

# BEAR MANAGEMENT IN YELLOWSTONE NATIONAL PARK, 1960-93

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*Abstract:* From 1931 through 1959, an average of 48 people per year was injured by bears within Yellowstone National Park (YNP). In 1960, YNP implemented a bear management program designed to reduce the number of bear-caused human injuries and property damages occurring within YNP and to re-establish bears in a natural state. Although the 1960 program included some efforts to reduce the human food and garbage sources that were attracting bears into developed areas and roadside corridors, most management effort went into the removal of potentially hazardous bears and those bears that damaged property in search of human foods. After 10 years (1960-69) of the program, 332 nuisance black bears (*Ursus americanus*) and 39 nuisance grizzly bears (*Ursus arctos horribilis*) had been removed from the population. However, the number of bear-caused human injuries within YNP had decreased only slightly, to an average of 45 per year. In 1970, YNP initiated a new, more intensive bear management program with the objectives of restoring the grizzly bear and black bear populations to subsistence on natural forage and reducing the number of bear-caused injuries to humans. Management involved eliminating the sources of human food and garbage that attracted bears into developed areas and along roadsides, the source of most bear-human conflicts. During the first 3 years of the program, bear-caused human injuries decreased significantly to an average of 10 per year. During the same period, an average of 38 grizzly bears and 23 black bears per year were trapped and translocated from roadsides and developed areas to backcountry areas. In addition, an average of 12 grizzly bears and 6 black bears per year, were removed from the population. After 1972, the number of bear-human conflicts as well as the number of bear management control actions declined significantly. A modified bear management program similar to the 1970 program, but with greater emphasis on habitat protection in backcountry areas, was implemented in 1983. Since 1983, bear-caused human injuries have declined to an average of 1 per year and the number of nuisance bears translocated (grizzly bears = 4/yr, black bears = 2/yr) as well as the number of incorrigible bears removed from the population (grizzly bears = 1/yr, black bears = 0.4/yr) has also declined significantly from earlier periods. During the first years of these management programs, most bear-human conflicts involved food-conditioned bears that aggressively sought human foods. In more recent years, management problems have involved habituated (but not food-conditioned) bears seeking natural foods within developed areas and along roadsides.

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Yellowstone National Park (YNP) was established 1 March 1872. Since then, the park has had a long history of bear-human interactions. As early as 1889, black bears were gathering at night to feed at garbage piles near park hotels (Schullery 1992). Within a few years grizzly bears were also frequenting park dumps in search of food. In 1891, the acting park superintendent reported that bears had become very troublesome at all hotels, camps, and other places in YNP where human food or garbage could be found, and that it might be necessary to occasionally kill bears that became too destructive (Schullery 1992). In 1910, the first reports of black bears begging for human food handouts along roadsides were recorded (Schullery 1992). In 1916, the first confirmed bear-caused human fatality within YNP occurred when a grizzly bear killed a wagon teamster in a roadside camp (Schullery 1992). However, at the time, park managers considered this bear's behavior to be completely out of the ordinary. By the 1920s, roadside begging by black bears for human food handouts was common (Schullery 1992). Similar behavior in grizzly bears was not reported.

As park visitation and the number of bear-human conflicts began to increase, park managers became more concerned over the situation. By 1931, because of these concerns, the park began to keep more detailed records of bear-caused human injuries, property damages, and subsequent nuisance bear control actions. During this period, most management efforts were

directed at the bears that were causing problems and not at the underlying causes leading to bear-human conflicts. During the 29-year period 1931-59, an average of 48 people per year were injured by bears within YNP (Cole 1976, Meagher and Phillips 1983, Schullery 1992). In addition, bears caused an average of 98 incidents of property damage per year. The second known bear-caused human fatality occurred during this period when an unknown species of bear killed a woman at the Old Faithful campground in 1942 (Schullery 1992). After this fatality, Congress criticized the park for failing to solve its bear problems. Also during this period, YNP personnel removed an average of 3 nuisance grizzly bears and 22 nuisance black bears per year because of management actions.

