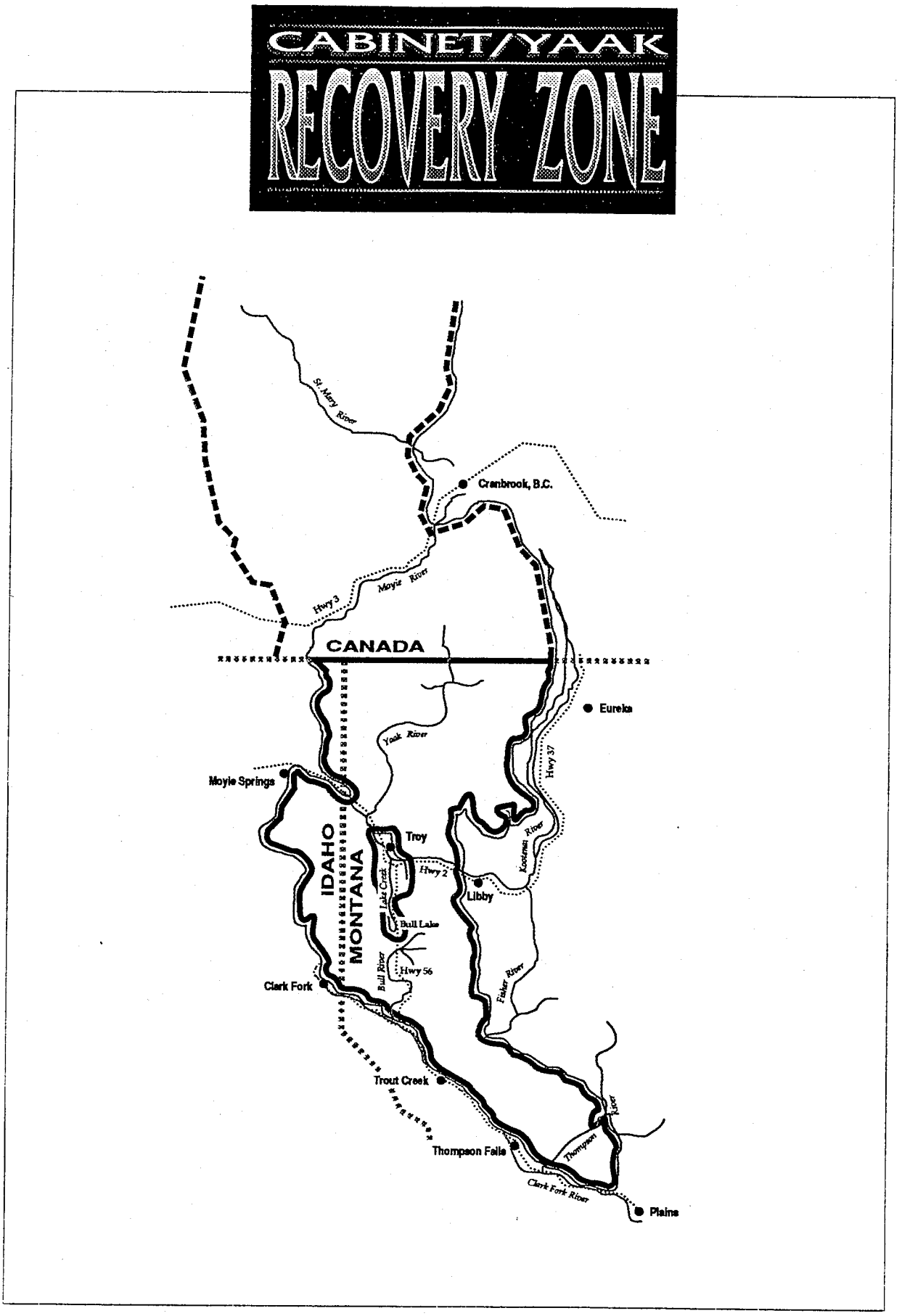

CABINET/YAAK
RECOVERY ZONE
St. Mary's River
Cranbrook, B.C.
Moyie River
Hwy 3
CANADA
Eureka
Yaak River
Hwy 37
Moyie Springs
Troy
Kootenai River
IDAHO
MONTANA
Hwy 2
Libby
Lake Creek
Bull Lake
Bull River
Hwy 56
Clark Fork
Fisher River
Trout Creek
Thompson Falls
Thompson River
Clark Fork River
Plains

Figure 10.

Cabinet/Yaak Grizzly Bear Recovery Zone

Subgoal: For the Cabinet/Yaak Grizzly Bear Recovery Zone (CYE), six females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada; 18 of 22 BMU's occupied by females with young from a running 6-year sum of verified evidence; and known, human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Presently grizzly bear numbers are so small in this ecosystem that the mortality goal shall be zero known human-caused mortalities.

Establish the Population Objective for Recovery and Identify the Limiting Factors. (C1)

Approximately 2,600 mi^2 (6,734 km^2) are delineated as the recovery zone in this area (fig. 10). At recovery levels, it is anticipated that the minimum population will be approximately 100 grizzly bears in this ecosystem. The basis for this goal is the relatively small size of this recovery zone. It should be noted that the 100 bears projected as the goal for this area are a subset of a much larger population that is contiguous with grizzly bear populations northward into Canada. Bears will and do move freely back and forth into the recovery zone from adjacent grizzly bear habitat in Canada. The population goal is set to ensure that a sufficient population of grizzly bears exists throughout the area to allow for a continued population in the U.S. portion of this area. The goal indicates the status, based on the three key items monitored, of the population in the Cabinet/Yaak portion of this contiguous area. These goals will be revised as necessary or as new information becomes available.

Recovery targets for the CYE grizzly bear recovery zone were developed using the following assumptions and methods:

(1) Recovery of the CYE grizzly bear population depends upon verification that the population meets the criteria for a recovered population. A recovered population is defined as one that (a) can sustain the existing level of known and unknown, unreported, human-caused mortality that exists within the CYE, and (b) is well distributed throughout the recovery zone in the CYE.

(2) Assuming that a minimum of 100 bears is a reasonable goal based on the size of the ecosystem and because it is contiguous with grizzly populations in Canada, the target for the minimum number of unduplicated females with cubs on a running 6-year average is six verified reports, both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada. The target was derived using the following facts and assumptions about the grizzly bear population in the CYE:

   (a) A running 6-year average of unduplicated females with cubs is based on a 3-year reproductive cycle and will allow at least 2 years when each adult female alive can be reported with cubs. A running 6-year tally will also stabilize the average and make it less sensitive to changes in annual reporting levels and sightability.

(b) On average, 33 percent of adult females (at least 5 years old) will be with cubs each year. This is based on an average 3-year reproductive interval for adult females. Thus, the 6-year average number of females with cubs can be multiplied by three to estimate the minimum number of adult females in the population.

(c) The reporting efficiency for females with cubs is estimated to be 60 percent. Thus, of all females with cubs in the CYE in a given year, on average 60 percent will be detected/seen and reported (based on average reporting of females on the Rocky Mountain Front, Montana, Aune and Kasworm 1989). This is a conservative estimate of females with cubs. Because of the forested nature of much of the CYE, the reporting efficiency is most likely lower than 60 percent. Therefore, the calculated minimum number of females with cubs will underestimate the actual number. This process is designed to err on the side of the bear.

(d) The grizzly population in the CYE is assumed to be 50 percent adults and 50 percent subadults (Grizzly Bear Compendium, 1987, pp. 47-59).

(e) The sex ratio of both adults and subadults is assumed to be 1:1 (Grizzly Bear Compendium, 1987. pp. 47-59).

(f) The proportion of adult females in the population is 28.40 percent (using methods in Knight et al. 1988, Appendix C, and Knight et al. 1993, Appendix D).

The target of at least 6 females with cubs is sufficient to indicate a minimum population of at least 106 bears (using method of Knight et al. 1988) (Appendix C):

6 females with cubs seen divided by 0.6 (sightability correction factor) = 10 total females with cubs; 10 x 3 = 30 adult females; 30 divided by 0.2840 (the assumed proportion of adult females in population) = a minimum of 106 grizzly bears in the CYE.

(3) There is a relationship between sustainable human-caused mortality and the number of unduplicated females with cubs. Therefore, the number of females with cubs can be useful in managing mortality.

(4) Human-caused mortality will continue at some long-term rate due to inevitable interactions between bears and people.

(5) Unknown, unreported, human-caused mortality occurs each year at some level.

(6) The maximum human-caused mortality level that can be sustained without population decline by a grizzly bear population is 6 percent when no more than 30 percent of these mortalities are females (Harris 1984).

(7) The present minimum population estimate for the Cabinet/Yaak ecosystem is 15-20 bears. Insufficient monitoring data are available to report the number of females with cubs at this time. Because of low estimated population and uncertainty in estimates, the current human-caused mortality goal to facilitate recovery of the population is zero. In reality, this goal may not be realized because human-bear conflicts are likely to occur at some level within the ecosystem. Management will strive to prevent all human-caused grizzly bear mortality in the CYE.

(8) In the future, to facilitate recovery of the population as population growth is realized and to allow for both error in minimum population estimates and for unknown, unreported mortality, the human-caused mortality limit for the CYE population will be 4 percent, 30 percent of which may be females. In order to account for changes in population size and to establish a link between population size and known, human-caused mortality, the mortality limit will be recalculated annually using the most recent 3-year sum of females with cubs as described in Y1. The lead for completion of these calculations shall be the Recovery Coordinator of the U.S. Fish and Wildlife Service working in cooperation with other agencies. This mortality level is conservative because:

(a) it is applied to a minimum population estimate that is based on the number of females with cubs seen in the CYE, corrected by a conservative sightability factor (as detailed in 2c). It is recognized that the actual population size is likely higher than the estimate; and

(b) according to Harris (1985), a grizzly bear population can sustain 6 percent human-caused mortality without experiencing a decline in that population.

For the present CYE population estimate, the annual goal is zero known, human-caused mortality. The female mortality limit will remain zero until the three key parameters indicate a minimum population of approximately 100 grizzly bears. Management will strive to prevent all human-caused mortality within and surrounding the CYE. If control actions are deemed absolutely necessary, the population will probably not experience overall decline if human-caused mortality remains less than 4 percent. For instance, a population of 86 grizzly bears could theoretically sustain a total of three mortalities or one female mortality annually ($86 \times 0.04 = 3$, and $3 \times 0.30 = 1$). However, these calculations do not account for demographic, genetic, or other problems that can be amplified dramatically in such small populations.

Determine Population Conditions at which the Species is Viable and Self-sustaining. (C11)

Reevaluate and refine population criteria as new information becomes available. The grizzly bear population in the CYE will be viable when monitoring efforts indicate that recruitment and mortality are at levels supporting a stable or increasing population, and reproducing females are distributed throughout the recovery zone. The population will be judged as meeting recovery population requirements when, as determined through systematic monitoring throughout the recovery zone, it meets each of the following criteria:

(a) The average number of unduplicated female grizzly bears with cubs is a minimum of six annually on a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, excluding Canada.

(b) The distribution of family groups of grizzly bears represented by female grizzly bears accompanied by cubs or yearlings or 2-year olds is reported in 18 of the 21 BMU's on a running 6-year sum of observations. This is equivalent to verified evidence of at least one grizzly bear female with young within 18 of 21 BMU's over a 6-year period.

(c) The known, human-caused mortality level does not exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs, minus known adult female mortality. Additionally, no more than 30 percent of the known, human-caused mortality limit shall be females. However, the mortality goal for this ecosystem is zero until the three key parameters monitored indicate a population of approximately 100 bears.

Determine Population Monitoring Methods and Criteria. (C111)

The maintenance of a secure and robust grizzly bear population will require ongoing careful monitoring. This monitoring should provide data to allow reasonable assurance that the population is secure. The greater the number of parameters monitored, the greater the assurance that the information is representative of the status of the population.

With this in mind, a system has been developed to monitor a wide range of parameters, with three being of primary importance. These include (1) unduplicated number of females with cubs seen annually, (2) the distribution of females with young throughout the ecosystem, and (3) the annual number of known human-caused mortalities. Other factors should also be monitored to increase the confidence in the information, but these three parameters will be the key criteria used to judge the status of the population. The target of distribution by females with young is designed to demonstrate adequate dispersion of the reproductive cohort within the recovery zone. Distribution of reproducing females also will provide evidence of adequate habitat management assuming that successful reproduction is an indicator of habitat sufficiency. Lastly, adequate distribution of family groups indicates future occupancy of these areas because grizzly bear offspring, especially female offspring, tend to occupy habitat within or near the home range of their mother after weaning.

Establish Reporting Procedures and Systems to Gather and Evaluate Information on Populations. (C112)

All cooperating agency personnel should report females with cubs of the year on the standard form as stated in the Guidelines (U.S. Forest Service 1985). Agency personnel should be assigned to and responsible for one or more bear management units to ensure consistency in collection of reporting information. It should be the responsibility of such personnel to submit an annual report of the number of verified females with cubs for their respective BMU's to the appropriate reporting point by December 1 for compilation.

To eliminate duplicate reports, sightings and track data should be reviewed by agency representatives at an annual meeting. Methods to eliminate duplicate reports should follow Knight and Blanchard (1993). A running 6-year average of unduplicated females with cubs should be calculated using the annual report data. All unduplicated females with cubs within the U.S. outside the recovery zone line but within 10 airline miles of the line shall be counted as part of the total number seen within the recovery zone during that year. Additionally, observations of females with young should be plotted annually for a running 6-year cumulative total for determination of occupancy.

Determine Current Population Conditions. (C12)

The present grizzly bear population in the CYE is far below the levels necessary for viability. It is estimated that the population of grizzly bears in the east and west Cabinet Mountains is less than 15 animals. During 5 years of intensive research from 1983-87, only 3 grizzly bears were captured in this area while over 180 black bears were captured (Kasworm and Manley 1988). One female was known in this area, and she was 34 years old when she lost her collar in 1989. She is apparently beyond reproductive age and has never been seen with young during 6 years of monitoring. In 1990, a subadult female was successfully relocated into the Cabinet portion of the ecosystem (Kasworm and Thier 1991a). A second female was relocated into the Cabinets in 1992 (Kasworm et al. 1993). This female was seen with a cub in the spring of 1993. Both bears are known to have remained in the Cabinets. The Yaak

area between the Kootenai River and the Canadian border has a small grizzly population. Eight grizzly bears were captured and radio-collared in the Yaak during 1986-1991, and reproduction has been documented. Detailed monitoring of females with cubs in the CYE has been limited. Ongoing research activities should include the development and implementation of a reporting process.

Identify the Human-related Population Limiting Factors if Present Populations Differ from Desired. (C13)

Mortality from direct and indirect sources within and surrounding the recovery zone must be addressed if populations are to recover.

Identify Sources of Direct Mortality. (C131)

Sources of direct mortality include illegal hunting, poaching, vandal killing, and malicious killing. Accidental killings are a result of mistaken identity by black bear hunters. Private citizen control by livestock operators, apiarists, outfitters, hunter defense of quarry, and resort operators for protection of property also may result in direct mortality. Accidental deaths result from road kills (automobiles, trains, etc.) or handling error when bears are captured for management or research. Direct mortality may also occur during agency control of nuisance bears for livestock conflicts, other property damage, or life-threatening situations. Live removal of a grizzly to a zoo or another ecosystem as part of nuisance bear management is also considered a mortality because individual relocated bears are no longer part of the population. Mortality occasionally results from actions of private citizens for self-defense or defense of others.

Identify Sources of Indirect Mortality. (C132)

Sources of indirect mortality are those actions that bring bears and people into conflict such as road use, land development, and recreation. These actions include but are not limited to road construction, livestock grazing operations, timber harvest, mining, water development, energy exploration/development, recreation, and human development of conflicting enterprises, (subdivisions, dog kennels, fish farms, pig farms, livestock disposal sites, garbage dumps, etc.).

Determine Effects of Human Activities on Bears and Bear Habitat and Incorporate the Results into Management Plans and Decisions on Human Activities. (C133)

Complete research to document the effects of timber harvest, road use, oil and gas exploration, hard rock mining, and recreation on behavior, physiological condition, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities of grizzly bears. Revise the Guidelines as necessary as this information is obtained.

Redress Population Limiting Factors. (C2)

Develop ways to minimize actions that limit populations.

Reduce Sources of Direct Mortality. (C21)

The recommended annual human-induced grizzly bear mortality limit for expediting species recovery is zero. This is necessary for the present because of the low population of grizzly bears in this ecosystem. This mortality limit may not be achieved because some level of human-bear conflict within the ecosystem is inevitable. Reaching recovery goals will be facilitated if all human-caused mortality within and outside the recovery zone does not exceed 4 percent of the estimated population based on

the most recent 3-year sum of females with cubs, and no more than 30 percent of this mortality is female (see C1. above).

Known, human-caused mortalities in excess of the level sustainable at a given number of unduplicated females with cubs could result in population decline, while mortalities below this level would likely result in population increase. As the grizzly population increases, the number of sustainable, known, human-induced mortalities also increases. The known number of females with cubs will be used to calculate what is believed to be a minimum population estimate; therefore, the projected number of sustainable mortalities (less than 4 percent of this minimum population) is conservative.

However, at this time, there are insufficient numbers of bears in the Cabinet/Yaak to sustain even low levels of human-caused mortality. Therefore, management should strive to prevent all human-caused mortality.

Reduce Illegal Killing. (C211)

Use all methods possible to minimize illegal mortality.

Coordinate State, Federal, and Canadian Law Enforcement Efforts. (C2111)

Provide a concerted law enforcement effort by designating a specially trained law enforcement team coordinated by the U.S. Fish and Wildlife Service to minimize the illegal kill of grizzly bears. One or more persons representing the U.S. Fish and Wildlife Service, U.S. Forest Service, States of Montana and Idaho, and British Columbia should be appointed. Each member should receive specialized training to work on illegal kills of grizzly bears. The team should be trained initially by biologists in such matters as distribution, home ranges of identifiable bears, movements by season, mating habits, current location of radio-marked bears, and other biological information that may be helpful to the team.

All incidents of grizzly bear kills, suspected illegal activities, and rumors of kills should be communicated between the enforcement team and their respective agencies on a daily basis or as often as is practical.

The Enforcement Team Leader should keep all members of the enforcement team informed and should organize coordination meetings as needed. Special emphasis should be directed at covert operations that may be operating commercially.

The Enforcement Team should operate through an interstate, interagency agreement under the direction of the U.S. Fish & Wildlife Service.

It is imperative that the group leader establish a line of communications and rapport with all field personnel, field office staff, and local law enforcement agencies in order that he/she may be notified immediately on a violation or threat on a violation.

Public assistance should be solicited in reporting suspected or known illegal kills. Persons furnishing information that leads to a finding of civil violation or a conviction of a criminal violation of 50 CFR 17.40 regarding grizzly bears can be rewarded up to one half of the fine or civil penalty.

States having toll-free numbers for reporting violations or for information should publicize their numbers as means of reporting grizzly problems and grizzly bear deaths.

Reduce Illegal Killing by Big Game Hunters and Mistaken Identity Killing by Black Bear Hunters. (C2112)

Montana and Idaho should make information about handling and storing game available to big game hunters to reduce the likelihood of the carcass being claimed by a grizzly. Information should be provided to all black bear hunters to assist them in distinguishing between black and grizzly bears. Montana and Idaho should issue special warnings to black bear hunters using areas frequented by grizzly bears. Black bear hunting regulations should be modified as appropriate to reduce or eliminate areas of significant conflicts or time periods of conflict. Special attention should be given to evaluate and eliminate as necessary bear baiting in recovery zones. Bear baiting is prohibited in all portions of Montana.

