RESTORATION OF NATURAL POPULATIONS OF GRIZZLY AND BLACK BEARS IN YELLOWSTONE NATIONAL PARK

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Abstract: Yellowstone National Park began an intensive bear management program in 1970, with the stated goal of restoring and maintaining natural populations of grizzly bears (*Ursus arctos*) and black bears (*U. americanus*). The Park closed the last of its large open-pit garbage dumps in 1971. During the decade 1970–79, bear management went through 3 phases. In 1970–72 most incorrigible bears that had developed strong ties to sources of human foods were translocated or removed. This period also included intensive efforts to educate people, increased law enforcement, intensified sanitation, refinement of management techniques, and development of a monitoring system to provide management information. The next period, 1973–78, represented a transition from emphasis on correction of a situation to awareness that a high level of preventive bear management must be a routine and never-ending part of Park operations. By the summer of 1979, the bears with prior knowledge of sources of unnatural foods within the Park appeared to be gone. Thus, in 10 years Park management appears to have attained the objective of restoring the populations of bears to subsistence on natural forage to the extent that outside influences beyond the Park's control will permit. The future of the grizzly bear in and around Yellowstone appears increasingly dependent on management decisions which give the bear adequate priority over human desires.

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Yellowstone National Park began an intensive bear management program in 1970, with the concurrent objectives of restoring a grizzly bear population to subsistence on natural forage and reducing bear-caused injuries to humans. Although the emphasis was on grizzly bear management, proper black bear management was a necessary and inseparable corollary. Cole (1976) evaluated the management program for 1970–75. He concluded that the management program appeared to be accomplishing its intended objectives. Two subsequent evaluations for the years 1976 and 1977 provided current information and discussed ongoing management problems (Meagher 1977, 1978). This report provides a review and perspective for the entire period 1970–79. Management considerations for the future are included.

This report would not be complete without acknowledgement of the contributions to bear management made by many Park employees. Additionally, retired Superintendent Jack Anderson is singled out for his leadership in implementing the program. In this, the professional contributions of former Supervisory Biologist Glen Cole were invaluable. The Scientific Advisory Board, headed by Dr. A. Starker Leopold, provided perspective, support, and advice. We thank G.F. Cole, D.B. Houston, C.J. Martinka, N.J. Reid, and P. Schullery for helpful reviews of the manuscript.

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BACKGROUND

Yellowstone's bear problems spanned approximately 90 years before the National Park Service combined technology and determination to set about complete restoration of natural feeding conditions for bears within the park. The problems which led to the management program initiated in 1970 evolved largely through circumstances beyond technological control and as a function of the knowledge and attitudes of the times. Developed areas within the park came into being because of proximity to major scenic attractions, coupled with the distance which could conveniently be traveled in 1 day by horse or stage. Convenience dictated the locations of both the casual stopovers and the more formal camps and hotels. Concurrently, as a result of deliberate feeding, inadequate food storage, careless garbage disposal, and the establishment of dump sites, bear problems began. These were first mentioned as occurring on a widespread basis in 1891 (Schullery 1980). Likewise, because people fed bears, the better to see them, black bears began begging along roadsides as early as 1900 (Yellowstone Natl. Park Archives, unpubl. data). Haines (1977) provided a comprehensive historical account of the human attitudes and activities prevalent when bear problems began to develop. Schullery (1980) traced the history of bears and bear management together with the technological means and accompanying attitudes for dealing with bears in Yellowstone from the earliest years

of the Park to the present. Cole (1972) reviewed and summarized in detail the management efforts from 1930 through 1969. All of these accounts indicated that the scope, scale, and detail of the linkage of bears to artificial food sources varied but inevitably escalated over time.