From the parks inception through the 1950s, bear management was somewhat informal, with overly troublesome bears being removed as necessary. As the numbers of bear-caused human injuries and property damages within YNP continued to increase, park managers became increasingly concerned over the safety of people, property, and bears, and park scientists began to recommend that food and garbage storage facilities within YNP be made bear-proof (Dole 1914, Murie 1944).

In 1960, a National Park Service (NPS) bear management program was implemented (NPS 1960). The 1960 program was designed to reduce the number of bear-caused human injuries and property damages

that occurred within YNP and to re-establish bears in a natural state (NPS 1960). The 1960 program included the following management efforts: (1) expanded efforts to educate visitors as to bear behavior, methods for reducing bear-human conflicts, and the proper storage of food, garbage, and other bear attractants; (2) more prompt and efficiently scheduled removal of garbage to reduce the availability to bears, thus making them less dependent on garbage as a food source; (3) stricter enforcement of regulations that prohibited the feeding of bears; (4) the use of garbage cans designed to prevent tipping by bears and the proposed development of new types of bear-proof garbage cans; and (5) the removal of potentially hazardous bears, habitual beggar bears, and those bears that damaged property in search of food. These guidelines were directed primarily at the management of black bears and were largely in response to public complaints of personal injury and property damage caused by roadside and campground bears (Craighead and Craighead 1967).

During the 2-year period from 1968 to 1969, the park continued to operate under the 1960 NPS bear management program, and in addition, began to reduce the amounts of garbage being deposited at the Trout Creek Dump. The garbage reductions were done in preparation for the eventual closing of the Trout Creek dump in 1971 (Schullery 1992).

In 1970, YNP initiated a new, more intensive bear management program (Leopold et al. 1969) with the objectives of restoring the grizzly bear and black bear populations to subsistence on natural forage and reducing bear-caused injuries to humans (Cole 1976, Meagher and Phillips 1983). As part of the management program implemented in 1970, regulations that prohibited the feeding of bears were strictly enforced, as were regulations that required human foods be kept secured from bears (Meagher and Phillips 1983). In addition, garbage cans parkwide were made bear-proof, and garbage dumps within and adjacent to the park were closed: Rabbit Creek in 1970, Trout Creek in 1971, West Yellowstone (outside YNP) in 1971. The park also intensified efforts to inform park visitors of proper food handling and storage procedures in bear country and on the consequences of feeding bears (increased injuries to humans and the need to destroy bears). This period was characterized by an intensive level of management, and many incorrigible bears were translocated or removed.

From 1973 to 1982, the park continued to operate under the 1970 bear management program. During this period, the last 2 dumps within and adjacent to the park were closed: Gardiner (dump located just inside the

park boundary) in 1978; and Cooke City (located outside YNP) in 1979. This was a transition period characterized by lower numbers of bear-human conflicts and subsequent bear management control actions (translocations and removals). However, most incidents of bear-human conflict that did occur still involved food-conditioned bears aggressively seeking human foods (M. Meagher, NPS, pers. commun.).

In 1983, the park implemented a modified grizzly bear management program (NPS 1983). The 1983 program was similar to the 1970 program, but with greater emphasis on habitat protection in backcountry areas. As part of the 1983 bear management plan, the park implemented a Bear Management Area program that restricted recreational use in areas with seasonal concentrations of grizzly bears. The goals behind these restrictions were to: (1) minimize bear-human interactions that may lead to habituation of bears to people; habituation often results in the bear being removed from the population due to concern for human safety; (2) prevent human-caused displacement of bears from prime food sources; and (3) decrease the risk of bear-caused human injury in areas with high levels of bear activity (NPS 1983). This period was also characterized by a major change in bear behavior within YNP. Most bear-human conflicts before 1983 involved food-conditioned bears aggressively seeking human foods (M.M. Meagher, NPS, pers. commun.). From 1983 to 1993, most bear-human conflicts involved habituated, but not food conditioned, bears seeking natural foods within developed areas or along roadsides (K.A. Gunther, NPS, unpubl. data). Habituated bears are often trapped and translocated or removed due to concern for human safety. Further details of the history and evolution of bear management within YNP have been described in Craighead and Craighead (1971), Cole (1971, 1972, 1976), Craighead (1979), Meagher and Phillips (1983), and Schullery (1992).