Investigate and Prosecute Illegal Killing of Grizzly Bears. (C2113)

The special enforcement team should investigate accidental grizzly bear kills and recommend prosecution when appropriate.

Reduce Accidental Deaths. (C2114)

Minimize those activities that result in attraction of bears to sites of conflict and management mistakes that might result in losses.

Increase Efforts to Clean up Carrion and Other Attractants in Association with Roads, Human Habitation, and Developed Areas within Recovery Zones. (C21141)

All agencies should evaluate and improve warning signs along highways and roads in high-use grizzly bear areas. All agencies should increase efforts to clean up carrion and other attractants along highways and other routes within occupied grizzly bear range.

Reduce Losses Due to Mishandling of Bears During Research and Management Actions through Development of a Bear Handling Manual. (C21142)

To reduce losses due to mishandling of bears (e.g., an overdose of immobilizing drugs or improper handling), only experienced personnel that are certified by a sponsoring unit having the required permits and knowledge in the application of capture techniques, immobilizing drugs, transportation of drugged animals, and scientific data collection should handle grizzly bears. Only the safest, most effective drugs available should be used. A detailed manual for trapping, immobilizing, transporting, and handling grizzly bears has been prepared for use by all agencies as a training and reference manual.

Reduce Losses Due to Predator and Rodent Control. (C21143)

Agencies responsible for licensing, conducting, or in any way overseeing predator or rodent damage control programs using toxic substances in occupied grizzly bear habitat should use the most selective (but effective) rodenticide available, and use it in lowest effective dosage. Poison bait should be used only under the onsite supervision of a certified applicator. Poisoning within grizzly bear habitat should be delayed as long as possible into July to minimize the potential for grizzly bears to consume poisoned rodents or bait.

Agency control on Federal lands should be in accordance with 50 CFR 17.40. For grizzly bears involved in livestock conflicts, animal damage control officers should follow the Guidelines and other interagency agreements.

Ensure that Control of Nuisance Bears is Accomplished According to 50 CFR 17.40 and the Guidelines. (C21144)

All management control actions should be carried out according to the Guidelines. The only legal citizen control of a grizzly bear is that related to self-defense or defense of others. The law enforcement team should carefully investigate every case of grizzly bear mortality alleged to be self-defense or defense of others.

Reduce Losses by Developing and Implementing Public Education and Awareness Programs. (C21145)

Accidental mortalities and nuisance bear mortalities are often the result of lack of information about the effects of human behavior on grizzly bears such as sanitation in residential areas and back-country areas as well as the behavior of back-country visitors. Agencies should cooperate in the development and implementation of public education programs.

Appoint a Grizzly Bear Mortality Coordinator. (C212)

The U.S. Fish and Wildlife Service has appointed an employee of MDFWP as grizzly bear mortality coordinator to tabulate annual bear mortality for this ecosystem and ensure that all cooperating agencies and the public have current mortality data. The coordinator should maintain key contacts with all agencies and keep detailed records of all conditions surrounding each grizzly bear death. A standard form meeting the needs of all agencies should be prepared.

Identify and Reduce Sources of Indirect Mortality. (C22)

Ongoing human actions in grizzly habitat contribute to bear-human conflicts that often result in bear deaths. Management of these activities in consideration of the needs of bears will reduce indirect mortality.

Make Domestic Livestock Grazing Compatible with Grizzly Bear Habitat Requirements. (C221)

Encourage consideration of grizzly habitat needs regarding grazing on State and private lands. On Federal lands, the Guidelines should be applied to make grazing operations compatible with grizzly bear spacial and seasonal habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines as a cooperative extension effort.

Make Timber Harvest and Roadbuilding Compatible with Grizzly Bear Habitat Requirements. (C222)

Encourage consideration of grizzly habitat needs relating to timber harvest and roadbuilding on State and private lands. On Federal lands, the Guidelines should be applied and road density guidelines should be phased in to make timber operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Mining and Oil and Gas Exploration and Development Compatible with Grizzly Bear Habitat Requirements. (C223)

Encourage consideration of grizzly habitat needs and road density guidelines relating to mining and oil and gas exploration on State and private lands. On Federal lands or lands where subsurface rights are under Federal jurisdiction, the Guidelines should be applied; road density guidelines should be phased in to make mining and energy operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Recreation on Federal Lands Compatible with Grizzly Bear Habitat Needs. (C224)

On Federal lands, the Guidelines should be applied and road density guidelines should be phased in to make recreation activities compatible with grizzly bear spacial and habitat requirements.

Coordinate with State and County Governments to Make Land Development and Land Use Decisions within the Recovery Zones Compatible with Grizzly Bear Habitat Needs. (C225)

Land management agencies, State regulatory agencies, county commissioner, and county zoning boards should be encouraged to give consideration to the needs of grizzly bears in any actions requiring their approval. When homes, summer homes, cabins, camps, farm operations, etc., with attendant dog kennels, pig farms, garbage dumps, and livestock disposal sites are allowed to invade the habitat occupied by grizzly bears, they should directly or indirectly effectively reduce the space and habitat necessary for the bears survival. For private lands not subject to the above restrictions, wildlife managers should give consideration to purchase, lease, or easement if habitat components are necessary to survival of the species.

Monitor the Cumulative Effects of Management Actions in Grizzly Bear Habitat. (C226)

Determine the cumulative effects of all or any combination of the actions described above (C221-C225) that may adversely impact grizzly bears through application of the cumulative effects model on an ongoing basis. Past adverse impacts on the bears and their habitat must be a major consideration in the evaluation of any new action. New actions must be evaluated on a regional basis to avoid the cumulative effects of several well planned individual actions impacting bears from too many directions simultaneously. Historical records indicate that at some point in time, probably associated with the degree of stress, grizzly bears will no longer use certain portions of their former range. Therefore, each new action has the potential of being "the last straw" from the standpoint of the bear, and every effort must be made to evaluate each new action with respect to former and future actions.

Coordinate, Monitor, and Report Activities Relating to Redressing Population-limiting Factors, and Monitor Compliance with the Recovery Plan. (C23)

This should be accomplished through the activities of the Coordinator and the management subcommittees of the IGBC. Actions should be taken by the management committees as necessary to address needs and to ensure implementation of the recovery plan and the application of the Guidelines.

Determine the Habitat and Space Required for the Achievement of the Grizzly Bear Population Goal. (C3)

Careful definition of the recovery zones will allow agencies and the public to know where grizzly bears and grizzly habitat will be managed. Information on range and the biology of bears as well as the nature and quality of habitat is necessary to ensure that habitat is properly managed and that the habitat delineated has sufficient quality and quantity to support a viable population.

Define the Recovery Zone within which the Grizzly Bear will be Managed. (C31)

The recovery zone for the CYE was delineated by members of the Northwest Ecosystem Management subcommittee of the IGBC (fig. 10). The recovery zone was defined on the basis of the best available information on bear and bear habitat distribution and needs for a viable, well distributed population. Present boundaries will be defined as the Cabinet/Yaak Grizzly Bear Recovery Zone and should be corrected and revised as new data become available.

Changes in the recovery zone lines can be made by a committee appointed by the ecosystem management subcommittee consisting of representatives of the State wildlife agency, the U.S. Fish and Wildlife Service, and the involved land management agencies. Additions to the recovery zone require that a significant area of seasonally important habitat exist outside the existing recovery zone line, and that it be used by grizzly bears that live primarily within the recovery zone. The area to be added must have significant value to the survival of the bears within the recovery zone. Changes in the recovery zone lines should be made using the best biological information available.

It is recognized that grizzly bears will occur outside the recovery zone lines and that the mere presence of bears outside the recovery zone line is not sufficient reason for changing the line. The area to be added must be of significant biological value to bears residing inside the line. These values must be demonstrated by habitat mapping and bear movement data. Any changes to the recovery zone line should be approved by the ecosystem management subcommittee and the IGBC, and should be added to the next draft of the recovery plan.

Identify Agency Management Stratifications within the Recovery Zone including the Delineation of BMU's and Management Situations I, II, or III as Defined in the Guidelines. (C32)

The BMU's should be defined on the basis of units suitable for application of the CEM. Management situations should be defined according to the Guidelines (1985). Correct delineation of the management situation areas within the recovery zone as necessary as new information becomes available.

Conduct Research to Determine the Extent of Grizzly Bear Range. (C33)

This research is being conducted by cooperating agencies.

Conduct Research to Determine Habitat Use, Food Habits, Home Range Size, and Seasonal Habitat Preference and Incorporate into Habitat Management Programs. (C34)

These data should be used to ensure that habitat values are available within the grizzly bear recovery zone, and that ongoing management actions do not significantly degrade these habitat values. Information on behavior, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities has been gathered since 1982 by researchers from the MDFWP, the

U.S. Fish and Wildlife Service, the U.S. Forest Service, and university researchers. These data are presented in peer-reviewed journals and in annual project reports.

It is crucial that this information on the grizzly bears biological requirements be correlated with habitat conditions. Of particular relevance are habitat factors relating to ecosystem dynamics that may limit the range or food availability of bears. These factors can include climate change, fire effects, plant phenology, habitat availability changes, and growth patterns of major food species. Detailed information on these factors should be gathered as soon as possible, and annual recording of patterns should be initiated in order to recognize habitat dynamics changes as they might occur. This research and evaluation should be conducted by cooperating agencies. Results are to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so. One area of special concern is the effect of fire management in grizzly bear habitat. Natural fires can improve grizzly bear habitat by increasing the quality and quantity of food source. Fire suppression can reduce food availability and reduce habitat quality.

Conduct Research to Determine the Relationship between Habitat Values, Physiological Condition of Bears, and the Ability of the Habitat to Sustain a Population Density Necessary to Achieve Viable Population Size. (C35)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research to Determine the Effects of Various Road Densities on Grizzly Bear Habitat Use and Human-caused Bear Mortality. (C36)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research on the Effects of Habitat Fragmentation Caused by Human Activities, such as Modification of Cover Type, Road Building, and Human Residences, in order to Assess the Possibility of Linkage between Grizzly Bear Ecosystems and between Habitat Tracts within Ecosystems. (C37)

This research is being conducted by the U.S. Fish and Wildlife Service in cooperation with various Federal and State land management agencies, local governments, and the public. Results may be useful to developing long-term cooperative land management planning to include both public and private sectors.

Evaluate the Applicability of PVA to Grizzly Bear Recovery. (C38)

The PVA are based on theoretical biological models of a species reproduction, survival, and genetic interchange and stability through time. The PVA studies have been utilized sometimes in identifying possible population numbers that may contribute to long-term species survival. The applicability of a PVA study to grizzly bear recovery should be evaluated.

Monitor Populations and Habitats. (C4)

Population monitoring is necessary to determine the status of the population and to assess the success of conservation efforts associated with recovery. An increasing population validates ongoing management efforts, while a decreasing population indicates a failure to address problems facing the population.

Monitor Populations Before, During, and After Recovery. (C41)

Develop and apply techniques to ensure the population is carefully monitored.

Develop and Conduct an Intensive Monitoring System to Measure the Annual Number of Females with Cubs, Family Groups, and Number of Human-caused Mortalities. (C411)

The method is detailed in C11 and C111.

Develop a System of Agency Responsibilities to Collate, Analyze, and Report Annual Information on Population Data. (C412)

The system is detailed in C112.

Standardize Observation Report Forms and Methods, and Develop Training Methods for all Persons involved in Reporting Sightings of Females with Cubs and Family Groups. (C413)

Reporting system detailed in C112. Training methods should involve identification materials to enable individuals involved to be able to identify the bear species seen or to be able to report unknown species. Training methods should be distributed to all agency reporting personnel, and should be formally presented in training sessions to seasonal and staff personnel at the beginning of each field season in order to ensure quality observation data.

Monitor Relocated Bears in Order to Assess the Success of Nuisance Bear Management. (C414)

The probability of having nuisance bears at such low bear densities is slight; however, if a bear should become a nuisance such bears should be relocated and monitored.

Monitor Habitats Before, During, and After Recovery. (C42)

Develop and apply techniques to ensure the habitat is carefully monitored.

Develop and Apply the CEA Process to Allow Monitoring of Effects of Management Actions over a Large Geographic Area of Habitat. (C421)

The CEA should be completed, thoroughly evaluated, and refined. If applicable, it can be applied to assist in judging the suitability of ongoing management actions. Development of CEA requires five phases (1) data base compilation, (2) software development, (3) testing/validation, (4) development of mortality submodel, and (5) development of thresholds. Biologists' interpretation of data and output should be a continual part of the CEA. The CEA is currently at the testing/validation stage where data bases are complete. Results of CEA testing and validation in the YGBE will facilitate its use in other grizzly bear ecosystems.

Complete Habitat Mapping of the Recovery Zone and Digitize these Data so they are Available for use by the CEA. (C422)

Habitat mapping should be standardized and completed in a format compatible with the CEA. Updating of these habitat maps should be programmed every 5 years, or as necessary.

Establish a Threshold of Minimal Habitat Values to be Maintained within each CEA unit in Order to Ensure that Sufficient Habitat is Available to Support a Viable Population. (C423)

The threshold values or series of values are the benchmarks used in conjunction with the CEA to judge that ongoing actions in grizzly habitat have not degraded the value and/or availability of the habitat to bears. The objective of determining thresholds is not to establish and maintain minimal values, but to establish a measure of the level of ongoing change in the habitat. Management should attempt to manage habitat above threshold values. Maintenance of habitat values above the threshold values allows greater environmental flexibility for bears and will benefit recovery.

Threshold values are unknown at this time. Development of the threshold values should be based on the best available biological data on the habitat needs and biology of the grizzly bear. It should be based on the assumption that environmental diversity is necessary for bear survival, especially in years of food shortage due to environmental conditions (i.e., years of berry crop failure).

Apply CEA to each BMU to Ensure Habitat Quality is Sufficient for Maintenance of a Viable Population and to Monitor Changes in Habitat as a Result of Human Activity. (C424)

As CEA becomes applicable in the CYE, it should be applied every 5 years to each BMU to monitor changes in habitat quality and availability as a result of human activities and natural processes such as fire and plant succession. Deviations below the desired threshold level will require reanalysis of human activities in the BMU to ensure reattainment of the threshold level. Primary responsibility for CEA application lies with the ecosystem data base coordinator.

Report Management Activities Successfully used to Manage Habitat. (C425)

This should be completed as part of the ongoing business of the management agencies, the Northwest Ecosystems Management Subcommittee, and the Recovery Coordinator.

Develop a Conservation Strategy to Outline Habitat and Population Monitoring Mechanisms that will Continue in Force after Recovery. (C426)

This should be completed as population status data indicate attainment of the recovery targets. This conservation strategy should detail the habitat and population monitoring structures in the Cabinet/Yaak Ecosystem that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population monitoring will remain in place to ensure that the species will be remain recovered without protection under the Act. The conservation strategy must be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Manage Populations and Habitat. (C5)

Apply the best management techniques to ensure recovered populations.

Manage Populations and Habitats Prior to Recovery on Federal Lands. (C51)

Refine Procedures for Relocation of or Aversively Conditioning Nuisance Grizzly Bears. (C511)

Develop and coordinate procedures to expedite the relocation of nuisance bears, and review and update interagency agreements. Relocate bears within 24 hours and continue to search for new release areas. Research and develop methods to deal with problem bears, and test and develop aversive conditioning of bears, if possible. Evaluate the effects of relocated nuisance bears on resident bears in relocation areas. Refine the Guidelines as necessary.

Develop and Test Procedures to Relocate Bears from one Area into Another for Demographic or Genetic Purposes. (C512)

The introduction of grizzly bears into the population in the Cabinet Mountains area is underway and relocation procedures are being developed and tested. Some interagency agreements have been completed but should be reviewed annually and modified as needed. Further, specific procedures to increase the number of breeding-age females and the natural reproduction in the area need to be developed. Using nuisance bears for this purpose should not be permitted. Ecosystems with larger populations that are not isolated breeding units should be the source for suitable bears. Responsibility for this effort lies with the Coordinator in cooperation with the U.S. Forest Service and the MDFWP.

Apply Interagency Grizzly Bear Management Guidelines Prior to Recovery that Maintain or Enhance Habitats. (C513)

By applying the Guidelines, agencies should ensure that land use activities are conducted in a manner that is compatible with grizzly bear requirements for space and habitat, and minimizes the potential for human/bear conflicts. Ensure that road density guidelines are phased within grizzly bear habitat.

Manage Populations and Habitats on Private and State Lands. (C52)

Develop and apply management guidelines prior to recovery that maintain or enhance habitats. Recommend land use activities compatible with grizzly bear requirements for space and habitat; minimize potential for human/bear conflicts. Implement cooperative efforts with State lands agencies and private landowners to incorporate standards similar to the Guidelines and road density guidelines in order to ensure that management actions will be sensitive to grizzly bear habitat needs. Cooperative efforts between State and Federal land management agencies should facilitate this.

Develop a Conservation Strategy that Outlines all Habitat and Populations Regulatory Mechanisms in Force after Recovery. (C53)

Develop and implement conservation strategies that outline all existing habitat and population regulatory mechanisms for each ecosystem. Demonstrate the existence of adequate regulatory mechanisms after recovery. Provide guidelines for the continuation of habitat and population management upon recovery of the grizzly bear population in the ecosystem through the creation of a

CYE conservation strategy. This conservation strategy should detail the habitat and population management structures in the CYE that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population management will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy should be finalized and signed by all agencies prior to consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Develop and Initiate Appropriate Information and Education Programs. Reducing Human-induced Mortalities is a Major Factor in Effecting the Recovery of the Grizzly Bear. (C6)

Therefore, it is crucial to the recovery effort that the public understand reasons for actions in order to generate tolerant or favorable attitudes toward the bear. The IGBC has appointed an I&E subcommittee to develop education programs and disseminate information. Private conservation organizations interested in the recovery of grizzly bears could be of assistance if they would include appropriate information in their publications and news releases.

Evaluate Public Attitudes toward Grizzly Bear Management, Habitat Protection and Maintenance, Land Use Restrictions, Mitigating Measures, Relocation of Bears, Hunting, Nuisance Bear Control Actions, and Habitat Acquisition or Easement. (C61)

Public attitudes are a major part of the success or failure of grizzly bear recovery efforts. Understanding of these attitudes and the basis for public sentiment is important. Carefully designed research surveys by qualified scientists experienced in such sampling should be initiated. The basic questions and attitudes of interest should be formulated by the management subcommittee members. The data should be useful in designing public outreach programs to foster public support for support recovery programs.

Formulate Ways to Improve Public Attitudes about Grizzly Bears and the Grizzly Bear Recovery Program. (C62)

Agencies should use the data on public attitudes to formulate public relations and I&E programs through the respective I&E offices of each agency and the I&E subcommittee of the IGBC. Agencies having the authority and responsibility for grizzly bear control actions should institute and carry out I&E programs to inform citizens having problems with grizzly bears of the appropriate procedures and contacts for assistance.

Implement the Recovery Plan through Appointment of a Recovery Coordinator. (C7)

The Fish and Wildlife Service has appointed a Recovery Coordinator to collate all relevant information on grizzly bears, and to coordinate and stimulate compliance and action to implement the recovery plan. The Coordinator should submit progress reports and conduct workshops and meetings as necessary. This position provides a central focus for the accumulation, exchange, and dissemination of information, and a central point for multi-agency coordination that should aid in the judicious use of resources and materially enhance the recovery effort.