Information from the above sources and additional reviews of Park files and archives indicated that:

1. Impressive populations of black and grizzly bears existed before modern man's use of Yellowstone Park.
2. An apparent increase in bear numbers between 1900 and 1930 reflected, at least in part, increased visibility as bears became linked to human foods.
3. The kinds and numbers of bear problems which were tolerated when relatively few people visited Yellowstone Park could not be permitted as human use increased.
4. A mixture of attitudes, dominated by a desire to have bears readily visible for the touring public, led to an astounding tolerance for bear problems while recognizing artificial foods as the root cause. By 1930 the National Park Service acknowledged the desirability of maintaining bears under natural conditions. However, attitudes had not yet crystallized regarding the degradation of bears seeking garbage and handouts and the impossibility of having natural populations of bears while artificial foods were available.
5. In 1970 the Park committed its best efforts and knowledge to restoring grizzly and black bear populations to natural foraging conditions. The timing of the program was influenced by Executive Order 11507, which required closure of open-pit garbage dumps on Federal lands as a sanitation measure.

MANAGEMENT PROGRAM

Procedures

Management procedures involved 3 main efforts: garbage handling, public education, and control of problem bears.

To remove sources of garbage, the Rabbit and Trout Creek dump sites (Fig. 1) were closed by the Park in 1970 and 1971, respectively. Three

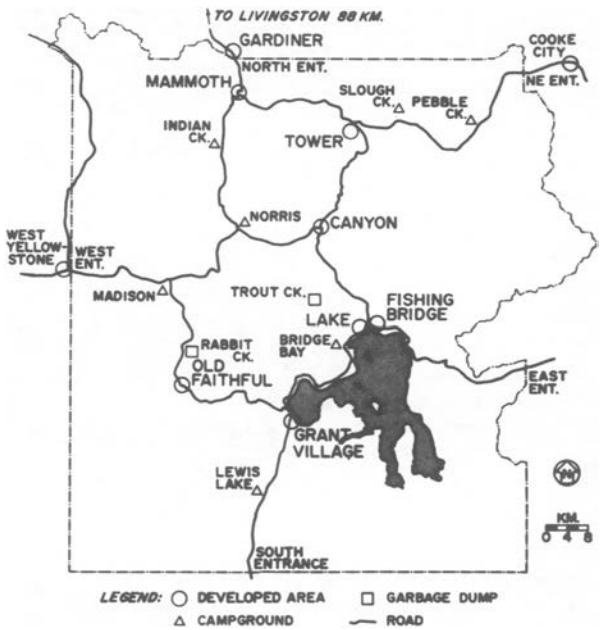

Fig. 1. Yellowstone National Park, showing developed areas, adjacent towns, and two former interior garbage dumps.

nearby town dumps with influences on Park bears were subsequently closed: West Yellowstone, 1971; Gardiner (dump located just inside the Park boundary), 1978; and Cooke City, 1979. Three incinerator sites and 2 sanitary landfills used within the Park in the 1970's were enclosed in bearproof fencing. By 1979, cooperative arrangements were made for all Park and adjacent town garbage to be hauled to 2 sanitary landfills beyond Park boundaries (1 at West Yellowstone, enclosed in bearproof fencing, and 1 at Livingston, 55 miles north). Bearproof tops were installed on all garbage cans within the Park (mostly complete by July 1970). All garbage was collected daily. When necessary, collections were scheduled late in the day, or twice daily, to prevent overflow and to minimize the attractiveness of odors to bears.

Intensified efforts to inform Park visitors of proper food handling and storage procedures in bear country were coupled with the dissemination of information on the consequences of feeding bears (increased injuries to humans and the need to destroy bears). This information program was reinforced by establishment of special regulations and increased law enforcement. Finally, bears were removed that could not be discouraged from seeking food in developed areas or that became excessively dangerous to humans.

Table 1. Numbers of grizzly and black bears observed (total of unduplicated daily counts) in developed areas and in the wild within Yellowstone National Park, 1970–79.