In this report I review the changes in bear management, bear-human conflicts, and nuisance bear control actions that have occurred within YNP over the 34-year period, 1960 to 1993. When available, data on bear-human conflicts and management actions that occurred before 1960 are included for comparison. My objectives were to evaluate the effects of the 1960 (NPS 1960), 1970 (Leopold et al. 1969), and 1983 (NPS 1983) bear management programs on the number of bear-human conflicts (bear-caused human injuries and property damages) and nuisance bear control actions (bear translocations and removals) that occurred within YNP. Recent trends in bear management problems as well as management considerations for the future are

also addressed.

The effects of these bear management programs on grizzly bear population dynamics (Craighead et al. 1974; McCullough 1981; Knight and Eberhardt 1984, 1985, 1987; Knight et al. 1988; Mattson and Reid 1991), distribution (Blanchard et al. 1992), home-range sizes (Blanchard and Knight 1991), behavior (Schleyer 1983, Harting 1985, Gunther 1991), food habits (Mealey 1980, French and French 1990, Gunther and Renkin 1990, Reinhart and Mattson 1990, Mattson et al. 1991), and size and growth (Blanchard 1987) have been studied and reported by others and are not addressed in this report.

I wish to acknowledge the dedication and contributions to bear management made by all YNP employees. Additionally, S. Fowler, D. Fraser-Herring, R. Danforth, K. Churchill, M. Biel, and S. Rice compiled and summarized much of the data. J. Mack and M. Biel provided computer graphics of the data. This project was funded by the NPS, YNP.

## STUDY AREA

Yellowstone National Park encompasses approximately 899,139 ha in the states of Wyoming, Montana, and Idaho. The park was established 1 March 1872, and "dedicated and set apart as a public pleasuring-ground for the benefit and enjoyment of the people" and "for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders . . . and their retention in their natural condition." As part of this goal, the 1960 (National Park Service 1960), 1970 (Leopold et al. 1969), and 1983 (National Park Service 1983) bear management programs were implemented in an effort to reduce the influence of human activities and foods on bear behavior and to reduce the number of bear-caused human injuries and property damages that occurred within YNP.

The climate, physiography, vegetation, and fauna of YNP are described in detail by Mealey (1975), Knight and Eberhardt (1985), Mattson et al. (1987), and Despain (1990).

## METHODS

Data was collected from bear sighting reports, case incident reports, and management summary reports from park files. Information contained in these reports included bear-caused human injuries and fatalities, bear-caused property damages, nuisance bears trapped and translocated, and nuisance bears removed from the

population by park personnel.

Records from YNP of the numbers of bear-caused human injuries and property damages, as well as the numbers of bears removed from the population, were readily available for the years 1931-93. Records of the numbers of bears trapped and translocated within YNP were only readily available for the years 1968-93. The human-injury records for the years 1931-69 distinguish known grizzly bear-caused human injuries, but combine injuries caused by black bears with those caused by unknown species of bear. The bear-caused property damage records for 1931-59 do not distinguish the species of bear involved.

Since bears have large home ranges and travel freely across jurisdictional boundaries (Blanchard and Knight 1980), bear management programs implemented by YNP obviously influence bear activity in areas administered by other agencies. Unfortunately, the number of human-caused grizzly bear mortalities from 1959 to 1993 were the only bear management records readily available from areas outside YNP. Records of the numbers of bear-caused human injuries, bear-caused property damages, nuisance bears trapped and translocated, and nuisance black bears removed during management control actions outside YNP were not available.