Revise Appropriate Federal and State Regulations to Reflect Current Situations and Initiate International Cooperation. (C8)

Ensure consistent, up-to-date regulations and maintain international cooperation and communication with all other countries where brown bears are being managed.

Revise Federal and State Regulations as Necessary. (C81)

The Coordinator should initiate revision of Federal regulations through the *Federal Register* and CFR. The Coordinator should assist States in regulation revisions as necessary to ensure that regulations provide the State management authority with the ability to control bear mortality. Such authority is necessary to ensure that adequate regulatory mechanisms exist. These regulations include CFR regulations, and national forest and national park regulations regarding sanitation. State regulations involved include regulations on the taking of bears and management of hunting.

Coordinate and Exchange Information and Expertise with Canada and other Countries Concerning Bear Research and Management. (C82)

This will increase information exchange of the state-of-the-art in bear research and management, and will promote international cooperation and improve management and recovery efforts. All IGBC member agencies and the Coordinator should exchange information and expertise concerning recovery activities with Canada and other countries managing bears. International cooperation is critical to the success of the grizzly bear recovery effort. Four grizzly populations span the U.S./Canada border. The cooperation and involvement of Canadian management authorities will facilitate conservation of grizzlies in the U.S. Management authorities from British Columbia and Alberta need to be full participants in all aspects of the recovery program. Research conducted in Canada on grizzly bears is applicable to situations in the U.S.; cooperation in funding such research, cooperative efforts involving personnel from both countries, and sharing of research results is vital. Joint U.S/Canadian management of bears and bear habitat is necessary for the four ecosystems that lie along the U.S./Canada border. Cooperative international management plans should be developed for each ecosystem along the border incorporating concerns about the continued maintenance of habitats and populations. Such plans should be developed and accepted by agencies on both sides of the border.

International communication on bears and bear management is necessary to the success of the recovery effort. Many of the management problems and considerations impacting the threatened grizzly bears in the U.S.—such as insular populations and small population size conflicting with timber harvest and livestock grazing, genetic concerns relating to small population size, movement of bears from one area to another, management of sport hunting, and public attitudes—are also impacting many species of bears in Europe and Asia. Sharing information on management approaches and techniques will facilitate recovery in the U.S. as well as assist managers and researchers in other countries. The Recovery Coordinator should facilitate cooperation and international communication, and provide information gained to managers and researchers as necessary.

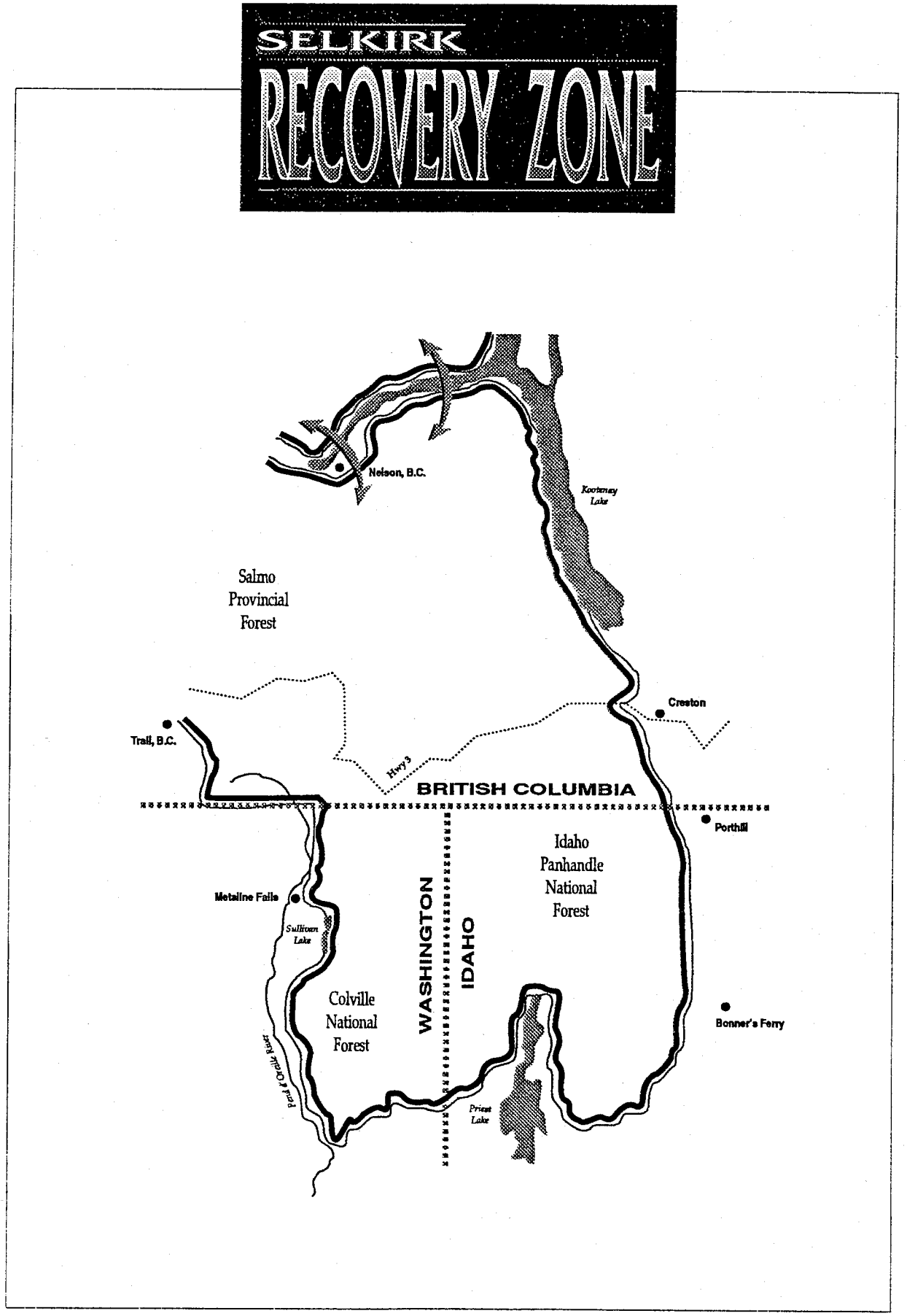

SELKIRK
RECOVERY ZONE
Nelson, B.C.
Kootenay Lake
Salmo Provincial Forest
Creston
Trail, B.C.
Hwy 3
BRITISH COLUMBIA
Porthill
Idaho Panhandle National Forest
Metaline Falls
Sullivan Lake
WASHINGTON
IDAHO
Colville National Forest
Bonner's Ferry
Pend d'Oreille River
Priest Lake

Figure 11.

Selkirk Grizzly Bear Recovery Zone

Subgoal: For the Selkirk Grizzly Bear Recovery Zone (SE), six females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, including Canada; 7 of the 10 BMU's on the U.S. side occupied by females with young from a running 6-year sum of observations; and known, human-caused mortality not to exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs; furthermore, no more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved. Presently grizzly bear numbers are so small in this ecosystem that the mortality goal shall be zero known human-caused mortalities.

Establish the Population Objective for Recovery, and Identify the Limiting Factors. (S1)

The Selkirk area in the U.S. is the southern tip of the Selkirk Mountain Range that extends northward into Canada (fig. 11). The area of the U.S. portion is limited by the fact that the Selkirk range ends approximately 23 mi (60 km) south of the border. Because there is not sufficient area for a viable grizzly bear population on the U.S. side, and because the bears in the area regularly move across the border, a portion of the Selkirk Range on the Canadian side was included in the designated SE. The inclusion of this Canadian area brought the size of the SE to the approximately 2,000 mi^2 (5,180 km^2) necessary to support a minimum population of 90 bears. It is recognized that the SE is contiguous with grizzly bear habitat northward into Canada, and that the 90 bears projected as the goal in this recovery zone are a subset of a much larger population. Bears can and do move between the recovery zone and contiguous habitat to the north. The population goal for the recovery zone is set to ensure sufficient bears exist throughout the area to ensure a continued population in the U.S. portion of this recovery zone. All recovery goals will be revised as necessary or as new information becomes available.

Recovery targets for the SE were developed using the following assumptions and methods:

1. Recovery of the SE grizzly bear population depends upon verification that the population meets the criteria for a recovered population. A recovered population is defined as one that (a) can sustain the existing level of known and unknown, unreported, human-caused mortality that exists within the SE and (b) is well distributed throughout the recovery zone in the SE.

2. Assuming that a minimum of 90 bears is a reasonable goal based on the size of the ecosystem, and because it is contiguous with grizzly population in Canada, the target for the minimum number of unduplicated females with cubs on a running 6-year average is six verified reports, both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, *including* Canada. The target was derived using the following facts and assumptions about the grizzly bear population in the SE:

   (a) A running 6-year average of unduplicated females with cubs is based on a 3-year reproductive cycle, and will allow at least 2 years when each adult female alive can be reported with cubs. A running 6-year tally will stabilize the average and make it less sensitive to changes in annual reporting levels and sightability.

(b) On average, 33 percent of adult females (at least 5 years old) will be with cubs each year. This is based on an average 3-year reproductive interval for adult females. The 6-year average number of females with cubs can be multiplied by three to estimate the number of adult females in the population.

(c) The reporting efficiency for females with cubs is 60 percent. Thus, of all females with cubs in the SE in a given year, on average 60 percent will be detected/seen and reported. This is a conservative estimate of females with cubs. Because of the forested nature of much of the SE, the reporting efficiency most likely is lower than 60 percent. Therefore, the calculated minimum number of females with cubs will underestimate the actual number. This process is designed to err on the side of the bear.

(d) The grizzly population in the SE is estimated to be 48 percent adults and 52 percent subadults (Weilgus et al. 1993).

(e) The sex ratio of adults is estimated to be approximately one male:two females, and for subadults is estimated to be one male:one female (Weilgus et al. 1993).

(f) The proportion of adult females in the population is 33 percent (Weilgus et al. 1993).

The target of at least 6 females with cubs is sufficient to indicate a minimum population of at least 91 bears (using method of Knight et al. 1988) (Appendix C):

6 females with cubs seen divided by 0.6 (sightability correction factor) = 10 total females with cubs; 10 x 3 = 30 adult females; 30 divided by 0.33 (the estimated proportion of adult females in the Selkirk population, Weilgus et al. 1993) = a minimum of 91 grizzly bears in the SE.

3. There is a relationship between the sustainable human-caused mortality levels, recruitment of animals into the population, and the number of unduplicated females with cubs. Therefore, the estimate of the number of females with cubs is important in managing mortality.

4. Human-caused grizzly mortalities will continue at some long-term rate due to inevitable interactions between bears and people throughout the ecosystem. These mortality levels will probably increase as the grizzly population increases and bear-human interactions increase.

5. Unknown, unreported, human-caused mortality occurs each year at some level.

6. The maximum human-caused mortality level that can be sustained without population decline by a grizzly bear population with the above assumed characteristics is 6 percent when no more than 30 percent of these mortalities are females (Harris 1984).

7. The present absolute minimum population estimate for the SE is at least 26-36 bears within the recovery zone (Weilgus et al. 1993). Insufficient monitoring data is available to report the number of females with cubs at this time. Because of low estimated population and uncertainty in estimates, the current human-caused mortality goal to facilitate recovery of the population is zero. In reality, this goal may not be realized because human-bear conflicts are likely to occur at some level within the ecosystem. Management should strive to prevent all human-caused mortality in the SE.

8. In the future, to facilitate recovery of the population as population growth is realized and to allow for both error in minimum population estimates and for unknown, unreported mortality, the human-caused mortality limit for the SE population will be 4 percent, 30 percent of this limit may be females. In order to account for changes in population size and to establish a link between population size and known, human-caused mortality, the mortality limit will be recalculated annually using the most recent 3-year sum of females with cubs as described in Y1. The lead for completion of these calculations shall be the Coordinator of the U.S. Fish and Wildlife Service working in cooperation with other agencies. This mortality level is conservative because:

   (a) it is applied to a minimum population estimate that is based on the number of females with cubs seen in the SE corrected by a conservative sightability factor (as detailed in S1.). It is recognized that the actual population size is higher than the minimum estimate; and

   (b) according to Harris (1984), a grizzly bear population can sustain 6 percent human-caused mortality without experiencing a decline in that population.

   For the present SE population estimate, the annual goal is *zero* known, human-caused mortality. The female mortality limit will remain zero until the three key parameters indicate a minimum population of at least 90 grizzly bears. Management should strive to prevent all human-caused mortality within and surrounding the SE. If a control action is deemed necessary, the population will probably not experience overall decline if human-caused mortality remains less than 4 percent. A population of 86 grizzly bears could theoretically sustain a total of three mortalities or one female mortality annually ($86 \times 0.04 = 3$, and $3 \times 0.30 = 1$). However, these calculations do not account for demographic, genetic, or other problems that can be dramatically amplified in such small populations.

Determine Population Conditions at which the Species is Viable and Self-sustaining. (S11)

Reevaluate and refine population criteria as new information becomes available. The grizzly bear population in the SE will be viable when monitoring efforts indicate that recruitment and mortality are at levels supporting a stable or increasing population, and reproducing females are distributed throughout the recovery zone. The population will be judged as meeting recovery population requirements when, as determined through systematic monitoring throughout the recovery zone, it meets each of the following criteria:

(a) The average number of unduplicated females with cubs is a minimum of six annually on a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the recovery zone, *including* Canada.

(b) The distribution of family groups of grizzly bears represented by female grizzly bears accompanied by cubs, yearlings, or 2-year olds is reported in 7 of the 10 BMU's in the U.S. portion of the recovery zone on a running 6-year sum of observations. This is equivalent to verified evidence of at least one grizzly bear female with young within 7 of 10 BMU's over a 6-year period. It is recognized that BMU's or their equivalent should be designated in the Canadian portion of the SE. This should be accomplished through a cooperative effort between U.S. and Canadian authorities.

(c) The known human-caused mortality level does not exceed 4 percent of the population estimate based on the most recent 3-year running sum of females with cubs, minus known adult female mortality. Additionally, no more than 30 percent of the known human-caused mortality limit shall be females. However, the female mortality goal for this ecosystem is zero until the three key parameters monitored indicate a population of at least 90 bears.

Determine Population Monitoring Methods and Criteria. (S111)

The maintenance of a secure and robust grizzly bear population will require ongoing careful monitoring. This monitoring should provide data to allow reasonable assurance that the population is secure. The greater the number of parameters monitored, the greater the assurance that the information is representative of the status of the population.

With this in mind, a system has been developed to monitor a wide range of parameters, with three being of primary importance. These include unduplicated number of females with cubs seen annually, the distribution of females with young throughout the ecosystem, and the annual number of known human-caused mortalities. Other factors also should be monitored to increase the confidence in the information, but these three parameters will be the key criteria used to judge the status of the population. The target distribution by females with young is designed to demonstrate adequate dispersion of the reproductive cohort within the recovery zone. Distribution of reproducing females also will provide evidence of adequate habitat management, assuming that successful reproduction is an indicator of habitat sufficiency. Lastly, adequate distribution of family groups indicates future occupancy of these areas because grizzly bear offspring, especially female offspring, tend to occupy habitat within or near the home range of their mother after weaning.

Establish Reporting Procedures and Systems to Gather and Evaluate Information on Populations. (S112)

All cooperating agency personnel should report females with cubs and females with young on the standard form as stated in the Guidelines (U.S. Forest Service 1985). Agency personnel should be assigned to and responsible for one or more BMU's to ensure consistency in collection of reporting information. It should be the responsibility of personnel assigned to BMU's to submit an annual report of the number of verified females with cubs for their BMU's to the appropriate reporting point by December 1 for compilation.

Agency representatives should review all reports, and track data and eliminate duplicate reports at an annual meeting. Methods to eliminate duplicate reports should follow Knight and Blanchard (1993). A running 6-year average of unduplicated females with cubs will be calculated using the annual reporting data. All unduplicated females with cubs outside the recovery zone line but within 10 airline miles of the line shall be counted as part of the total number seen within the recovery zone during that year. Observations of females with young will be plotted annually for a running 6-year cumulative total for determination of occupancy.

Determine Current Population Conditions. (S12)

The present grizzly bear population in the SE is far below the levels necessary for viability. It is estimated that the population consists of at least 26-36 grizzly bears within the recovery zone, including both U.S. and Canadian portions (Weilgus et al. 1993). However, detailed monitoring of sightings of females with cubs and family groups has been limited. Research currently underway in the area is

determining productivity and distribution data necessary for a better understanding of this population. As of 1992, two female grizzly bears have been captured and marked. A total of 28 different grizzly bears have been captured and collared. Of particular interest is the movement of bears across the border, especially the possible southward dispersal of subadults from areas of higher density in contiguous northern areas. As research proceeds, there should be a better understanding of this population and its status. Additionally, researchers are working to coordinate the reporting of females with cubs between the Idaho Fish and Game Department, the U.S. Forest Service, Idaho Department of Lands, Washington Department of Wildlife, and officials in British Columbia.

Identify the Human-related Population Limiting Factors if Present Populations Differ from Desired. (S13)

Mortality from direct and indirect sources within and surrounding the recovery zone must be addressed if populations are to recover.

Identify Sources of Direct Mortality. (S131)

Sources of direct mortality including illegal hunting, poaching, vandal killing, and malicious killing. Accidental killings are a result of mistaken identity by black bear hunters. Private citizen control by livestock operators, apiarists, outfitters, hunter defense of quarry, and resort operators for protection of property also may result in direct mortality. Accidental deaths result from road kills (automobiles, trains, etc.) or handling error when bears are captured for management or research. Direct mortality also may occur during agency control of nuisance bears for livestock conflicts, other property damage, or life-threatening situations. Live removal of a grizzly to a zoo or another ecosystem as part of nuisance bear management also is considered a mortality because individual relocated bears are no longer part of the population. Mortality occasionally results from actions of private citizens for self-defense or defense of others.

Identify Sources of Indirect Mortality. (S132)

Sources of indirect mortality are those actions that bring bears and people into conflict such as road use, land development and recreation. These actions include but are not limited to road construction, livestock grazing operations, timber harvest, mining, water development, energy exploration/development, recreation, and human development of conflicting enterprises (subdivisions, dog kennels, fish farms, pig farms, boneyards, garbage dumps, etc.).

Determine Effects of Human Activities on Bears and Bear Habitat and Incorporate the Results into Management Plans and Decisions on Human Activities. (S133)

Complete research to document the effects of timber harvest, road use, oil and gas exploration, and recreation on behavior, physiological condition, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities. Revise the Guidelines as necessary as this information is obtained.

Redress Population Limiting Factors. (S2)

Develop ways to minimize actions within and surrounding the recovery zone that limit populations.

Reduce Sources of Direct Mortality. (S21)

To expedite species recovery, the recommended annual human-induced grizzly bear mortality goal within and surrounding the recovery zone is zero. This is necessary for the present because of the low population of grizzly bears within this ecosystem. This mortality goal may not be achieved because some level of human-bear conflict within the ecosystem is inevitable. Reaching recovery goals will be facilitated if all human-caused mortality within and outside the recovery zone does not exceed 4 percent of the estimated population based on the most recent 3-year sum of females with cubs and no more than 30 percent of this mortality limit is female (see S1. above).