	Grizzly bears[a]		Black bears	
Year	Dev'd areas	Wild	Dev'd areas	Wild
1970	178	614		
1971	146	320		
1972	105	349		
1973	54	348		
1974	26	426		
1975	5	216	57	347
1976	65	331	60	441
1977	45	528	147	499
1978	21[b]	406	15[b]	221
1979	3[c]	346	13	271

[a] Grizzly bear data for 1970–75 from Cole (1976).
[b] Sightings corrected from original end-of-year total.
[c] Two of these are tenuous.

Management Information and Evaluation

A centralized bear-monitoring system was designed, refined, and utilized for day-to-day management information and for evaluation of the program (Meagher 1978). As experience with the system increased, Park management personnel intensified efforts to acquire details. All reported observations, depredations, confrontations, injuries to human, dead bears, and translocations of problem bears were recorded daily. Efforts by recorders to obtain sightings made by observers on the ground have probaby varied somewhat from year to year, but because there was no systematic effort to sight bears, this variable was not considered important. Sightings made by research personnel from fixed-wing aircraft, beginning in 1973, increased the annual totals of bears seen in the wild, but this extra effort reflected the observability of bears consistent with other observations for any specific year. The system was not designed to provide unduplicated samples of bear numbers; however, reports obviously representing the same bear on the same day were recorded as one observation. For management purposes, experienced observers were not necessary; bear reports uncertain as to species were listed as unknowns. The records were computerized after 1974; earlier records did not contain sufficient detail to justify inclusion. The system provided information for preventing or dealing with problems in developed areas; it also provided useful backcountry information which may be of more importance in the future.

Results

Observations of grizzly bears in developed areas progressively declined from 178 in 1970 to 3 in 1979 (Table 1). Comparable observation records for black bears were not maintained until 1975 (Table 1). However, black bears were more commonly sighted in developed areas than grizzlies when the present bear management program began in 1970 (G. Mernin, pers. commun.); in 1979 only 13 black bear observations were recorded in such areas. Repeated translocations of 4 problem bears accounted for the sharp increase to 147 observations in developed areas in 1977 (Meagher 1978). No black bears were reported begging or scavenging on artificial foods adjacent to Park roads after June 1977 (Meagher, unpubl. data).

Numbers of grizzly and black bears seen in the wild varied each year (Table 1). As noted by Cole (1976), these sightings indicated that bears were widely distributed according to natural conditions rather than in artificially influenced concentrations. The sightings did not indicate population numbers nor trends, but the numbers of reports, coupled with an assessment of the different bears involved (based on sighting date, location, sex, age, and color), indicated viable populations.

Grizzly bear control actions (bears translocated or removed from the population) decreased from a high of 70 in 1970 to 1 in 1979 (Table 2). Concurrently the number of different grizzlies handled decreased from 50 to 1. Twenty-four grizzlies were destroyed in the Park in 1970–72, for an average of 8 a year; 6 were destroyed in 1973–79, for an average of 1 a year. The percentage of successful translocations (calculated annually) was variable, but generally high as incorrigible bears were removed (Table 2). Two of the grizzly bears destroyed after 1975 had been translocated in previous years: an adult female destroyed in 1976 had been moved once in 1974; and an adult male destroyed in 1978 had been moved once in 1976 and twice in 1977. Both bears were old enough to have acquired some experience with sources of human foods prior to closure of the last large garbage dumps in 1971.

For black bears in the decade 1970–79 (Table 3), peak numbers of translocations (34) and bears destroyed for control (8) occurred in 1972, 2 years later than the maximum numbers of sim-

Table 2. Records of grizzly bear control actions in developed areas, Yellowstone National Park, 1968–79.[a]