Throughout this paper, the term "bear-human conflict" is defined as any incident in which bears injured people, damaged property, or were considered to pose a threat to human safety in developed areas or along roadsides. "Nuisance bears" are defined as any bear involved in a bear-human conflict. The term "translocation" is defined as any incident in which a bear involved in bear-human conflict situations was trapped and translocated, usually by helicopter, truck, or boat, to a remote area. A "removal" is defined as any incident in which bears involved in bear-human conflicts were removed from the ecosystem population. Removals include bears sent to zoos or other ecosystems, bears intentionally destroyed for management reasons, and bears killed unintentionally during management actions. "Food-conditioned bears" are defined as bears that have learned to identify humans or human developments as a source of food due to a prior food reward. "Habituated bears" are defined as bears that have learned to tolerate people, vehicles, and human structures at close distances. The term "frontcountry" is used to describe areas within or immediately adjacent to roadside corridors or human developments. The term "backcountry" is used to describe all areas located outside frontcountry areas.

For analysis, the data was separated into 6 different

periods, each representing major changes in bear management strategies and/or bear behavior within YNP (Table 1).

The bear management statistics contained within this report were undoubtedly influenced by many factors, including weather, variations in the availability of natural bear foods, bear population numbers and trends, park visitation rates, the perception of bears by park visitors, YNP efforts to educate park visitors about bears, bear biology knowledge of the times, park staffing levels, and changes in the management philosophies of the NPS and individual park staff over time. The influence of all these parameters on bear management within YNP is beyond the scope of this paper.

## RESULTS

### 1931-59

*Bear-Human Conflicts.*—During the 29-year period from 1931 to 1959, an average of 98 ( $\pm 90.3$  SD) bear-caused property damages per year were reported within YNP (Table 2). In addition, grizzly bears caused an average of 1 ( $\pm 1.5$  SD) human injury per year and black bears caused an average of 48 ( $\pm 30.9$  SD) injuries per year (Table 2). Most of these injuries were due to people attempting to feed black bears along park roads. In 1942, an unknown species of bear killed a woman in the Old Faithful Campground (the only known bear-caused human mortality during this period).

*Nuisance Bear Control Actions.*—Also during this period, an average of 3 ( $\pm 5.5$  SD) nuisance grizzly bears and 22 ( $\pm 17.4$  SD) nuisance black bears per year were removed from the park during control actions (Table 2).

Records of nuisance bear removals that occurred outside YNP were not available for this period.

### 1960-67

*Bear-Human Conflicts.*—During the first 8 years (1960-67) of the 1960 bear management program, an average of 262 ( $\pm 72.0$  SD) bear-caused property damages per year were reported within YNP (Table 2). In addition, grizzly bears caused an average of 4 ( $\pm 2.8$  SD) human injuries per year and black bears caused an average of 47 ( $\pm 16.7$  SD) injuries per year.

*Nuisance Bear Control Actions.*—During this period, an average of 3 ( $\pm 1.2$  SD) nuisance grizzly bears and 35 ( $\pm 27.0$  SD) nuisance black bears per year were removed from the park during control actions (Table 2).

Outside YNP, an average of 3 ( $\pm 2.1$  SD) grizzly

**Table 1. Changes in bear management programs in Yellowstone National Park, 1931-93.**

Time period	Bear management program	Major changes from previous periods
1931-59	Informal	More detailed record keeping, removal of nuisance bears as necessary, nuisance bears food conditioned
1960-67	1960 Bear Management Program & Guidelines	Public education, reduction in availability of garbage, feeding of bears prohibited, new garbage can designs, removal of nuisance bears
1968-69	1960 Bear Management Program & Guidelines	Reduction of garbage at Trout Creek Dump
1970-72	1970 Bear Management Program	Bear-proof garbage cans, closure of Rabbit Creek, Trout Creek, and West Yellowstone dumps, period of intensive management
1973-83	1970 Bear Management Program	Closure of Gardiner and Cooke City dumps, most nuisance bears food conditioned, period of lower numbers of bear-human conflict
1983-93	1983 Grizzly Bear Management Program	Protection of backcountry habitat, continued low numbers of bear-human conflict, changes in behavior of nuisance bears from food conditioned to habituated

bears per year involved in bear-human conflict situations were removed. Wildlife management agencies removed 6 of these grizzly bears and private citizens removed 16.