Known human-caused mortalities in excess of the level sustainable at a given number of unduplicated females with cubs could result in population decline while mortalities below this level would likely result in population increase. As the grizzly population increases, the number of sustainable known human-induced mortalities also increases. The known number of females with cubs will be used to calculate what is believed to be a minimum population estimate; therefore, the projected number of sustainable mortalities (less than 4 percent of this minimum population) is conservative.

However, at this time there are insufficient numbers of bears in the U.S. portion of this area to support even low levels of human-caused mortality. Management should strive to prevent all human-caused mortality. Human-caused mortalities in the Canadian portion of this ecosystem are more sustainable due to the contiguous occupied habitats. However, maximum potential for recovery will be achieved with minimal numbers of human-caused mortalities within the Canadian portion of the recovery zone.

Reduce Illegal Killing. (S211)

Use all methods possible to minimize illegal kills.

Coordinate State, Federal, and Canadian Law Enforcement Efforts. (S2111)

Provide a concerted law enforcement effort by designating a specially trained law enforcement team coordinated by the U.S. Fish and Wildlife Service to minimize the illegal kill of grizzly bears. One or more persons representing the U.S. Fish and Wildlife Service, U.S. Forest Service, State of Idaho, State of Washington, and British Columbia should be appointed. Each member should receive specialized training to work on illegal kills of grizzly bears. The team should be trained initially by biologists in such matters as distribution, home ranges of identifiable bears, movements by season, mating habits, current location of radio-marked bears and other biological information that may be helpful to the team.

All incidents of grizzly bear kills, suspected illegal activities, and rumors of kills should be communicated between the enforcement team and their respective agencies on a daily basis or as often as is practical.

The enforcement team leader should keep all members of the enforcement team informed and should organize coordination meetings as needed. Special emphasis should be directed at covert operations that may be operating commercially.

The enforcement team should operate through an interstate, interagency agreement under the direction of the U.S. Fish & Wildlife Service.

It is imperative that the group leader establish a line of communication and rapport with all field personnel, field office staff, and local law enforcement agencies in order that he/she may be notified immediately on a violation or threat of a violation.

Public assistance should be solicited in reporting suspected or known illegal kills. Persons furnishing information that leads to a finding of civil violation or a conviction of a criminal violation of 50 CFR 17.40 regarding grizzly bears can be rewarded up to one-half of the fine or civil penalty.

States having toll-free numbers for reporting violations or for information should publicize their numbers as means of reporting grizzly problems and grizzly bear deaths.

Reduce Illegal Killing by Big Game Hunters and Mistaken Identity Killing by Black Bear Hunters. (S2112)

Idaho and Washington should continue to make information about handling and storing game available to big game hunters to reduce the likelihood of the carcass being claimed by a grizzly. Information should continue to be provided to all black bear hunters to assist them in distinguishing between black and grizzly bears. Idaho and Washington should issue special warnings to black bear hunters using areas frequented by grizzly bears. Black bear hunting regulations should be modified as appropriate to reduce or eliminate areas of significant conflicts or time periods of conflict. Special attention should be given to evaluate and eliminate as necessary bear baiting in recovery zones.

Investigate and Prosecute Illegal Killing of Grizzly Bears. (S2113)

The enforcement team should investigate accidental grizzly bear kills and recommend prosecution when appropriate.

Reduce Accidental Deaths. (S2114)

Minimize activities that result in attraction of bears to sites of conflict and management mistakes that might result in losses.

Increase Efforts to Clean up Carrion and other Attractants in Association with Roads, Human Habitation, and Developed Areas within Recovery Zones. (S21141)

All agencies should evaluate and improve warning signs along highways and roads in high-use grizzly bear areas. All agencies should increase efforts to clean up carrion and other attractants along highways and other routes within occupied grizzly bear range.

Reduce Losses due to Mishandling of Bears during Research and Management Actions through Development of a Bear Handling Manual. (S21142)

To reduce losses due to mishandling of bears (e.g., an overdose of immobilizing drugs or improper handling), only experienced personnel certified by a sponsoring unit having the required permits and knowledge in the application of capture techniques, immobilizing drugs, transportation of drugged animals, and scientific data collection should handle grizzly bears. Only the safest, most effective drugs available should be used. A detailed manual for trapping, immobilizing, transporting, and handling grizzly bears has been prepared for use by all agencies as a training and reference manual.

Reduce Losses due to Predator and Rodent Control. (S21143)

Agencies responsible for licensing, conducting, or in any way overseeing predator or rodent damage control programs using toxic substances in occupied grizzly bear habitat should use the most selective (but effective) rodenticide available, and use it in lowest effective dosage. Poison bait should be used only under the onsite supervision of a certified applicator. Poisoning within grizzly bear habitat should be delayed as long as possible into July to minimize the potential for grizzly bears to consume poisoned rodents or bait.

Agency control on Federal lands should be in accordance with 50 CFR 17.40. For grizzly bears involved in livestock conflicts, animal damage control officers should follow the Guidelines and other interagency agreements.

Ensure that Control of Nuisance Bears is Accomplished According to 50 CFR 17.40 and the Guidelines. (S21144)

All management control actions should be carried out according to the Guidelines. The only legal citizen control of a grizzly bear is that related to self-defense or defense of others. The law enforcement team should carefully investigate every case of grizzly bear mortality alleged to be self-defense or defense of others.

Reduce Losses by Developing and Implementing Public Education and Awareness Programs. (S21145)

Accidental mortalities and nuisance bear mortalities are often the result of lack of information about the effects of human behavior on grizzly bears such as sanitation in residential areas and back-country areas, as well as the behavior of back-country visitors. Agencies should cooperate in the development and implementation of public education programs.

Appoint a Grizzly Bear Mortality Coordinator. (S212)

The U.S. Fish and Wildlife Service has appointed an employee of MDFWP as grizzly bear mortality coordinator to tabulate annual bear mortality for this ecosystem and ensure that all cooperating agencies and the public have current mortality data. The coordinator should maintain key contacts with all agencies and keep detailed records of all conditions surrounding each grizzly bear death. A standard form meeting the needs of all agencies should be prepared.

Identify and Reduce Sources of Indirect Mortality. (S22)

Ongoing human actions in grizzly habitat contribute to bear-human conflicts that often result in bear deaths. Management of these activities in consideration of the needs of bears should reduce indirect mortality.

Make Domestic Livestock Grazing Compatible with Grizzly Bear Habitat Requirements. (S221)

Encourage consideration of grizzly habitat needs regarding grazing on State and private lands. On Federal lands, the Guidelines should be applied to make grazing operations compatible with grizzly bear spacial and seasonal habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines as a cooperative extension effort.

Make Timber Harvest and Roadbuilding Compatible with Grizzly Bear Habitat Requirements. (S222)

Encourage consideration of grizzly habitat needs and road density guidelines relating to timber harvest and roadbuilding on State and Private lands. On Federal lands, the Guidelines should be applied, and road density guidelines should be phased in to make timber operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Mining and Oil and Gas Exploration and Development Compatible with Grizzly Bear Habitat Requirements. (S223)

Encourage consideration of grizzly habitat needs and road density guidelines relating to mining and oil and gas exploration on State and private lands. On Federal lands or where subsurface rights are under Federal jurisdiction, the Guidelines should be applied, and road density guidelines should be phased in to make mining and energy operations compatible with grizzly bear spacial and habitat requirements. On State and private lands, agencies and field personnel of agencies involved in grizzly bear management should communicate the intent of the Guidelines and road density guidelines as a cooperative extension effort.

Make Recreation on Federal Lands Compatible with Grizzly Bear Habitat Needs. (S224)

On Federal lands the Guidelines should be applied, and road density should be phased in to make recreation activities compatible with grizzly bear spacial and habitat requirements.

Coordinate with State and County Governments to Make Land Development and Land Use Decisions Within the Recovery Zones Compatible with Grizzly Bear Habitat Needs. (S225)

Land management agencies, State regulatory agencies, county commissioner, and county zoning boards should be encouraged to give consideration to the needs of grizzly bears in any actions requiring their approval. When homes, summer homes, cabins, camps, farm operations, etc., with attendant dog kennels, pig farms, garbage dumps, and livestock disposal sites are allowed to invade the habitat occupied by grizzly bears, they will directly or indirectly effectively reduce the space and habitat necessary for the bears' survival. For private lands not subject to the above restrictions, wildlife managers should give consideration to purchase, lease, or easement if habitat components are necessary to survival of the species.

Monitor the Cumulative Effects of Management Actions in Grizzly Bear Habitat. (S226)

Determine the cumulative effects of all or any combination of the actions described above (S221-S225) that may adversely impact grizzly bears through application of the CEM on an ongoing basis. Past adverse impacts on the bears and their habitat must be a major consideration in the evaluation of any new action. New actions must be evaluated on a regional basis to avoid the cumulative effects of several well planned individual actions impacting bears from too many directions simultaneously. Historical records indicate that at some point in time, probably associated with the degree of stress, grizzly bears will no longer use certain portions of their former range. Therefore, each new action has the potential of being "the last straw" from the standpoint of the bear, and every effort must be made to evaluate each new action with respect to former and future actions.

Coordinate, Monitor, and Report on Activities Relating to Redressing Population Pimiting Factors and Monitor Compliance with the Recovery Plan. (S23)

This should be accomplished through the activities of the Coordinator and the management subcommittees of the IGBC, both of which should operate in close coordination and communication with British Columbia authorities. Actions should be taken by the management committees as necessary to address needs and to ensure implementation of the recovery plan and the application of the Guidelines.

Determine the Habitat and Space Required for the Achievement of the Grizzly Bear Population Goal. (S3)

Careful definition of the recovery zones will allow agencies and the public to know where grizzly bears and grizzly habitat will be managed. Information on range and the biology of bears as well as the nature and quality of habitat is necessary to ensure that habitat is properly managed, and that the habitat delineated has sufficient quality and quantity to support a viable population.

Define the Recovery Zone within which the Grizzly Bear will be Managed. (S31)

The recovery zone for the SE was delineated by members of the Northwest Ecosystem Management Subcommittee of the IGBC and modified in 1987 by the addition of 162 square miles to the area delineated in the 1982 Recovery Plan (fig. 11). The recovery zone was defined on the basis of the best available information on bear and bear habitat distribution and needs for a viable, well distributed population. The additional area was added after radio-collared bears were found to use spring range that was outside the original lines. Present boundaries will be defined as the SE, and should be corrected and revised as new data become available.

Changes in the recovery zone lines can be made by a committee appointed by the ecosystem management subcommittee consisting of representatives of the State wildlife agency, the U.S. Fish and Wildlife Service, and the involved land management agencies. Additions to the recovery zone require that a significant area of seasonally important habitat exists outside the existing recovery zone line, and that it be used by grizzly bears that live primarily within the recovery zone. The area to be added must have significant value to the survival of the bears within the recovery zone. Changes in the recovery zone lines should be made using the best biological information available.

It is recognized that grizzly bears will occur outside the recovery zone lines and that the mere presence of bears outside the recovery zone line is not sufficient reason for changing the line. The area to be added must be of significant biological value to bears residing inside the line. These values must be demonstrated by habitat mapping and bear movement data. Any changes to the recovery zone line should be approved by the ecosystem management subcommittee and the IGBC, and should be subsequently added to the next draft of the recovery plan.

Identify Agency Management Stratifications within the Recovery Zone including the Delineation of BMU's and Management Situations I, II, or III as Defined in the Guidelines. (S32)

The BMU's should be defined on the basis of units suitable for application of the CEA. Management situations should be defined according to the Guidelines. Correct delineation of the management situation areas within the recovery zone as necessary as new information becomes available. It is recognized that the Guidelines do not apply in Canada. Efforts to communicate the intent of the

Guidelines to British Columbia officials should be made through cooperative efforts via the Northwest Ecosystems Management Subcommittee.

Conduct Research to Determine the Extent of Grizzly Bear Range. (S33)

This research is being conducted by cooperating agencies.

Conduct Research to Determine Habitat Use, Food Habits, Home Range Size, and Seasonal Habitat Preference and Incorporate into Habitat Management Programs. (S34)

These data should be used to ensure that habitat values are available within the grizzly bear recovery zone, and that ongoing management actions do not significantly degrade these habitat values. Information on behavior, population distribution, density, food habits, home range, reproduction, survivorship, and denning activities has been gathered since 1983 by researchers from the Idaho Department of Fish and Game, the Washington Department of Wildlife, the U.S. Fish and Wildlife Service, the U.S. Forest Service, the British Columbia Wildlife Branch, and university researchers. These data are presented in peer-reviewed journals and in annual project reports.

It is crucial that information on the grizzly bears' biological requirements be correlated with habitat conditions. Of particular relevance are habitat factors relating to ecosystem dynamics that may limit the range or food availability of bears. These factors can include climate change, fire effects, plant phenology and habitat availability changes, and growth patterns of major food species. Detailed information on these factors should be gathered as soon as possible and annual recording of patterns should be initiated in order to recognize habitat dynamics changes as they might occur. This research and evaluation should be conducted by cooperating agencies. Results are to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so. One area of special concern is the effect of fire management in grizzly bear habitat. Natural fires can improve grizzly bear habitat by increasing the quality and quantity of food source. Fire suppression can reduce food availability and reduce habitat quality.

Conduct Research to Determine the Relationship between Habitat Values, Physiological Condition of Bears, and the Ability of the Habitat to Sustain a Population Density Necessary to Achieve Viable Population Size. (S35)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research to Determine the Effects of Various Road Densities on Grizzly Bear Habitat Use and Human-caused Bear Mortality. (S36)

This research is being conducted by cooperating agencies. Results to be used by management agencies to judge the effectiveness of management policies. Policies should be adjusted as necessary when research demonstrates the need to do so.

Conduct Research on the Effects of Habitat Fragmentation Caused by Human Activities, such as Modification of Cover Type, Roadbuilding, and Human Residences, in order to Assess the Possibility of Linkage between Grizzly Bear Ecosystems and between Habitat Tracts within Ecosystems. (S37)

This research is being conducted by the U.S. Fish and Wildlife Service in cooperation with various Federal and State land management agencies, local governments, and the public. Results may be useful to developing long-term cooperative land management planning to include both public and private sectors.

Evaluate the Applicability of PVA to Grizzly Bear Recovery. (S38)

The PVA are based on theoretical biological models of a species reproduction, survival, and genetic interchange and stability through time. The PVA studies have been utilized sometimes in identifying possible population numbers that may contribute to long-term species survival. The applicability of a PVA study to grizzly bear recovery should be evaluated.

Monitor Populations and Habitats. (S4)

Population monitoring is necessary to determine the status of the population and to assess the success of conservation efforts associated with recovery. An increasing population validates ongoing management efforts, while a decreasing population indicates a failure to address problems facing the population.

Monitor Populations Before, During, and After Recovery. (S41)

Develop and apply techniques to ensure the population is carefully monitored.

Develop and Conduct an Intensive Monitoring System to Measure the Annual Number of Females with Cubs, Family Groups, and Number of Human-caused Mortalities. (S411)

The method is detailed in S11 and S111.

Develop a System of Responsibilities to Collate, Analyze, and Report Annual Information on Population Data. (S412)

The system is detailed in S112.

Standardize Observation Report Forms and Methods, and Develop Training Methods for all Persons involved in Reporting Sightings of Females with Cubs and Family Groups. (S413)

Reporting system detailed in S112. Training methods should involve identification materials to enable individuals involved to be able to identify the bear species seen or to be able to report unknown species. Training methods should be distributed to all agency reporting personnel and should be formally presented in training sessions to seasonal and staff personnel at the beginning of each field season in order to ensure quality observation data.

Monitor Relocated Bears in order to Assess the Success of Nuisance Bear Management. (S414)

The probability of having nuisance bears at such low bear densities is slight; however, if a bear should become a nuisance such bears should be relocated and monitored.

Monitor Habitats Before, During, and After Recovery. (S42)

Develop and apply techniques to ensure the habitat is carefully monitored.

Develop and Apply the CEA Process to Allow Monitoring of Effects of Management Actions over a Large Geographic Area of Habitat. (S421)

The CEA should be completed, thoroughly evaluated, and refined. If applicable, it can be applied to assist in judging the suitability of ongoing management actions. Development of CEA requires five phases (1) data base compilation, (2) software development, (3) testing/validation, (4) development of mortality submodel, and (5) development of thresholds. Biologists' interpretation of data and output should be a continual part of the CEA. The CEA is currently at the testing/validation stage where data bases are complete. Results of CEA testing and validation in the YGBE will facilitate its use in other grizzly bear ecosystems.

Complete Habitat Mapping of the Recovery Zone and Digitize these Data so they are Available for Use by the CEA. (S422)

Habitat mapping should be standardized and completed in a format compatible with the CEA. Updating of these habitat maps should be programmed every 5 years, or as necessary.

Establish a Threshold of Minimal Habitat Values to be Maintained within each CEA Unit in order to Ensure that Sufficient Habitat is Available to Support a Viable Population. (S423)

The threshold value or series of values are the benchmarks used in conjunction with the CEA to judge that ongoing actions in grizzly habitat have not degraded the value and/or availability of the habitat to bears. The objective of determining thresholds is not to establish and maintain minimal values, but to establish a measure of the level of ongoing change in the habitat. Management should attempt to manage habitat above threshold values. Maintenance of habitat values above the threshold values allows greater environmental flexibility for bears and will benefit recovery.

Threshold values are unknown at this time. Development of the threshold value should be based on the best available biological data on the habitat needs and biology of the grizzly bear. It should be based on the assumption that environmental diversity is necessary for bear survival, especially in years of food shortage due to environmental conditions (i.e., years of berry crop failure).

Apply CEA to each BMU to Ensure Habitat Quality is Sufficient for Maintenance of a Viable Population and to Monitor Changes in Habitat as a Result of Human Activity. (S424)

As CEA becomes applicable in the SE, it should be applied every 5 years to each BMU to monitor changes in habitat quality and availability as a result of human activities and natural processes such as fire and plant succession. Deviations below the desired threshold level will require reanalysis of human activities in the BMU to ensure reattainment of the threshold level. Primary responsibility for CEA application lies with the ecosystem data base coordinator.

Report Management Activities Successfully used to Manage Habitat. (S425)

This should be completed as part of the ongoing business of the management agencies, the Northwest Ecosystems Management Subcommittee, and the Recovery Coordinator.

Develop a Conservation Strategy to Outline Habitat and Population Monitoring Mechanisms that will Continue in force after Recovery. (S426)

This should be completed as population status data indicate attainment of the recovery targets. This conservation strategy should detail the habitat and population monitoring structures in the SE that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population monitoring will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy must be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Manage Populations and Habitat. (S5)

Apply the best management techniques to ensure recovered populations.

Manage Populations and Habitats prior to Recovery on Federal Lands. (S51)

Refine Procedures for Relocating or Aversively Conditioning Nuisance Grizzly Bears. (S511)

Develop and coordinate procedures to expedite the relocation of nuisance bears and review and update interagency agreements. Relocate bears within 24 hours and continue search for new release areas. Research and develop methods to deal with problem bears, and test and develop aversive conditioning of bears, if possible. Evaluate the effects of relocated nuisance bears on resident bears in relocation areas. Refine the Guidelines as necessary.

Develop and Test Procedures to Relocate Bears from one Area into Another for Demographic or Genetic Purposes. (S512)

Develop and coordinate interagency agreements and procedures for the introduction of grizzly bears into areas where the populations are in need of additional bears for demographic and/or genetic reasons. This procedure is necessary to increase the number of breeding females in some areas such as the CYE. Using nuisance bears for this purpose should not be permitted. Sources of bears should be ecosystems with larger populations that are not isolated breeding units. Responsibility for this effort lies with the Coordinator in cooperation with other agencies. Cooperation of agencies involved in management in the SE, as necessary, should aid the development of these techniques.