	Number of control actions[b] in developed areas							Translocations		Number of bears			
Year	Old Faithful	Canyon	Lake Outlet	Bridge Bay	Grant Village	11 other areas	Total	No.	% successful[c]	Translocated	Destroyed[d]	Sent to zoos	Total
1968	1	14	16	8	20	0	59	54	33	?	5(3)	0	?
1969	0	16	25	9	5	2	57	47		?	10(5)	0	?
1970	22	9	11	0	15	13	70	50	60	30	12(6)	8	50
1971	1	11	20	1	5	1	39	33	80	27	6(2)	0	33
1972	0	10	13	3	0	0	26	19	74	14	6(4)	1	21
1973	0	3	4	3	0	0	10	10	70	7	0	0	7
1974	1	6	5	2	0	0	14	12	77	9	2(1)	0	11
1975	0	0	0	0	0	0	0	0		0	0	0	0
1976	3	0	10	1	0	1	15	14	57	8	1	0	9
1977	3	0	3	2	0	1	9	8	77	6	1(1)	0	7
1978	1	0	0	1	0	0	2	0		0	2	0	2
1979	1	0	0	0	0	0	1	1	100	1	0	0	1

[a] Data for 1968–75 from Cole (1976).
[b] Control actions include translocating, shipping to a zoo, or destroying bears.
[c] Translocation considered successful if bear did not return to cause problems within the same year.
[d] Numbers in parentheses represent bears that were destroyed unintentionally because they charged personnel, came out of drug effects during handling, injured themselves in traps, or failed to recover from drugs.

ilar management actions applied to grizzly bears. These figures probably reflected priorities in management effort, with attention initially focused on problem grizzly bears because of the danger to humans (G. Mernin, pers. commun.). Translocations and numbers of black bears destroyed dropped sharply after 1972 and continued to decrease as incorrigible bears were progressively removed or disappeared naturally. The exception to this pattern, in 1976–77, refected an insistence by some operational personnel on repeated translocations of problem bears. The behavior of the 4 black bears destroyed in 1977 (Meagher 1978) indicated considerable earlier experience with sources of human foods. The black bear destroyed in 1978 died of an accidental drug overdose; it had no prior history of causing problems.

Injuries to humans caused by grizzly bears in developed areas (Table 4) decreased from an average of 3.6 per year in the 1960's to an average of 0.4 per year in the 1970's, in spite of high levels of Park visitation. Conversely, grizzly-caused injuries in backcountry areas increased from an average of 0.3 per year in the 1960's to an average of 1.0 per year in the 1970's. This increase reflected a 2- to 5-fold increase in backcountry use during the 1970's over that during the 1960's.

Injuries to humans by black bears decreased sharply in 1970 (Table 3) and decreased further between 1970 and 1979. Black bears which regularly sought foods from tourists along Park roads

Table 3. Park records on the numbers of human injuries caused by black bears and the number of black bears translocated and destroyed, 1931–69 and 1970 through 1979.[a]

Year(s)	No. captures and translocations	No. bears killed[b]	No. injuries to visitors	No. of Park visitors (millions)
$\bar{x}$,1931–69		24	46[c]	1.00
1970	19	7(1)	7	2.30
1971	15	4(2)	9	2.12
1972	34	11(3)	5	2.25
1973	13	3(0)	5(2[c])	2.06
1974	11	3(2)	7	1.94
1975	5	1(1)	1	2.25
1976	13	4(1)	4	2.53
1977	15	7(3)	2	2.49
1978	0	1	1[c]	2.62
1979	0	0	0	1.87

[a] Data for 1930–75 from Cole (1976).
[b] Includes bears killed by human actions; those hit by autos in 1970–79 are shown in parentheses.
[c] Injuries in 1931–69 presumably occurred along roads and in developed areas. Injuries in 1970–79 occurred along roads and in developed areas, except 2 in 1973 and 1 in 1978, which occurred in backcountry.