### 1968-69

*Bear-Human Conflicts.*—During the 2-year (1968-69) period that YNP was reducing the amount of garbage being dumped at the Trout Creek dump, an average of 220 ( $\pm 29.0$  SD) bear-caused property damages per year were reported within YNP (Table 2). In addition, grizzly bears caused an average of 4 ( $\pm 2.1$  SD) human injuries per year and black bears caused an average of 20 ( $\pm 2.1$  SD) injuries per year.

*Nuisance Bear Control Actions.*—During this period, an average of 53 ( $\pm 0.7$  SD) nuisance grizzly bears and 119 ( $\pm 0.7$  SD) nuisance black bears per year were translocated from frontcountry to backcountry areas within YNP (Table 2). In addition, YNP personnel

**Table 2.** The number of bear-caused human injuries and property damages and the number of nuisance bears trapped and translocated or removed during periods of different bear management strategies in Yellowstone National Park, 1931-93.

Time period	Species	Bear-caused						Nuisance bears					
		Human injury			Property damage			Translocated			Removed		
		<i>n</i>	$\bar{x}$	SD	<i>n</i>	$\bar{x}$	SD	<i>n</i>	$\bar{x}$	SD	<i>n</i>	$\bar{x}$	SD
1931-59	Grizzly	24	0.8	1.5							84	2.9	5.5
	Black	1,380	47.6	30.9							631	21.8	17.4
	Unknown				2,839	97.9	90.3						
1960-67	Grizzly	28	3.5	2.8							22	2.8	1.2
	Black	373	46.6	16.7							281	35.1	27.0
	Unknown				2,092	261.5	72.0						
1968-69	Grizzly	7	4.0	2.1	99	49.5	7.8	105	52.5	0.7	17	8.5	3.5
	Black	39	19.5	2.1	340	170	21.2	237	118.5	0.7	51	25.5	13.4
	Unknown												
1970-72	Grizzly	6	2.0	2.0	73	24.3	6.7	116	11.7	7.4	35	11.7	7.4
	Black	20	6.7	2.1	113	37.7	28.9	68	6.3	3.8	19	6.3	3.8
	Unknown	3	1.0	1.0	112	37.3	20.1						
1973-82	Grizzly	12	1.2	1.3	49	4.9	3.9	62	6.2	5.1	9	0.9	0.9
	Black	21	2.1	2.4	93	9.3	7.4	59	5.9	6.4	13	1.3	1.8
	Unknown	4	0.4	0.5	95	9.5	8.4						
1983-93	Grizzly	10	0.9	1.5	53	4.8	4.5	46	4.2	3.8	10	0.9	1.3
	Black	1	0.1	0.3	37	3.4	2.9	17	1.6	1.8	4	0.4	0.5
	Unknown	1	0.1	0.3	67	6.1	3.9						

removed an average of 9 ( $\pm 3.5$  SD) nuisance grizzly bears and 26 ( $\pm 13.4$  SD) nuisance black bears per year.

Outside YNP, an average of 5 ( $\pm 0.7$  SD) grizzly bears per year involved in bear-human conflict situations were removed. Wildlife management agencies removed 4 of these grizzly bears and private citizens removed 5.

### 1970-72

**Bear-Human Conflicts.**—During the first 3 years (1970-72) under the 1970 bear management program, an average of 24 ( $\pm 6.7$  SD) grizzly bear-caused property damages per year were reported within YNP (Table 2). Black bears caused an average of 38 ( $\pm 28.9$  SD) incidents of property damage per year. In addition, an average 37 ( $\pm 20.1$  SD) incidents of bear-caused property damage per year was reported in which the species of bear involved could not be determined.

Grizzly bears caused an average of 2 ( $\pm 2$  SD) human injuries per year. Black bears caused an

average of 7 ( $\pm 2.3$  SD) injuries per year. In addition, there was an average of 1 ( $\pm 1.0$  SD) injury per year in which the species of bear could not be determined. One person was killed by a bear during this period. In 1972, a grizzly bear killed a man in an illegally established camp. The bear had been feeding on improperly stored food when the man returned to the camp at night and was killed.