Apply Interagency Grizzly Bear Management Guidelines prior to Recovery that Maintain or Enhance Habitats. (S513)

By applying the Guidelines agencies should ensure that land use activities are conducted in a manner that is compatible with grizzly bear requirements for space and habitat, and minimizes the potential for human/bear conflicts. Ensure that road density guidelines are phased within grizzly bear habitat.

Manage Populations and Habitats on Private and State Lands. (S52)

Develop and apply management guidelines prior to recovery that maintain or enhance habitats. Recommend land use activities compatible with grizzly bear requirements for space and habitat; minimize potential for human/bear conflicts. Implement cooperative efforts with State lands agencies

and private landowners to incorporate standards similar to the Guidelines and road density guidelines in order to ensure that management actions will be sensitive to grizzly bear habitat needs. Cooperative efforts between State and Federal land management agencies should facilitate this. This is especially important in the SE because of the large area of State-managed habitat within the recovery zone.

Develop and Implement a Conservation Strategy that Outlines all Habitat and Population Regulatory Mechanisms in Force after Recovery. (S53)

Demonstrate the existence of adequate regulatory mechanisms after recovery. Provide guidelines for the continuation of habitat and population management upon recovery of the grizzly bear population in the ecosystem through the creation of a SE conservation strategy. This conservation strategy should detail the habitat and population management structures in the SE that will be in place after removal of the species from the threatened species list in this ecosystem. The conservation strategy should ensure that proper habitat and population management will remain in place to ensure that the species will remain recovered without protection under the Act. The conservation strategy must be finalized and signed by all agencies prior to any consideration of delisting the species. Its existence should demonstrate the existence of adequate regulatory mechanisms as required by section 4(b) of the Act.

Develop and Initiate Appropriate I&E Programs. (S6)

Reducing human-induced mortalities is a major factor in effecting the recovery of the grizzly bear. Therefore, it is crucial to the recovery effort that the public understand reasons for actions in order to generate tolerant or favorable attitudes toward the bear. The IGBC has appointed an I&E subcommittee to develop education programs and disseminate information. Private conservation organizations interested in the recovery of grizzly bears could be of assistance if they would include appropriate information in their publications and news releases.

Evaluate Public Attitudes toward Grizzly Bear Management, Habitat Protection and Maintenance, Land Use Restrictions, Mitigating Measures, Relocation of Bears, Hunting, Nuisance Bear Control Actions, and Habitat Acquisition or Easement. (S61)

Public attitudes are a major part of the success or failure of grizzly bear recovery efforts. Understanding of these attitudes and the basis for public sentiment is important. Carefully designed research surveys by qualified scientists experienced in such sampling should be initiated. The management subcommittee members should formulate the basic questions and attitudes of interest. The data should be useful in designing public outreach programs to foster public support for recovery programs.

Formulate Ways to Improve Public Attitudes about Grizzly Bears and the Grizzly Bear Recovery Program. (S62)

Agencies should use the data on public attitudes to formulate public relations and I&E programs through the respective I&E offices of each agency and the I&E subcommittee of the IGBC. Agencies having the authority and responsibility for control actions should institute and carry out I&E programs to inform citizens having problems with grizzly bears of the appropriate procedures and contacts for assistance.

Implement the Recovery Plan through Appointment of a Recovery Coordinator. (S7)

The Fish and Wildlife Service has appointed a Recovery Coordinator to collate all relevant information on grizzly bears, and to coordinate and stimulate compliance and action to implement the recovery plan. The Coordinator should submit progress reports and conduct workshops and meetings as necessary. This position provides a central focus for the accumulation, exchange, and dissemination of information, and a central point for multi-agency coordination that will aid in the judicious use of resources and materially enhance the recovery effort.

Revise Appropriate Federal and State Regulations to Reflect Current Situations and Initiate International Cooperation. (S8)

Ensure consistent, up-to-date regulations and maintain international cooperation and communication with all other countries where brown bears are being managed.

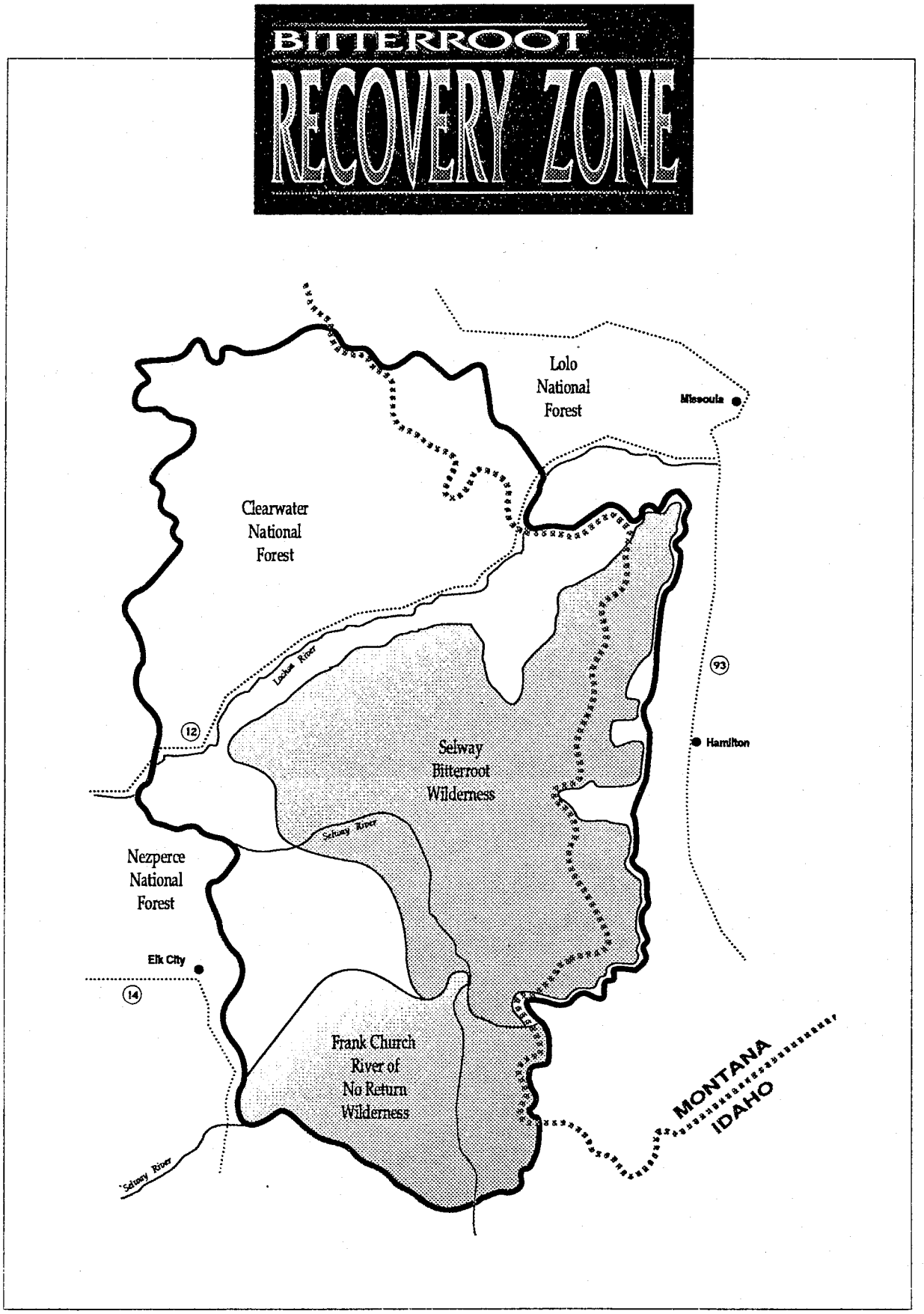
Revise Federal and State Regulations as Necessary. (S81)

The Coordinator should initiate the revision of Federal regulations through the *Federal Register* and CFR. The Coordinator should assist States in regulation revisions as necessary. Regulations should be revised to ensure regulatory adequacy. These regulations include CFR regulations and national forest and national park regulations regarding sanitation. State regulations involved include regulations on the taking of bears and management of hunting.

Coordinate and Exchange Information and Expertise with Canada and other Countries Concerning Bear Research and Management. (S82)

This will increase information exchange of the state-of-the-art in bear research and management and will promote international cooperation and improve management and recovery efforts. All IGBC member agencies and the Coordinator should exchange information and expertise concerning recovery activities with Canada and other countries managing bears. International cooperation is critical to the success of the grizzly bear recovery effort. Four grizzly populations span the U.S./Canada border, and the cooperation and involvement of Canadian management authorities should facilitate conservation of grizzlies in the U.S. Management authorities from British Columbia and Alberta need to be full participants in all aspects of the recovery program. Research conducted in Canada on grizzly bears is applicable to situations in the U.S.; cooperation in funding such research, cooperative efforts involving personnel from both countries, and sharing of research results is vital. Joint U.S./Canadian management of bears and bear habitat is necessary for the four ecosystems that lie along the U.S./Canada border. Cooperative international management plans should be developed for each ecosystem along the border incorporating concerns about the continued maintenance of habitats and populations. Such plans should be developed and accepted by agencies on both sides of the border.

International communication on bears and bear management is necessary to the success of the recovery effort. Many of the management problems and considerations facing the threatened grizzly bears in the U.S.—such as insular populations, small population size, conflicts with timber harvest and livestock grazing, genetic concerns relating to small population size, movement of bears from one area to another—are also of concern to managers and researchers in other countries. Many of the problems facing bears must be addressed soon, and the sharing of information will assist in rapid transfer of technology and techniques among all those managing bears. The Recovery Coordinator should facilitate cooperation and international communication and provide information gained to managers and researchers as necessary.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Selway River
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Frank Church
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Wilderness
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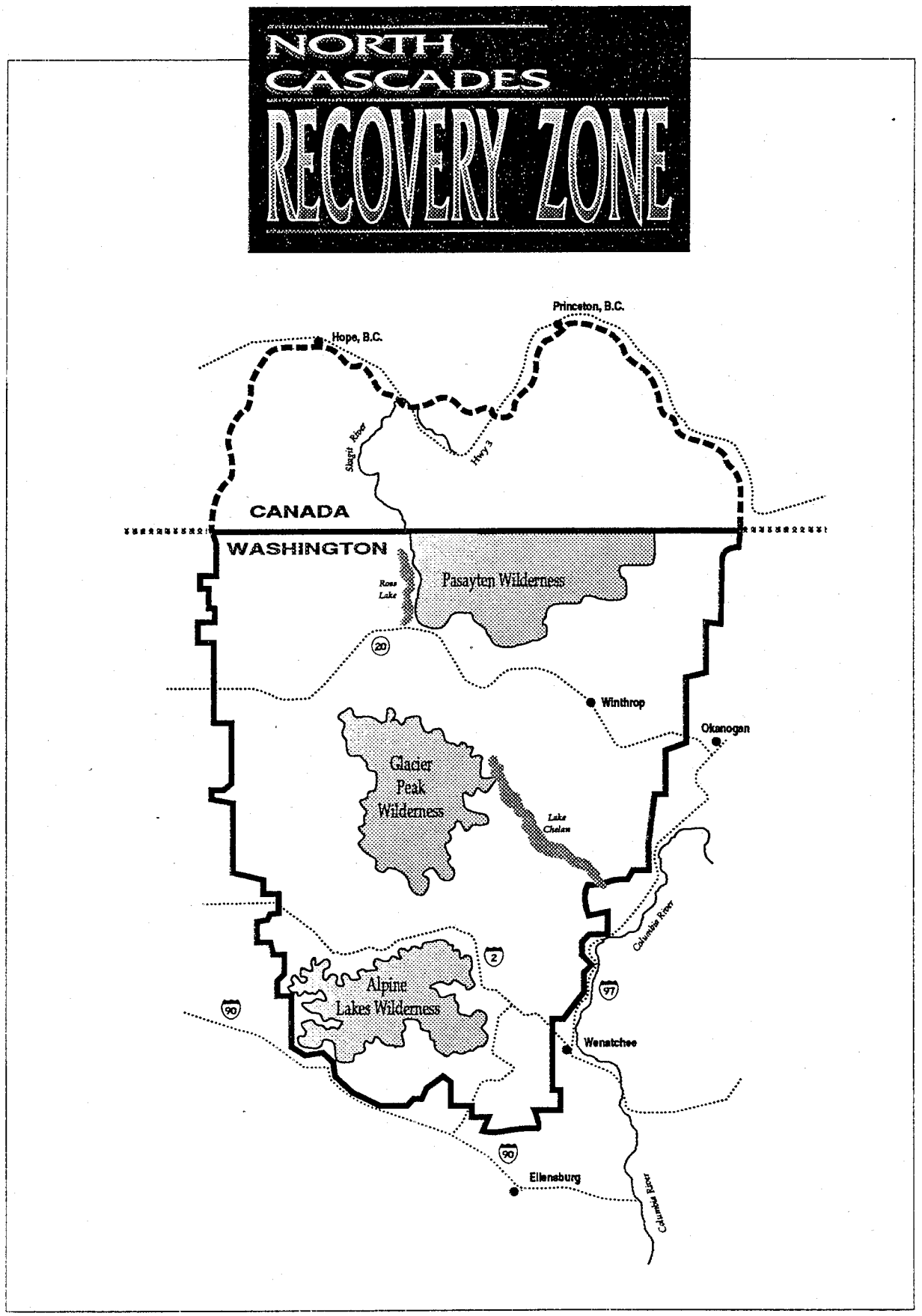
IDAHO
Selway River

Figure 12.


NORTH
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Princeton, B.C.
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Pasayten Wilderness
20
Winthrop
Okanogan
Glacier Peak Wilderness
Lake Chelan
Columbia River
2
97
Alpine Lakes Wilderness
90
Wenatchee
90
Ellensburg
Columbia River

Figure 13.

Bitterroot and North Cascade Grizzly Bear Recovery Zone

Subgoal: Develop the planning documents necessary to recovery the grizzly bear in the Bitterroot Mountains of Idaho and Montana (BE) and the North Cascade Mountains of Washington (NCE). (figures 12 and 13). Planning documents should be prepared for the North Cascades and the Bitterroot areas by interagency working groups during 1992 and 1993, and submitted to the Northwest Ecosystems Management Subcommittee for approval by 1994. These planning documents should follow the form and detail of the recovery chapters in this plan for each of the existing ecosystems. Public input should be sought throughout the development of these plans. Once these documents are completed, they should be appended to the grizzly bear recovery plan.

Evaluation of the Potential for Grizzly Bear Recovery in the San Juan Mountains and Other Possible Recovery Areas Throughout the Historical Range of the Grizzly Bear

Subgoal: Evaluate the feasibility of grizzly bear recovery in the San Juan Mountains of Colorado and other potential recovery areas throughout the historical range of the grizzly bear. This analysis should focus on habitat values, size of the areas, human use and activities in general, relation to other areas where grizzly bears exist, and historical information. This analysis is expected to take 5 years, at which time a report should be presented to the IGBC.

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PART 4

IMPLEMENTATION SCHEDULE

Implementation Schedule

The implementation schedule that follows outlines actions and costs for the recovery program. It is a guide for meeting the objectives elaborated under the recovery section of this plan. This schedule indicates task priorities, task number, task description, duration of tasks ("ongoing" denotes a task that once begun should continue on an annual basis), the responsible agencies, and lastly, estimated costs. These actions, when accomplished, should bring about the recovery of the grizzly bear and protect its habitat. No costs were identified for a task if the work on the task is not planned during the upcoming 3 years. Costs outlined in this implementation schedule are estimated annual costs for implementing each task in general. They are not meant to represent cost to a specific agency or program.

Priorities in column one of the following implementation schedule are assigned as follows:

1. Priority 1—all actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

2. Priority 2—an action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

3. Priority 3—all other actions necessary to provide for full recovery of the species.

Key to Acronyms used in Implementation schedule

BLM	-	Bureau of Land Management
FS	-	Forest Service
ES	-	Fish and Wildlife Service, Ecological Services
IGBC	-	All IGBC Agencies (Fish and Wildlife Service, Forest Service, Bureau of Indian Affairs, Bureau of Land Management, Idaho Department of Fish and Game, Montana Department of Fish, Wildlife and Parks, National Park Service, Washington Department of Wildlife, Wyoming Department of Fish and Game, British Columbia, Alberta and Tribes)
LE	-	Fish and Wildlife Service, Law Enforcement
NPS	-	National Park Service
U	-	Universities

Grizzly Bear Recovery Plan Implementation Schedule

Priority	Task	Task Description	Task Duration	Responsible Party: FWS Region	Responsible Party: FWS Program	Other Agency	Cost Estimates (in $1,000's) FY-01	FY-02	FY-03	Comments
1	11	Determine population monitoring methods and criteria.	Complete	6,1	ES	IGBC				
1	112	Establish reporting procedures and systems to gather and evaluate information on populations.	Complete	6,1	ES	IGBC				
1	12	Determine current population conditions.	Ongoing	6,1	ES	IGBC	300	300	300	
1	131	Identify human sources of direct mortality.	Complete	6,1	ES	IGBC				
1	132	Identify sources of indirect mortality.	Complete	6,1	ES	IGBC				
1	133	Determine effects of human activities.	Ongoing	6,1	ES	IGBC	60	60	60	
1	2111	Coordinate State, Federal, Tribal law enforcement.	Ongoing	6,1	ES	IGBC	10	10	10	
1	2112	Reduce mistaken-identity killing by big game and black bear hunters.	Ongoing	6,1	LE, ES	IGBC	15	15	15	
1	2113	Investigate and prosecute illegal killing of grizzly bears.	Ongoing	6,1	LE	IGBC	—	—	—	Included in Tasks 21 and 2111
1	21141	Increase efforts to clean up carrion and other attractants.	Ongoing	6,1	ES	IGBC	80	80	80	
1	21142	Reduce losses due to mis-handling of bears during research and management actions through development of a bear handling manual.	Complete	6,	ES					
1	21143	Reduce losses due to predator and rodent control.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs

Grizzly Bear Recovery Plan Implementation Schedule (Continued)

Priority	Task	Task Description	Task Duration	Responsible Party: FWS Region	Responsible Party: FWS Program	Other Agency	Cost Estimates (in $1,000's) FY-01	FY-02	FY-03	Comments
1	21144	Ensure that control of nusiance bears is accomplished according to 50 CFR 17.40 and the Guidelines.	Ongoing	6,1	ES	IGBC	100	100	100	
1	21145	Reduce losses by developing and implementing public education and awareness programs.	Ongoing	6,1	ES	IGBC	80	80	80	
1	221	Apply the Guidelines on Federal lands to make domestic live-stock grazing compatible.	Ongoing	6,1	ES	FS,BLM	—	—	—	Part of ongoing agency programs
1	222	Apply the Guidelines on Federal lands to make timber harvest and road building compatible.	Ongoing	6,1	ES	FS,BLM	—	—	—	Part of ongoing agency programs
1	223	Apply the Guidelines on Federal lands to make mining, oil and gas exploration and development compatible.	Ongoing	6,1	ES	FS,BLM	—	—	—	Part of ongoing agency programs
1	224	Apply the Guidelines on Federal lands to make recreational acti-vities compatible.	Ongoing	6,1	ES	FS,NPS BLM	—	—	—	Part of ongoing agency programs
1	225	Coordinate with State and county governments to encourage consideration of grizzly bear habitat needs.	Ongoing	6,1	ES	IGBC	100	100	100	
1	226	Monitor the cumulative effects of management actions in grizzly habitat.	Ongoing	6,1	ES	IGBC	350	350	350	FS lead
1	31	Define the recovery zone within which the grizzly bear will be managed.	Complete	6,1	ES	IGBC				
1	32	Identify agency management stratification within the recovery zone.	2 Years	6,1	ES	IGBC	50	50	—	Complete for NCDE, SE, YE, CYE Incomplete in North Cascades and Bitterroot