Table 4. Numbers of injuries to humans by grizzly bears, Yellowstone National Park, 1930–79.[a]

Year(s)	No. grizzly-caused injuries per year[b]		No. of Park visitors per year (millions)[b]
	Developed ares	Backcountry	
1930's	0.6 (0–3)	0	0.16–0.49
1940's	1.2 (0–7)	0	0.06–1.13
1950's	0.6 (0–2)	0	1.11–1.60
1960's	3.6 (1–8)	0.3 (0–2)	1.44–2.23
1970	2	1	2.30
1971	0	0	2.12
1972	1	2[c]	2.25
1973	0	0	2.06
1974	0	0	1.94
1975	0	2	2.25
1976	2	2	2.53
1977	0	1	2.49
1978	0	0[d]	2.62
1979	0	2	1.87

[a] Data for 1930–75 from Cole (1976).
[b] Figures for the 1st 4 decades are means and ranges for numbers of injuries, ranges for numbers of visitors.
[c] Includes 1 fatality.
[d] A backcountry injury of 1978 was recorded as caused by a bear of unknown species.

caused most injuries prior to 1970 (Yellowstone Natl. Park files, unpubl. data); the decrease from 7 injuries in 1970 to 0 in 1978 and 1979 apparently reflected the disappearance of roadside black bears.

DISCUSSION AND CONCLUSIONS

Cole (1976) hypothesized that the management applied during the 1970's would:

1. Restore more natural conditions, as evidenced by bears being widely distributed and relying on natural foods and by fewer bears visiting or being controlled in developed areas;
2. Reduce bear-caused injuries to humans in developed areas from previous levels;
3. Not prevent the Park's grizzly and black bear populations from maintaining or reestablishing their numbers at natural carrying-capacity levels.

We used these hypotheses in evaluating the success of the bear management program of 1970–79, which went through 3 phases. The most intensive level of management effort occurred in 1970–72 following closure of the 2 large interior and 1 exterior garbage dumps. Most incorrigible bears were translocated or removed. Intensive efforts to educate people, increased law enforcement, intensified sanitation, and refinement of management techniques contributed to the marked decreases in numbers of bears visiting developed areas and being controlled. Additionally, the decreases in the numbers of bear-caused injuries to humans with the initiation of the program reflected the prompt removal of bears from developed areas (including black bears persisting along roadsides).

The next period, 1973–78, represented a transition from correction of a situation to awareness that a high level of preventive bear management must be a routine and permanent part of Park operations. Problems continued at a comparatively low level; a few bears with prior experience that became incorrigible were removed from the populations. The period was noteworthy for the negative effects of transfers of personnel on the success of the program. Lack of first-hand experience with bears and complacency about bear-caused problems (especially those associated with black bears) produced the casual attitudes towards bear management apparent among employees in 1977 and emphasized the effort required to maintain a preventive program (Meagher 1978).

The importance of a very high level of sanitation was stressed at the old Trout Creek dump site (Fig. 1). Although no unnatural foods were available there after 1970, at least 1 grizzly bear dug shallow pits into the covered-over surface every year through 1979 (Meagher, unpubl. data). This indicated that at least some bears would continue to visit sites of formerly good sources of food probably throughout their lifetimes.

By 1979 grizzly and black bears with prior knowledge of sources of unnatural foods within developed areas in the park appeared to be gone from the populations. This does not imply that all individuals were totally naive. The 1 grizzly translocated in 1979 had been moved once in 1977, but had not become an incorrigible bear or he would have returned to a developed area before 1979, or repeated his visits in 1979. The low level of bear sightings in developed areas in 1979 (3 grizzly, 13 black) further indicated that the problems which led to the program initiated in 1970 had been corrected and that the populations of bears were naive regarding sources of human foods within the park. Furthermore, 1979 was exceptionally dry during the growing season of April–June (D.G. Despain, unpubl. data). Past experience by Park personnel indicat-

ed that such a year had a very high potential for bear-caused problems, but only 1 grizzly bear control action was necessary. No black bear control actions occurred.

We concluded that the bear management program within Yellowstone National Park during the 1970's had achieved the goal of restoring populations of grizzly and black bears to subsistence on natural forage. Concurrently the management program reduced bear-caused injuries to humans in developed areas.