Grizzly Bear Recovery Plan Implementation Schedule (Continued)

Priority	Task	Task Description	Task Duration	Responsible Party: FWS Region	Responsible Party: FWS Program	Other Agency	Cost Estimates (in $1,000's) FY-01	FY-02	FY-03	Comments
1	36	Conduct research on effects of road densities.	Ongoing	6,1	ES	IGBC	250	250	250	
1	411	Develop a population monitoring system.	Complete	6,1	ES	IGBC				
1	412	Develop a system of responsibilities to collate, analyze and report annual information on population data.	Complete	6,1	ES	IGBC				
1	413	Standardize reporting forms and methods.	Complete	6,1	ES	IGBC				
1	423	Establish a threshold of minimal habitat values to be maintained.	1 Year	6,1	ES	IGBC	80	—	—	
1	512	Develop and test procedures to relocate bears for demographic or genetic purposes.	Ongoing	6	ES	FS,NPS	150	150	150	
1	513	Apply the Guidelines to maintain and enhance habitat.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs.
1	61	Evaluate public attitudes towards grizzly bears.	2 Years	6,1	ES	IGBC	80	80	—	
1	62	Formulate ways to improve public attitudes about grizzly bears.	Ongoing	6,1	ES	IGBC	—	—	—	To be done after Task 61 is completed.
1	7	Implement the plan through appointment of a Grizzly Bear Recovery Coordinator.	Ongoing	6	ES		340	340	340	
2	212	Appoint a grizzly bear mortality coordinator.	Complete	6,1	ES	MFWP				
2	33	Conduct research to determine extent of grizzly bear range.	Ongoing	6,1	ES	IGBC	240	240	240	Complete for NCDE, SE, YE, CYE Incomplete in North Cascades and Bitterroots
2	35	Conduct research to determine the relationship between habitat values, physiological condition, and population viability.	5 Years	6,1	ES	FS,U	60	60	60	Washington State University lead

Grizzly Bear Recovery Plan Implementation Schedule (Continued)

Priority	Task	Task Description	Task Duration	Responsible Party: FWS Region	Responsible Party: FWS Program	Other Agency	Cost Estimates (In $1,000's) FY-01	FY-02	FY-03	Comments
2	37	Conduct research on effects of habitat fragmentation.	Ongoing	6,1	ES	IGBC	265	265	265	Include linkage zone studies
2	421	Develop and apply the CEA.	Ongoing	6,1	ES	IGBC	600	600	600	
2	422	Complete habitat mapping.	Ongoing	6,1	ES	FS, NPS	550	550	550	FS estimates of cost
2	424	Apply CEA analysis to each bear management unit.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs
2	426	Develop a Conservation Stratedy that outlines population and habitat monitoring.	Ongoing	6,1	ES	IGBC	66	66	66	
2	81	Revise Federal and State regulations as necessary.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs
2	82	Coordinate and exchange information with Canada and other countries.	Ongoing	6	ES	IGBC	—	—	—	Included in Task 7
3	23	Coordinate activities on readdressing population limiting factors and monitor compliance with Recovery Plan.	Ongoing	6,1	ES	IGBC	60	60	60	Included in Task 71
3	34	Conduct research to determine habitat use, food habits, home range size, etc.	Ongoing	6,1	ES	IGBC	240	240	240	
3	38	Evaluate applicability of PVA.	Ongoing	6,1	ES	IGBC	10	10	10	
3	414	Monitor relocated bears.	Ongoing	6,1	ES	IGBC	10	10	10	
3	425	Report management activities.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs
3	511	Refine procedures for relocating or aversively conditioning nuisance bears.	Ongoing	6,1	ES	IGBC	10	10	10	
3	52	Manage population and habitat on private and State lands.	Ongoing	6,1	ES	IGBC	—	—	—	Part of ongoing agency programs.
3	53	Develop a Conservation Strategy that outlines population and habitat regulatory mechanisms.	Ongoing	6,1	ES	IGBC	—	—	—	Included in Task 426.

Appendix A

Selected Pages from the Interagency Grizzly Bear Guidelines

Selected Pages from the Interagency Grizzly Bear Guidelines

I. Introductions

The Endangered Species Act (ESA) (P.L. 93-205) requires special protection and management on Federal lands for the grizzly bear (*Ursus arctos horribilis*), a threatened species. Federal and State personnel cooperatively developed guidelines for grizzly protection and management in National Forests, National Parks, and Bureau of Land Management lands in the grizzly bear ecosystems in compliance with ESA.

II. Background

On August 1, 1975, the grizzly bear south of Canada was determined to be a threatened species by the Secretary of Interior under ESA authority. This determination required Federal agencies to:

1. Utilize their authorities to carry out conservation programs for listed species;
2. Insure that their activities not jeopardize the continued existence of a listed species; and,
3. Insure that their activities not jeopardize the continued existence of a listed species; and,

III. Policy

A. Park Service Grizzly Bear Policy

Management policy of the National Parks are designed to:

1. Restore and maintain the natural integrity, distribution and behavior of bears in the parks.
2. Provide for visitors to understand, observe and appreciate bears,
3. Provide for visitor safety by minimizing bear/human conflict by reducing human-generated food sources and by regulating visitor distribution.

Specifically, the Park Service will identify, within Park boundaries, grizzly habitat requirements. As necessary, the Service shall control visitor use and access to such habitat, including closure to entry for other than official purposes. Active management programs, where necessary, will be carried out to perpetuate the national distribution and abundance of grizzlies and the ecosystems on which they depend, in accordance with existing Federal laws. The Service will cooperate with the Fish and Wildlife Service, which is recognized as the lead agency in matters pertaining to threatened or endangered species. Management actions for the protection and perpetuation of grizzly bear shall be incorporated into the resources management plan for the pertinent National Parks. The Bear Management Programs will compliment and supplement these Guidelines.

B. Forest Service Grizzly Bear Management Policy

The Forest Service (FS) is committed to helping achieve recovery of the grizzly bear by carrying out active conservation programs in close cooperation with the States, U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, and other agencies and groups.

The principal role for the Forest Service is to manage the habitat on the National Forests in a way that recovery can be accomplished. In helping to achieve recovery, the FS will establish and implement uniform planning and management procedures including:

1. A grizzly bear habitat mapping and cumulative effects analysis process (a tool for assessing effects of land management activities in time and space on occupied grizzly bear habitat.)
2. The resource management guidelines and grizzly management situations as established in the "Interagency Grizzly Bear Management Guidelines" (Guidelines).

3. Quantification of recovery objectives in Forest Plans including: (a) the amount of habitat needed for recovery, expresses as habitat capability when possible, and (b) objectives to decrease preventable human-caused mortalities.

The FS will emphasize actions which contribute toward conservation and recovery of the bear within areas identified in the Grizzly Bear Recovery Plan. Objectives are to maintain and enhance habitat and to minimize potential for grizzly-human conflicts. The FS will manage habitats essential to bear recovery for multiple land use benefits, to the extent these land uses are compatible with the goal of grizzly recovery.

Land uses which cannot be made compatible with the goal of grizzly recovery, and are under FS control, will be redirected or discontinued. Management guidelines and objectives, with cumulative effects process, and goals for habitat compatibility and mortality will be used to guide activities which are compatible with grizzly bear recovery. It is also the policy of the Forest Service to facilitate recreation use in occupied grizzly habitat to the extent that such levels or use are compatible with both human safety and grizzly recovery objectives. Emphasis will be placed on information programs to raise the awareness of National Forest users about proper behavior in grizzly habitat.

Policy on specific grizzly bear issues is found in Forest Service Manual 2670.

IV. Grizzly Bear Management Situations

Five different grizzly management situations are described. All involved National Forest, National Park, and Bureau of Land Management (BLM) lands will be identified by appropriate situations. Each management situation fits a type of land area where unique:

1. Grizzly populations and habitat conditions exist; and,
2. Management direction applies.

Forest Supervisors, Park Superintendents, and BLM Area Managers will identify the different management situations areas in their respective areas of responsibility.

A. Management Situation 1

1. **Population and Habitat Conditions**
   The area contains grizzly population centers (areas key to the survival of grizzly where seasonal year-long grizzly activity, under natural, free-ranging conditions is common) and habitat component needed for the survival and recovery of the species or a segment of its population. The probability is very great that major Federal activities or programs may affect (have direct or indirect relationships to the conservation and recovery of) the grizzly.

2. **Management Direction**
   Grizzly habitat maintenance and improvement (improvement does not apply to Park Service) and grizzly-human conflict minimization will receive the highest management priority. Management decisions will favor the needs of the grizzly bear when grizzly habitat and other land use values compete. Land uses which can affect grizzlies and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated. Grizzly-human conflicts will be resolved in favor of the grizzlies unless the bear involved is determined to be a nuisance. Nuisance bears may be controlled through either relocation or removal but only if such control would result in a more natural free-ranging grizzly population and all reasonable measures have been taken to protect the bear and/or its habitat (including area closures and/or activity curtailments).

B. Management Situation 2

1. **Population and Habitat Conditions**
Current information indicates that the area lacks distinct population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. Habitat resources in Management Situation 2 either are unnecessary for survival and recovery of the species, or the need has not yet been determined but habitat resources may be necessary. Certain management actions are necessary. The status of such areas is subject to review and change according to demonstrated grizzly population and habitat needs. Major Federal activities may affect the conservation of the grizzly bear primarily in that they may contribute toward (a) human-caused bear mortalities or (b) long-term displacement where the zone of influence could affect habitat use in Management Situation 1.

2. **Management Direction**
The grizzly bear is an important, but not the primary, use of the area. In some cases, habitat maintenance and improvement may be important management considerations. Minimization of grizzly-human conflict potential that could lead to human-caused mortalities is a high management priority. In this management situation, managers would accommodate demonstrated grizzly populations and/or grizzly habitat use in other land use activities if feasible, but not to the extent of exclusion of other uses. A feasible accommodation is one which is compatible with (does not make unobtainable) the major goals and/or objectives of other uses. Management will at least maintain those habitat conditions which resulted in the area being stratified Management Situation 2. When grizzly population and/or grizzly habitat use and other land use needs are mutually exclusive, the other land use needs may prevail in management consideration. In cases where the need of the habitat resources for recovery has not yet been determined, other land uses may prevail to the extent that they do not result in irretrievable/irreversible resource commitments which would preclude the possibility of eventual restratification to Management Situation 1. If grizzly population and/or habitat use represents demonstrated needs that are so great (necessary to the normal needs or survival of the species or a segment of its population) that they should prevail in management considerations, then the area should be reclassified under Management Situation 1. Managers would control nuisance grizzlies.

C. Management Situation 3

1. **Population and Habitat Conditions**
Grizzly presence is possible but infrequent. Developments, such as campgrounds, resorts or other high human use associated facilities, and human presence result in conditions which make grizzly presence untenable for humans and/or grizzlies. There is a high probability that major Federal activities or programs may affect the species' conservation and recovery.

2. **Management Direction**
Grizzly habitat maintenance and improvement are not management considerations. Grizzly-human conflict minimization is a high priority management consideration. Grizzly bear presence and factors contributing to their presence will be actively discouraged. Any grizzly involved in a grizzly-human conflict will be controlled. Any grizzly frequenting an area will be controlled.

D. Management Situation 4

1. **Population and Habitat Conditions**
   Grizzlies do not occur in the area but habitat and human conditions make the area potentially suitable for grizzly occupancy, and the area is needed for the survival and recovery of the species. The probability is very great that major Federal activities and programs may affect the species' conservation and recovery.

2. **Management Direction**
   The grizzly bear is an important potential use on the area. Grizzly habitat maintenance and improvement are important management considerations. Grizzly-human conflict minimization is not a management consideration. Habitat and human conditions making the area suitable for grizzly occupancy will not be degraded pending decisions regarding reestablishment of grizzlies.

E. Management Situation 5

1. **Population and Habitat Conditions**
   Grizzlies do not occur, or occur only rarely in the area. Habitat may be unsuitable, unavailable, or suitable and available but unoccupied. The area lacks survival and recovery values for the species or said values are unknown. Major Federal activities and programs probably will not affect species conservation and recovery.

2. **Management Direction**
   Consideration for grizzly bears and their habitat in other resource related decisions is not directed. Maintenance of grizzly habitat is an option. Any grizzly involved in a grizzly-human conflict will be controlled.

V. Grizzly Bear Management Guidelines

Grizzly management guidelines for each of five resource management systems are listed for each management situation. The guidelines are grouped under the headings

1. Maintain and Improve Habitat;
2. Minimize Grizzly-Human Conflict Potential; and,
3. Resolve Grizzly-Human Conflict.

The heading subjects are the major management objectives.

Guidelines are subject to change as research provides additional data and/or management directives change.

These Guidelines and the attendant Management Stations represent a comprehensive and integrated approach to the goal of grizzly bear conservation. Although the context and direction for management may vary legitimately between Management Situations, management actions and human activities in MS 1 through MS 4 may influence grizzly bear conservation. The value of the Management Situation concept for grizzly bear management is most fully realized with proper stratification and implementation.

Appendix B

Road Management in Grizzly Bear Habitat

Road Management in Grizzly Bear Habitat

The Management of Roads

The management of roads is the most powerful tool available to balance the needs of bears and all other wildlife with the activities of humans. In order to better understand the effectiveness of road management techniques, it is necessary to consider the actual impacts of forest roads on grizzly bears. Bears display varying responses to roads and road activity. In general, increased human access on open roads and continued human use of closed roads have overall detrimental effects on grizzly populations. Roads and road activity allow continued bear mortality risk, increase habituation of bears, and effectively decrease usable habitat (Elgmork 1978, Schallenberger and Jonkel 1980, Brannon 1984, McLellan 1989). The response of individual bears to roads is related to positive or negative associations with the road.

Mortality

Increased grizzly bear mortality is related to habituation or the lack of avoidance by bears of roads and the human activities that occur in association with roads. Bears can develop a positive association to roads because of the ease of travel along roads, including routes in or between important feeding areas. In some areas research has demonstrated that bears often use unpaved secondary roads as travel routes (Smith 1978, Zager 1980) during the night under cover of darkness (McLellan and Shackleton 1988), but also use roads during the daylight hours. Additionally, palatable natural foods and foods planted during management activities, such as clover and grasses, often grow in abundance along roads. These foods provide a strong attractant to bears and also encourage bear use of roads and surrounding habitat. Initially, this may appear beneficial in that it allows more complete habitat use in roaded areas. However, bear use of roads also exposes them to the presence of people and leads to human-bear conflicts and habituation of bears. In general, habituation (or the loss of an animal's natural wariness of humans), is not beneficial to bears. Habituation increases the presence of bears on and along roads, in open areas near roads, and in human-use areas, increasing the vulnerability of these bears to illegal killing. Even in national parks, habituation increases the likelihood of illegal feeding and the probability of a bear becoming a threat to human safety. Many habituated bears in parks must eventually be removed from the wild and/or destroyed. Habituated bears generally experience high mortality rates (Meagher and Fowler 1989).

Mortality is the most serious consequence of roads in grizzly habitat. Research has confirmed that grizzlies experience increased vulnerability to legal harvest and poaching as a consequence of increased road access by humans (Schallenberger 1980, Zager 1980, McLellan and Mace 1985, Aune and Kasworm 1989). McLellan and Mace (1985) found that a disproportionate number of human-caused grizzly mortalities occurred near roads. In Montana, Dood et al. (1986) reported that 48% of all known non-hunting mortalities during 1967-1986 occurred within one mile of roads. Aune and Kasworm (1989) reported 63% of known human-caused grizzly deaths on the east front of the Rocky Mountains occurred within 1 km of roads, including 10 of 11 known female grizzly deaths. Bears are also killed by vehicle collision, the most direct form of road-related mortality (Greer 1985, Knight et al. 1986, Palmisciano 1986).

Habitat Loss

Negative association with roads can decrease habitat use. Negative association arises from bears' fear of vehicles, vehicle noise, other human-related noise around roads, human scent along roads, and hunting and shooting along or from roads. Bears that experience such negative effects learn to avoid the disturbance generated by roads. Such animals are unlikely to change this resultant avoidance behavior even after road closures and the lack of negative reenforcement. Even occasional human-related vehicle noise can result in

continued road avoidance and habitat loss associated with such avoidance. In fact, unpredictable random road use, the kind of use that may occur with administrative use of closed roads, may be even more disturbing to bears that have a negative association with roads. Females who have learned to avoid roads may also teach their cubs to avoid roads. In this way, learned avoidance behavior can persist for several generations of bears before they again utilize habitat associated with closed roads. When roads are located in important habitats such as riparian zones, snowchutes, and shrubfields, habitat loss through avoidance behavior can be significant due to the denial of the resources in these areas to bears.

Recent studies in northwestern Montana reinforce the fact that the presence of even closed roads can affect grizzly populations. Preliminary analyses of grizzly bear research data from the South Fork of the Flathead River show that grizzlies avoided roaded areas even where existing roads were officially closed to public use (Manley and Mace in progress). Females with cubs remained primarily in high, rocky, marginal habitat far from roads. Avoidance behavior by bears of illegal vehicular traffic, foot traffic, and/or authorized use behind road closures may account for the lack of use of areas near roads by female grizzly bears in this area. This research demonstrated that a significant portion of the habitat in the study area apparently remained unused by female grizzlies for several years. Since adult females are the most important segment of the population, this lack of use of both open-roaded and closed-roaded areas is significant to the population. The data from the South Fork of the Flathead River area also showed that the survivorship of the offspring of females that lived in unroaded, high elevation habitat was lower than that recorded in other study areas in the NCDE. The majority of this mortality was due to natural factors related to the dangers of living in steep, rocky habitats. This is important in that the effects of road avoidance may result not only in higher mortality along roads and in avoidance of and lack of use of the resources along roads, but in the survival of young when their mothers are forced to live in less favorable areas away from roads.

Several studies elsewhere indicate that females and family groups avoid roads (Smith 1978, Miller and Ballard 1982). In coastal regions of British Columbia female grizzly bears avoided logging roads and the surrounding area (Archibald et al. 1987). Zager (1980) also believed that avoidance by females with cubs of choice habitats due to the presence of roads was a major concern. Females with cubs displaced into marginal habitat may experience physiological stresses related to decreased nutrient and energy intake, resulting in lower cub survivorship.

Further evidence that grizzlies are often displaced from habitat surrounding roads has been reported by Lloyd and Fleck (1977), Schallenberger and Jonkel (1980), Brannon (1984), Aune and Kasworm (1989), and Kasworm and Manley (1990). Aune and Stivers (1985) reported that bears avoided open roads and surrounding corridors even when the area contained preferred habitat. In southeastern British Columbia, grizzly bears were found to avoid areas within 100 m of roads resulting in a 58% loss of functional habitat within these areas (McLellan and Shackleton 1988). McLellan and Mace (1985) estimated that 8.5% of the total study area in southeastern British Columbia was made incompatible for grizzly use because of roads.

Grizzly populations in different areas show varying reactions to road stimuli. Non-habituated bears in direct view of roads and vehicles generally flee, whereas those in protective cover are less affected (McLellan and Mace 1985, McLellan 1990). Although they may become agitated, those bears in park populations and other areas frequented by human activity are generally more habituated to humans and show less reaction to road activity. Avoidance and flight are obvious responses to stress, however stress can also manifest itself with increased heart and respiration rates even in animals that show no outward reaction (Geist 1971). Additionally, changes in type of vehicles, road stimuli, or in the typical amount of road activity can invoke flight response even in habituated bears. In Yellowstone National Park, individual age and sex classes of bears were impacted differently by roads (Mattson et al. 1987). Subadults and females were most often

located near roads. Although the motivations for such behavior are not clear, subadults and females were perhaps displaced into roaded, marginal habitat by dominant bears. Displacement into or use of habitat less secure from humans can result in increased mortality for all age classes.

Management Options

Several national forests manage habitat that is considered essential to grizzly recovery and is designated as Management Situation I (MS1) (U.S.F.S. 1985). In MS1 areas, decisions will favor the needs of the grizzly bear when grizzly habitat and other land-use values compete. Land-uses which can affect grizzlies and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated (U.S.F.S. 1985). In MS2 areas, land-uses will be made compatible with grizzly needs when possible, but not to the exclusion of other land-use activity. Several forests have adopted, among other protective measures, open road density standards ranging from 0.75 to 1.0 mile of open road per square mile within MSI. Open road densities are calculated in "compartments", or "analysis areas" of 5,000 to 15,000 acres. National forests have adopted a wide range of road management policies in an attempt to address the negative effects of roads on grizzly populations in MS1 areas. The following road density standards or road management policies for MS1 areas (as identified in existing forest management plans) currently being implemented by various forests are:

Grizzly Bear Ecosystem	Forest	Management
YGBE	Gallatin	80% of elk habitat effectiveness (Lyon 1979)
	Targhee	Manage for no net gain in open road density
NCDE	Flathead	1.00 mi. open road / sq. mi.
CYE	Kootenai	0.75 mi. open road / sq. mi.
	Lolo	0.80 mi. open road / sq. mi. (approx.)
SE & CYE	Idaho Pan.	Maintain 70% of MS1 Habitat with no open roads. No road density standard.

Management of road density does not usually include the consideration of the amount of use the roads receive. McLellan (1989) reported high densities of bears concurrent with high open road density in southeastern B.C. However, his study area contains minimal permanent human settlement and is relatively remote, for the most part being more than 60 km from paved roads and towns. Except during hunting seasons, roads in this area receive very low use. Areas with similar road densities in most areas of Montana, Idaho, Wyoming, and Washington would likely be much nearer to paved roads and human settlement, and would likely receive considerably higher use. Proximity to human population centers and ease of access are primary concerns when considering the impacts of roads on grizzly bear populations. The Flathead National Forest has attempted to account for road use by ranking roads according to level of use.

Permanent or seasonal road closures provide intuitive solutions to many of the problems posed by roads. However the closing of existing roads can be difficult. Public education and strong enforcement are essential

to road closure programs. The public often exerts pressure to keep roads open once they are built and the effectiveness of road closures varies. Roads closed to public use through the use of only signs or gates are often not effective (Zager and Jonkel 1983). Funding and personnel necessary to maintain road closures and enforce regulations are rarely adequate, resulting in limited closure effectiveness. Roads closed with substantial physical barriers are more effective in prohibiting vehicular traffic, but are still often accessible by motorized all-terrain vehicles (ATVs), mountain bikes, and motorcycles. Also, long-distance visual access along roads in the forest environment is enhanced even beyond gates or other barriers because the road provides a visual pathway through the forest.

Administrative use often continues behind gates on roads although such roads are considered "closed" in road density calculations. A recent U.S. Forest Service proposal defines a "closed" road as one which is closed to public use and receives no more than 5 round trip administrative vehicular trips per week. A bear however, does not differentiate between agency and public use. To a bear that exhibits avoidance of road activity, a closed road receiving administrative use may be no different than an open road. Such bears will also avoid administratively used roads. Direct risk of mortality associated with administrative use is probably low, but continual administrative access directly contributes to habituation and a false sense of security for bears in areas which also contain open roads.

Current road closure policies in many areas do little to minimize the negative impacts of roads to grizzly bears. The two major impacts of roads that occur with either public or administrative use are 1) mortality along roads due to habituation and increased vulnerability and 2) avoidance of habitat due to the presence of roads, associated vehicle noise, and human activity.

In summary, public disregard of road closures, as well as continual administrative use, often reach such levels that the intent and objectives for the closures are no longer being met. These roads still receive substantial levels of human use and cannot legitimately be considered "closed" for their effects on bears when calculating the open road densities.

Recommendations for Road Management in Grizzly Habitat

A biologically sound and consistent definition of what constitutes an open road and a closed road is fundamental to road management. Based on the information presented above, the following definitions for roads are recommended for the management of grizzly bear habitat:

CLOSED ROAD: A closed road is any constructed or evolved route previously used by motorized four-wheeled vehicles, which is closed to public motorized use by gates and other methods. Total administrative use by motorized vehicles should be restricted to one or two periods that together should not exceed 14 days during the time bears are out of the den (usually between April 1 and November 15). Restricting administrative use to one period reduces the possibility of habituation of bears to roads, and reduces the displacement of bears from habitat because of random or periodic disturbance. When roads are not required for administrative use, or after all administrative activities are complete, it is recommended that closures be made more effective by, for example, building kelly humps or tank traps, piling logs, stumps, debris, and/or slash across the entire road grade, or physically obliterating the passageway and replanting vegetation. The optimum situation to maintain grizzly bear habitat effectiveness and minimize mortality risk is to obliterate the road.

OPEN ROAD: An open road is any constructed or evolved route that is passable by any type of four-wheel, motorized vehicle and does not meet the requirements for closed road status as described above.

OPEN ROAD DENSITY: It is recommended that open road density in all MSI and MS2 areas within grizzly bear recovery zones be standardized using the best available data. It is further recommended that this standardization be accomplished though a task force of biologists appointed through the IGBC and that these standards be adopted through the NEPA process in land management planning. This standardized approach could take into account ancillary needs for security such as road use, trail use, and the availability and extent of security areas. In the interim prior to NEPA implementation of the task force recommendations, where existing open road densities are currently below 1.0 mile per square mile, it is recommended that these road densities not be exceeded in order to maintain management options .

CURRENTLY UNROADED AREAS: Remaining unroaded areas (as per the unroaded area definition in Forest Plans) within recovery zones can and often do provide important refugia for grizzlies and other wildlife such as elk, and should be considered especially sensitive to further road building. Any unroaded land represents important and unique opportunities to assure adequate habitat and security for grizzly bears and other resource values such as watershed and big game security. Management should seek to maintain these areas as unroaded wherever possible. It is further recommended that all new roads, should they be built, in previously unroaded areas (those areas currently identified as inventoried "roadless" under existing forest plans) be closed to non-official use during the activity, be of low standard, and be obliterated and replanted after management activities are completed.

CALCULATION OF OPEN ROAD DENSITY: Current calculation of road density involves dividing the BMU or compartment area by the number of open miles of road in the compartment. When computer-based habitat monitoring systems using CEA (cumulative effects analysis) are implemented throughout all grizzly bear recovery zones, road density for each BMU or compartment could be calculated using a "moving window" analysis. It is important that consideration be given to the most appropriate method to measure road density because current methods are diverse and in some cases insufficient. The task force appointed by the IGBC to set road management standards should produce recommendations on the most applicable road density calculation method.

Appendix C

Report of the Yellowstone Grizzly Bear Population Task Force April 1988

Report of the Yellowstone Grizzly Bear Population Task Force

Equivalent Population Size for 45 Adult Females

April 5, 1988

Richard Knight, Interagency Grizzly Bear Study Team – Chairman

John Beecham	— Idaho Fish and Game Department
Bonnie Blanchard	— Interagency Grizzly Bear Study Team
Lee Eberhardt	— Battelle Northwest
Lee Metzgar	— University of Montana
Chris Servheen	— U.S. Fish and Wildlife Service
John Talbott	— Wyoming Game and Fish Department

Introduction

The Task Force met on February 9-10, 1988. Present were:

John Beecham, Chairman
Bonnie Blanchard
Lee Eberhardt
Lee Metzgar
Chris Servheen
John Talbott

The objectives of the Task Force as directed by the IGBC at their December 1987 meeting were as follows:

1. Estimate equivalent population size that might be present if there were 45 adult females in the population.

2. Estimate total mortality (natural plus known man-caused and unknown man-caused) that the Yellowstone grizzly bear population could sustain given the existence of 45 adult females.

Methods and Data Used

The Task Force agreed to use the data set beginning in 1975 when the IGBST first started radio-tracking grizzly bears. Data from 1959 to 1973 will no longer be used to directly assess current population conditions because:

1. They were representative of a time when food resources and mortality effects were not similar to current conditions.

2. They were not collected in a similar manner to the current data in type of sampling method or distribution of sampling.

Life tables were constructed for both males and females. The rate of population change (r) was calculated by using a supervisorship schedule for females and the standard Lotka equation, $1=\Sigma e^{-rx} l_x m_x$, and solving for r by iteration.

Survivorship (l_x) schedules were taken from age-specific survivorship rates on bears whose fate was known (Table 1). The overall survivorship figure of 0.85 was used for cubs because of larger sample size and because some litters were not sexed until they were yearlings. This procedure resulted in some cubs being identified as male or female only after having survived a year. Consequently, sexed cubs were, in part, a biased sample. Actual age-specific rates were used from the schedules from cub through 4 years of age. Since sample size begins to decrease in older age classes, ages 5 through 12 and 13 through 22 were pooled and weighted by sample size. Survivorship for ages 5 through 12 was 0.90 for both sexes, and that for ages 13 through 22 was 0.84 for both sexes.

Reproductive rate (m_x) was calculated by multiplying average litter size by proportion of female cubs and dividing by average cycle length.

Average litter size was calculated from the unduplicated sightings of females with cubs from 1975 through 1987. These figures were 169 adult females and 322 female cubs for an average of 1.91.

Table 1. Age-specific survivorship rates of Yellowstone grizzly bears.

	Sample size			Survivorship		
Age	Male	All	Female	Male	All	Female
Cub	24	81	17	0.88	0.85	0.94
1	24	68	20	0.83	0.82	0.80
2	24	43	16	0.63	0.72	0.81
3	23	39	16	0.83	0.85	0.88
4	17	35	18	0.76	0.86	0.94
5	14	29	15	0.93	0.90	0.87
6	15	29	14	0.87	0.86	0.86
7	10	24	14	0.90	0.92	0.93
8	11	24	13	1.00	0.91	0.85
9	7	17	10	0.86	0.88	0.90
10	7	18	11	1.00	1.00	1.00
11	7	15	8	1.00	1.00	1.00
12	6	14	8	0.67	0.79	0.88
13	5	11	6	1.00	0.91	0.83
14	5	10	5	0.60	0.80	1.00
15	3	8	5	1.00	1.00	1.00
16	2	6	4	1.00	0.67	0.50
17	2	4	2	0.50	0.75	1.00
18	1	3	2	1.00	1.00	1.00
19	1	3	2	1.00	0.67	0.50
20	1	3	2	1.00	1.00	1.00
21	1	3	2	1.00	1.00	1.00
22	1	3	2	1.00	0.67	0.50

Knowing that 45 adult females would be based on an average of 15/year (multiplied by 3), the Task Force used a 3-year cycle length.

The Task Force used two sex ratios for litters. We used a sex ratio of 51 males:49 females as indicated by 21 complete litters captured from 1975-87. This was supported by data from zoo litters totaling 1,326 cubs which also had a sex ratio of 51:49.

We also used an alternate cub sex ratio based on total mortality data since sex ratio at death must ultimately equally the sex ratio at birth. Although most of the Task Force contended that males would be overrepresented since their wider ranging movement patterns and heightened aggressiveness brings them into more contact with humans, we agreed to use this alternative to give a reasonable range of estimates. The sex ratio from mortality data was 58:42 based on a sample size of 104 known-sex mortalities of all ages from 1975-87.

Stable age structures for males and females were calculated from the life tables. A stabilized survivorship schedule was obtained by multiplying each original 1_x value by e^{-rx}. These were then summed and each new 1_x value was divided by the sum to obtain the proportion of bears in each age class.

The proportion of males in the population was calculated as:

$$Pm = \frac{R\,C_f}{R\,C_f + C_m}$$

Where R = sex ratio at birth (males/females);

C_f and C_m = proportions of females and males respectively in the stable age structure.

Age classes 5 and above were classified as adults. Using proportions in each category from the stable age structure multiplied by appropriate sex proportion in the population, proportions of subadult males, adult males, subadult females, and adult females were calculated. The equivalent total population corresponding to 45 adult females was then calculated as:

$$\frac{45}{\text{Proportion adult females}}$$

Sustainable mortality was calculated by prorating animals into each age class using the stable age structure and multiplying by respective age-specific mortality rates.

Results and Discussion

Two annual reproductive rates using the two different litter sex ratios were calculated as follows

$$\frac{1.91\ (.49)}{3} = .312$$

$$\frac{1.91\ (.42)}{3} = .267$$

Combining these rates with the survivorship schedule in Table 1 produced rates of population change (r) of 0.0158 and 0.00075, respectively. These two rates, in conjunction with the survivorship schedule, produced stable age structures as shown in Table 2.

Proportion of males in each population was computed as:

for 51:49	R	=	1.041	
	c_m	=	0.1896	gives P_m = .4511
	c_f	=	0.1497	
and for 58:42	R	=	1.381	
	c_m	=	0.1760	gives P_m = .5177
	c_f	=	0.1368	

Table 2. Calculated stable age structures for the Yellowstone grizzly bear population. The proportion in each age (S_x) is calculated as $S_x = 1_x e^{-rx}$

	r = .0158 (49% female cubs) Proportion of each sex in population		r = .00075 (42% female cubs) Proportion of each sex in population	
Age	Male	Female	Male	Female
0	.1896	.1497	.1760	.1368
1	.1587	.1252	.1495	.1162
2	.1296	.0986	.1240	.0929
3	.0804	.0786	.0781	.0752
4	.0657	.0681	.0647	.0661
5	.0491	.0630	.0492	.0621
6	.0440	.0561	.0447	.0562
7	.0394	.0500	.0407	.0508
8	.0353	.0445	.0370	.0459
9	.0316	.0397	.0336	.0415
10	.0283	.0353	.0306	.0376
11	.0254	.0315	.0278	.0340
12	.0227	.0281	.0253	.0307
13	.0190	.0250	.0215	.0278
14	.0159	.0209	.0182	.0236
15	.0133	.0175	.0155	.0200
16	.0011	.0146	.0132	.0170
17	.0093	.0122	.0112	.0145
18	.0078	.0102	.0095	.0123
19	.0065	.0086	.0081	.0104
20	.0055	.0072	.0068	.0089
21	.0046	.0060	.0058	.0075
22	.0038	.0050	.0049	.0064
23	.0032	.0042	.0042	.0054
	.9998	.9998	1.0001	.9998

Then summing, using age class 5 and above as adults (table 2), sex and age classes of the population were calculated as follows:

for 51:49:

Subadult males	=	.6240	(.4511)	=	.2815
Adult males	=	.3760	(.4511)	=	.1696
Subadult females	=	.5202	(.5489)	=	.2855
Adult females	=	.4798	(.5489)	=	.2634

and for 58:42:

Subadult males	=	.5923	(.5177)	=	.3066
Adult males	=	.4077	(.5177)	=	.2111
Subadult females	=	.4872	(.4823)	=	.2350
Adult females	=	.5128	(.4823)	=	.2473

From these data, population size based on 45 adult females was calculated as:

$$\text{Total} = \frac{45}{\text{proportion adult females}}$$

$$\text{for 51:49} = \frac{45}{.2634} = 171$$

$$\text{for 58:42} = \frac{45}{.2473} = 182$$

Therefore, if the data used are representative of the population and the sex and age structure becomes stable, the total population that contains 45 adult females would be about 170-180 bears.

The Task Force calculated the above population could sustain a total annual mortality of 25-30 bears a year. This includes natural, known, and unknown man-caused mortalities. The known and probable man-caused and natural mortality for the period 1975-87 was 127 bears which averages 9.8 known and probable mortalities per year. We do not know what proportion of the total mortalities (human-induced and natural) is represented by the known and probable sample. In the past, known and probable mortalities have been estimated to represent as low a percentage of the total as 50%. The Task Force feels that it is reasonable to assume the above-described population can sustain a known man-caused annual mortality of 11, two of which can be adult females. However, we emphasize that this pertains to a future population level with a stabilized sex and age structure. Until those conditions are realized, adult female mortality should be no more than 1 per year for maximum population growth.

The two rates of change reported here are both positive corresponding to 0.07% and 1.5% annual rates of increase. This is the first time that positive rate of change has been reported during the course of the present study. Much of the improvement can be attributed to increased female survivorship (Fig. 1) during recent

years. Although this is cause for optimism, it is not cause to relax current intensive management efforts since accuracy and precision of these estimates are low and, if really increasing, the population trend could easily return downward with increasing mortality or lower natality.

The Task Force realizes that this projected value of 170-180 bears based on 45 adult females is less than a population estimate of 183-207 made in 1983. The 1983 estimate based on 32 adult females incorporated for less data and necessarily less sophisticated methodology. The minimum number in the 1983 report was 139. This was then extrapolated to the 183-207 figure using two sighting efficiency estimates. We now believe that the application of sighting efficiency estimates cannot be substantiated since there is no way to assess their accuracy and they are therefore little better than guesses. The Task Force thus emphasizes that figures given in this report should not be compared to earlier estimates.

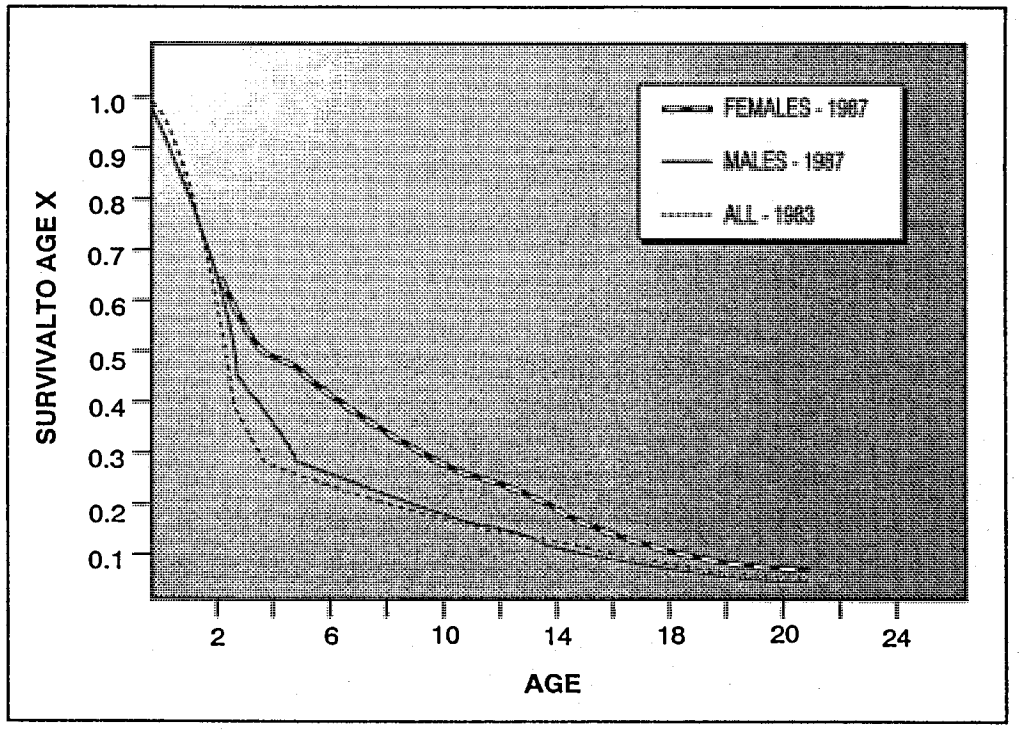

Figure 1. Comparison of grizzly bear survivorship between 1983 and 1987.