The status of the bear populations relative to natural carrying capacities was less obvious. Although the number of bear sightings in the wild (Table 1) indicated viable populations, numbers and trends were not apparent from the management data. Cole (1976) assessed various earlier estimates for numbers of grizzly bears; he estimated 250–320 for the Park only. The Interagency Study Team (Roop 1980) estimated 300–350 grizzlies in the Park and adjacent areas; this estimate was inferred from the number of animals seen and handled in the field. More recently Knight et al. (1981) estimated 247 grizzlies in the total area; Knight (pers. commun.) also used a range of 200–400 animals and indicated he favored the more conservative number. These estimates were also inferential. Cole (1976) also estimated about 650 black bears in the Park, based on extrapolations from a study conducted during the mid-1960's. No field data were available subsequently.

Most man-caused grizzly bear mortality occurred outside the Park after 1972 (Meagher 1978, Blanchard et al. 1980). Legal hunting ceased after 1974; thereafter the total known annual mortality for the population did not exceed 11. Blanchard et al. (1980) stated that illegal kills outside the Park appeared to be the greatest source of mortality for the Yellowstone grizzly. Additional unreported illegal kills probably increased the totals by at least a few animals each year. The extent to which man-caused mortality of black bears outside the Park impinged on the Park population was not known; mortality inside the Park appeared insignificant (Table 3).

We concluded that the natural carrying capacities within the Park for populations of grizzly and black bears were not known. However, after 1972 removals necessitated by the Park's management program did not appear to be a probable cause of a long-lasting depression of numbers from those which would be dictated by natural conditions.

THE FUTURE

The restoration of the bear populations within Yellowstone National Park to subsistence on natural forage does not necessarily ensure their future well-being, particularly that of the grizzly. The Park is the core of a much larger contiguous area of occupied grizzly bear habitat subject to the jurisdictional authority of 7 Federal agencies and 3 States. The grizzly bear population of the area is 1 unit; the bears freely cross jurisdictional lines (Blanchard and Knight 1980).

Yellowstone National Park is administered as a natural area with the objective of maintaining the ecosystem in as nearly pristine a condition as possible (Houston 1971), but the Park is becoming somewhat of a biological island. Pressures on public and private lands external to the Park accelerate: timber harvesting, energy development, recreational use, and homesite development. These increased uses are added to long-existing conflict situations such as livestock grazing. Any 1 proposal or existing use may not have great potential for harm to the grizzly bear population, but the cumulative effects of these changes must be considered. The extent of illegal kill is unknown but appears to be increasing as the value increases for parts of bears (hides, claws, teeth) and as more conflict situations occur.

Sources of unnatural foods continue to attract bears outside the Park. Some bears regularly obtain food in and around Cooke City and West Yellowstone, in spite of dump closures. Gardiner's lack of sanitary garbage collection is a potential attractant. Small "back yard" feeding sites exist from time to time. Jurisdictional concern and authority are needed to ensure proper disposal of garbage.

Within the Park the program for prevention of bear problems through intensive sanitation, public information, law enforcement, and prompt translocation of any bear that persists in a developed area must continue to receive high priority for funding and personnel. Recreational use of the backcountry by people must continue to be regulated through use of designated campsites, trail and campsite closures, and group size restrictions. Additionally, it is increasingly apparent

that prime areas of grizzly bear habitat should be considered for closure to all recreational use.

Ultimately the survival of the grizzly bear population in the Yellowstone area will depend on giving the bear adequate priority over human desires. Research on the status, trends, and dynamics of the grizzly bear population will help to guide management decisions regarding proposals for use, conflict situations, and regulation of human activity, both internal and external to the Park. However, research cannot substitute for genuine commitments to the welfare of the bear. The decisions made by administrators, land users, and residents, influenced by a concerned public, will determine the long-term survival of the grizzly bear in the Yellowstone area.

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