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Appendix D

Yellowstone Ecosystem Grizzly Bear Survivorship Table

Yellowstone Ecosystem Grizzly Bear Survivorship Table

Survivorship

Survivorship of marked animals through 1992 is given in Table 5. Both males and females have the lowest chance of surviving their 2-year-old year, the time most young are weaned. Females have a greater chance of surviving after 5 years than they did during 1987.

Table 5. Grizzly bear survivorship by sex and age class

	Sample size			Survivorship		
Age	Male	All	Female	Male	All	Female
Cub	26	112	27	0.88	0.83	0.89
1	27	101	26	0.78	0.84	0.85
2	28	54	23	0.68	0.76	0.83
3	29	54	25	0.86	0.87	0.88
4	27	53	26	0.81	0.85	0.88
	137	374	127	0.80	0.83	0.87
5	26	52	26	0.73	0.81	0.88
6	17	46	29	0.88	0.91	0.93
7	11	39	28	0.91	0.92	0.93
8	15	40	25	1.00	0.93	0.88
9	11	27	16	0.91	0.93	0.94
10	11	30	19	1.00	1.00	1.00
11	11	25	14	1.00	1.00	1.00
12	9	21	12	0.67	0.81	0.92
	111	280	169	0.87	0.91	0.93
13	7	16	9	1.00	0.94	0.89
14	8	16	8	0.75	0.87	1.00
15	6	13	7	1.00	1.00	1.00
16	4	12	8	1.00	0.83	0.75
17	4	9	5	0.75	0.89	1.00
18	4	7	3	1.00	1.00	1.00
19	4	6	2	0.75	0.67	0.50
20	2	4	2	1.00	1.00	1.00
21	2	4	2	1.00	1.00	1.00
22	2	4	2	1.00	0.75	0.50
	43	91	48	0.91	0.90	0.90
All adults:	154	371	217	0.88	0.91	0.92
Survival to age 5:				0.33	0.39	0.49
Total bear years:	291	745	344			

from: Knight et. al (1993)

Appendix E

Major Changes from the 1982 Plan to the 1993 Revised Plan

Major Changes from the 1982 Plan to the 1993 Revised Plan

Delineation of Recovery Zones

The 1982 plan called for the determination of occupied space and habitat to specify the habitat required for the achievement of recovery goals. This term is no longer used because of the difficulty in determining what is occupied habitat. The revised plan includes grizzly bear "recovery zones". Recovery zones are those areas within which grizzly bears and grizzly bear habitat will be managed for recovery and within which population parameters will be monitored. Recovery zones have been established in the Yellowstone, Northern Continental Divide, Cabinet-Yaak, and Selkirk Ecosystems. Grizzly bear recovery zones are currently being delineated in the North Cascades and Bitterroots Ecosystems.

Revised Population Monitoring Methods

The 1982 plan called for the development of population monitoring methods. The revised plan describes a monitoring method which uses three measurable parameters as indicators of population status: 1) number of females with cubs; 2) the number of known human-caused mortalities; 3) the distribution of family groups throughout the ecosystem. These parameters are used to set recovery criteria and targets.

Revised Population Targets

The 1982 plan used population targets including reproductive rate, average litter size, reproductive intervals, and annual total mortality. These parameters are extremely difficult and expensive to measure in a grizzly bear population over many years.

The revised plan relies on targets that are more easily measured on an annual basis. The revised plan seeks to assure a population of adequate size to offset the amount of human-caused grizzly mortality which occurs in that population. The targets in the revised plan include a known minimum number of adult female bears which is used to determine a minimum estimate of the population. This minimum population estimate is used to calculate a conservative limit on known human-caused grizzly mortalities. Each year the limit on annual mortality will change according to the number of adult females known to be alive that year. In contrast, the 1982 plan had a fixed annual mortality limit for each population. The revised plan's floating mortality limit is based on a minimum population size and will allow for increases or decreases in that minimum population. Finally, the revised plan also calls for the distribution of family groups throughout the ecosystem to assure that habitat management throughout the ecosystem is conducive to recovery.

Linkage Zone Assessment

Fragmentation of habitat and the eventual isolation of these fragmented parcels is recognized as a major factor contributing to the demise of wildlife species. The five known grizzly bear populations in the lower 48 states are largely if not completely isolated from each other, although four are contiguous with Canadian bear populations. The 1982 plan did not address the issue of linkage between the ecosystems.

The revised recovery plan includes a discussion of the importance of linkages between grizzly bear ecosystems and identifies problems associated with the fragmentation of habitat within ecosystems. The FWS has initiated a five-year pilot study to assess the fragmentation within ecosystems and the potential for movement of bears between existing ecosystems. Information gained will be used to develop long term habitat conservation strategies to conserve, or restore where possible, the connectivity within and between ecosystems. Such information can be used to develop strategies for public lands as well as cooperative public-private land management efforts.

Conservation Strategy

The revised plan calls for the development of a conservation strategy for each grizzly bear population prior to its delisting. The conservation strategy will be developed through an interagency process and will detail the population monitoring strategies and the population and habitat management measures that will remain in effect after delisting. The strategies detailed in the conservation strategy are intended to ensure that relisting of the population will not be necessary. All participating federal and state agencies will sign the document and agree to its provisions.

Long-term Strategy for Yellowstone Population

The Yellowstone grizzly bear population is the only one of five grizzly populations that is completely isolated from populations in other U.S. ecosystems and Canada. The population has approximately 300 bears. The population's small size and isolation make it vulnerable to the detrimental effects of the loss of genetic diversity, and to environmental and demographic stochasticity. Connectivity between the Yellowstone Grizzly Bear Ecosystem and other grizzly ecosystems is not likely to be realized in the near future because of the distance to other ecosystems and the intervening human development and alteration of landscape. Therefore, the recovery plan recommends that one grizzly be placed into the ecosystem from an outside population every ten years as an effort to maintain the genetic health of the population.

Appendix F

Revised Reporting Rules for Recovery Plan Targets

July 12, 1992

Revised Reporting Rules for Recovery Plan Targets, July 12, 1992

Agreed:

1. Unduplicated females with cubs will be counted inside or within 10 miles of the Recovery Zone line.
2. Females with cubs or family groups in Canada will not be counted toward recovery targets for the NCDE or CYE.
3. Family group sightings/radio locations count towards occupancy targets each time a credible observation is recorded within the Recovery Zone.
4. Occupancy wll be documented only within BMU lines and within the Recovery Zone, except in cases where the monitoring review team makes a special exception and documents the reason for doing so.
5. Sighting data will be summarized by age of offspring to assess the possibility of using female with yearling sightings to backdate to females with cubs.
6. Include females with cubs towards the unduplicated female with cubs even when they loose their cubs (because this is an index that is minimally dependent on marked bears).
7. Mortality of females with offspring will not count as an observation. Only females alive when seen with cubs will be counted toward the unduplicated count for that year.
8. Mortality of adult females ($\geq$ 5 years) will be subtracted from a 3-year running sum of unduplicated females with cubs to estimate the minimum population alive and the resultant 4 percent mortality level.
9. Management relocations count toward unduplicated females with cubs (when with cubs) even though the family group is moved.
10. Management relocations will not count towards BMU occupancy in the old or new location, or subsequent movements. The female would count for occupancy in the next year if sighted again after 1 year from initial relocation date.

Year	New Femael with Cubs NCDE	Old Female With Cubs Inside Recovery Zone	Within 10 Miles of Recovery Zone
1987	29	27	2
1988	25	25	0
1989	38	34	3
1990	14	12	2
1991	21	20	1
1992	22	22	0

These numbers have not yet been calculated for other ecosystems.

Appendix G

Summary of the Public Comments

Summary of the Public Input Content Analysis for the 1992 Draft Revision of the Grizzly Bear Recovery Plan

In September, 1990, the U.S. Fish and Wildlife Service (Service) released the first revision of the 1982 Grizzly Bear Recovery Plan (Plan) for the lower 48 states. Input on the revision was received from the agencies of the Interagency Grizzly Bear Committee (IGBC). In addition to an agency review, the draft was available for public comment from September 1990 to February 1991. Eleven public meetings were held in Idaho, Montana, Wyoming, Washington, Colorado, and Washington, D.C.

In July, 1992, the Service released the second revision of the Plan. Again the Service received input from all IGBC agencies as well as other state and federal agencies. A public comment period on the second revision of the Plan extended from July 1992 to October 1992.

This report summarizes the content of public comments on the second revision of the Plan. A total of 2113 letters was received, each containing varying numbers of comments. Many specific comments re-occurred in letters. A total of 70 different comments re-occurred often in the letters received. Each of these 70 comments was tallied from all letters. Because many letters contained more than one comment, the number of comments tallied exceeds the number of letters received.

This report provides a summary of general demographic information including the total number of letters received from various affiliations and states. It also provides a summary of the 70 major comments and the total number of times a particular comment appeared in the letters. A more detailed breakdown by State of the number of each comment received is available from the office of the Grizzly Bear Recovery Coordinator, Missoula, Montana.

Agency comments are not included in the totals. Comments received from the agencies were typically very specific and unique to an agency. The Service received three petitions containing comments on the plan. Petitions are not included in the totals. All agency letters and petitions, along with all letters of comment on the Plan, are kept on file in the office of the Grizzly Bear Recovery Coordinator, Missoula, Montana.

Demographic Information

The following is a breakdown of the number of letters received from various affiliations:

business/industry	27	letters
environmental/conservation organizations	46	letters
multiple use/recreation organizations	15	letters
academia/professional	19	letters
local government	1	letter
individual responses		
original letters	1427	letters
form letters	312	letters
form letters with additional comments	266	letters

The following is a breakdown of the number of letters received by state:

AK 0	HI 0	ME 1	NM 7	TN 3
AL 1	IA 1	MI 7	NV 1	TX 20
AR 0	ID 212	MN 17	NY 102	UT 14
AZ 11	IL 22	MO 3	OH 10	VA 6
CA 93	IN 6	MS 0	OK 5	VI 0
CO 72	KS 0	MT 714	OR 13	VT 0
CT 8	KY 5	NC 5	PA 14	WA 208
DE 1	LA 3	ND 0	RI 19	WI 4
FL 30	MA 45	NH 2	SC 3	WV 0
GA 9	MD 10	NJ 51	SD 3	WY 274

District of Columbia 3
Canada 1

Summary of Comments

Comment	Comment Description	# Comments Received
	General Comments	
C37	Letter contained no specifics, but indicated general support for the recovery plan, but stressed the need for even more stringent measures to conserve grizzly bears.	194
C36	Letter contained few specifics, but indicated that the plan is inadequate to protect grizzly bears and must be strengthened or withdrawn.	476
C35	General opposition to the grizzly bear recovery plan, and/or agency efforts to recover grizzly bears.	100
C44	Letter contained few specifics, but indicated general opposition to grizzly bears and grizzly bear recovery efforts.	17
C53	Letter indicated general support for grizzly bears and grizzly bear recovery, but indicated that the plan is too restrictive of human uses of natural resources.	243
	Comments Regarding Grizzly Habitat	
C1	Plan fails to address current management practices in grizzly bear habitat, and fails to provide mechanisms to halt the on-going loss of habitat effectiveness.	401
C2	Grizzly bear habitat protection and preservation should take precedence over human uses of natural resources such as logging, mining, recreation, roading, and livestock grazing.	557

C3	The plan should include a number of specific habitat protection measures, such as timing restrictions on logging and other human uses and activities, security zones, displacement areas, and restrictions on the size of cutting units.	184
C4	The road density standard of 1 mile of open road per square mile of habitat recommended in the plan is too high and should be reduced, and/or support for a more restrictive standard in the plan.	180
C5	Support closing more roads to improve grizzly bear habitat.	349
C6	Increase the size of recovery zones. The recovery zones should be based on the biological needs of grizzly bear, and/or wherever bears occur, and/or should not be based on political boundaries.	638
C7	Support the consideration of linkage zones, and/or the plan should include measures for the immediate protection of linkage zones, and/or reduce the 5-year time frame for the study of linkage zones to 2 or 3 years to expedite conservation of the zones.	745
C57	The plan should specify protection for insect feed sites.	1
C61	Critical habitat should be designated for grizzly bears.	20
C62	The plan should require the agencies to use an ecosystem approach to habitat and wildlife management.	20
C8	Opposed to increasing the size of the recovery zones, and/or opposed to additional recovery zones to facilitate the recovery of grizzly bears.	91
C9	Strong reservations about the implications of potential linkage zone management, and/or opposed to the concept and/or study of linkage zones between grizzly bear ecosystems.	73
C10	Habitat that is suitable for grizzly bears, but currently unoccupied by grizzlies, should not be protected or managed as occupied habitat.	18
C11	The road density standard recommended in the plan of 1 mile of open road per square mile of habitat is too restrictive, and/or opposed to road closures for grizzly bear conservation.	325
C70	The plan gives too much authority to the U.S. Fish and Wildlife Service, and/or the plan should not allow the U.S. Fish and Wildlife Service authority over the U.S. Forest Service in management decisions involving National Forest lands.	12

Comments on Grizzly Populations and Recovery Criteria

C12	The plan should include the San Juans Wilderness in Colorado as a grizzly bear recovery zone, and/or the plan should include the specific details necessary to begin the evaluation of the San Juans for grizzly bear recovery.	449
C13	Support for the recovery of grizzly bears in the Bitterroot Mountains of Idaho and Montana.	53
C14	Support for the recovery of grizzly bears in the North Cascades Mountains of Washington.	90
C56	Support for the recovery of grizzly bears in the Selkirk Mountains of Idaho and Washington.	55
C15	The Loomis State Forest of Washington should be included in the North Cascades grizzly bear recovery zone.	57
C16	The grizzly bear population in the Mission Mountains of Montana requires special attention and/or protection.	36
C17(60)	Support the recovery of grizzly bears in other parts of the United States wherever suitable habitat occurs, and/or in the Gila-Blue Mountains Wilderness of New Mexico, the Wind River region of Wyoming, and others.	47
C18	Support for reintroduction of grizzly bears into the Bitterroot Mountains of Idaho and Montana.	10
C19	Support for reintroduction or augmentation of grizzly bears wherever necessary for the recovery of grizzly populations.	57
C28	The plan should require 100% occupancy of Bear Management Units (BMUs) for population recovery criteria.	114
C29	Recovery plan population targets are too low, and/or the plan should require a minimum of 2000 grizzly bears in the U.S.	592
C30	The allowable human-caused grizzly mortality goals are too high, allowable human-caused mortality should be lowered, or zero.	271
C31	The methods recommended in the plan to estimate grizzly bear populations are not reliable.	31
C32	The United States should work to increase the number of grizzly bears in the U.S., and should not rely on Canadian grizzly populations to ensure sustainable grizzly populations in the U.S.	8

C49(50)	Opposed to delisting any grizzly populations at this time, and/or opposed to delisting individual grizzly bear populations, and/or opposed to delisting any grizzly population until there is a minimum of 2000 grizzlies in the U.S.	53
C24	Opposed to the recovery of grizzly bears in the Bitterroot Mountains of Idaho and Montana.	29
C25	Opposed to the recovery of grizzly bears in the North Cascades Mountains of Washington.	29
C27	Opposed to the recovery of grizzly bears in the Cabinet-Yaak ecosystem of Montana and northern Idaho.	24
C20	Opposed to the augmentation of the grizzly bear population in the North Cascades Mountains of Washington.	9
C26	Opposed to the recovery of grizzly bears in the San Juan Mountains of Colorado, and/or opposed to the evaluation of the San Juan Mountains as a grizzly bear recovery zone.	3
C21	Opposed to the reintroduction of grizzly bears into the Bitterroot Mountains of Idaho and Montana.	22
C22	Opposed to the augmentation of the grizzly bear population in the Cabinet-Yaak ecosystem of Montana and northern Idaho.	12
C23	Opposed to the reintroduction or augmentation of grizzly bear populations anywhere.	10
C33	Opposed to any constraints or "taking" (from an involuntary seller) of private lands for grizzly bear recovery, and/or the plan threatens private property rights.	47
C34	Opposed to the government acquiring (from a voluntary seller) private land for grizzly bear recovery.	200
C45	Support delisting of the NCDE and/or Yellowstone ecosystems, and/or all populations.	33
C54	The recovery plan population criteria are too stringent, of private and/or current grizzly populations are acceptable, there is no need to increase them.	72
C59	The plan should recommend a limited nuisance bear hunt to alleviate the number of nuisance bears, and/or a limited sport hunt conducted under proper management, and/or should recognize a limited hunt as a wildlife management tool and valid recreational use of a natural resource.	5

Comments on Other Aspects of Grizzly Recovery

C48	End the use of hounds and bait to hunt black bears within recovery zones, and/or eliminate all black bear hunting within recovery zones.	66
C51	There is a need for more public information and education about grizzly bears, their biological needs, and the recovery process.	38
C52(58)	There is a need for more research on the needs of grizzly bears, and/or for more research into aversive conditioning of nuisance bears.	12
C38	The recovery measures recommended in the plan will negatively affect local economies and livelihoods.	703
C39	The recovery plan and recovery efforts are too costly, and/or a waste of tax dollars.	61
C40	The plan should consider the affects of grizzly recovery on local economies.	178
C41	The recovery measures recommended in the plan will negatively affect recreation opportunities.	119
C42	Concerned for human safety as grizzly bear populations increase, and/or opposed to recovery because grizzly bears are too dangerous.	91
C43	Extinction is a natural process and should be accepted, and/or bears as a species must exist on their own without measures specified in the recovery plan.	16
C63	The plan should assess the impacts of increased grizzly bear populations on other wildlife.	4
C55	Support for the 1982 recovery plan, the new plan makes unnecessary changes in recovery efforts.	20
C46	Increase public input in the recovery process, including the development of the recovery plan.	15
C47	The recovery plan should not be categorically excluded from the provisions of the National Environmental Policy Act (NEPA), and/or an Environmental Impact Statement (EIS) should be developed to assess the impacts of the recommendations of the grizzly bear recovery plan.	310
C64	The plan should address compensation for personal loss or injury, and economic loss associated with the recovery of grizzly bears.	158

C65	The plan should provide for funding for nuisance bear monitoring programs to protect human safety and property.	157
C66	The plan should provide for funding for increased public information and education regarding the recovery of grizzly bears.	3
C67	The plan should specify that an economic impact analysis be conducted to assess the impacts of grizzly bear recovery on local and/or regional economics.	160
C68 (69)	The needs of people must take precedence over the needs of grizzly bears, and/or the plan should balance the needs of bears and people, and/or people are more important than animals.	26