**Nuisance Bear Control Actions.**—During this period an average of 39 ( $\pm 17.8$  SD) nuisance grizzly bears and an average of 23 ( $\pm 10.0$  SD) nuisance black bears per year were translocated from frontcountry to backcountry areas within YNP (Table 2). All of the nuisance bears trapped and translocated were food-conditioned bears that had been seeking human foods or garbage when trapped (M.M. Meagher, NPS, pers. commun.). In addition, YNP personnel removed an average of 12 ( $\pm 7.4$  SD) nuisance grizzly bears and 6 ( $\pm 3.8$  SD) nuisance black bears per year.

Outside YNP, an average of 13 ( $\pm 2.9$  SD) grizzly bears per year involved in bear-human conflict

situations were removed. Wildlife management agencies removed 22 of these grizzly bears and private citizens removed 16.

### 1973-82

*Bear-Human Conflict.*—During the period from 1973 to 1982, an average of 5 ( $\pm 3.9$  SD) grizzly bear-caused property damages were reported within YNP. Black bears caused an average of 9 ( $\pm 7.4$  SD) incidents of property damage per year (Table 2). In addition, an average of 10 ( $\pm 8.4$ ) incidents of bear-caused property damage per year was reported in which the species of bear involved could not be determined.

Grizzly bears caused an average of 1 ( $\pm 1.3$  SD) human injury per year. Black bears caused an average of 2 ( $\pm 0.5$  SD) injuries per year. In addition, there was an average of 0.4 ( $\pm 0.5$  SD) injuries per year in which the species of bear involved could not be determined.

*Nuisance Bear Control Actions.*—During this period, an average of 6 ( $\pm 5.1$  SD) nuisance grizzly bears and 6 ( $\pm 6.4$  SD) nuisance black bears were translocated from frontcountry to backcountry areas within YNP (Table 2). In addition, YNP personnel removed an average of 1 ( $\pm 0.9$  SD) nuisance grizzly bear and 1 ( $\pm 1.8$  SD) nuisance black bear per year.

From 1973 to 1980, all (100%) nuisance grizzly bears that had to be trapped and translocated were food conditioned and had been seeking human foods or garbage when trapped (M.M. Meagher, NPS, pers commun.). From 1980 to 1982, 22% (2 of 16) of the nuisance grizzly bears trapped were not food conditioned, but were habituated to people. These habituated bears were feeding on natural foods within developed areas and along roadsides. These bears were translocated due to concern for human safety. All other (78%) nuisance grizzly bears trapped and translocated during this period were food-conditioned bears.

Outside YNP, an average of 2 ( $\pm 2.1$  SD) grizzly bears per year involved in bear-human conflict situations were removed. Wildlife management agencies removed 12 of these grizzly bears and private citizens removed 6.

### 1983-93

*Bear-Human Conflict.*—During the 11-year (1983-93) period that YNP operated under the 1983 bear management plan, an average of 5 ( $\pm 4.5$  SD) grizzly bear-caused property damages per year were reported in YNP (Table 2). Black bears caused an average of 3 ( $\pm 2.9$  SD) incidents of property damage per year. In addition, an average of 6 ( $\pm 3.9$  SD) incidents of bear-

caused property damage per year was reported in which the species of bear involved could not be determined.

Grizzly bears caused an average of 1 ( $\pm 1.5$  SD) human injury per year. Black bears caused an average of 0.1 ( $\pm 0.3$  SD) injuries per year. In addition, there was an average of 0.1 ( $\pm 0.3$  SD) injuries per year in which the species of bear involved could not be determined. Two people were killed by grizzly bears during this period. In 1984, a female backpacker, camping alone, was killed in a backcountry campsite by a grizzly bear. In 1986, a male photographer who was working alone approached a grizzly bear and was killed.

*Nuisance Bear Control Actions.*—During this period, an average of 4 ( $\pm 3.8$  SD) nuisance grizzly bears and 2 ( $\pm 1.8$  SD) nuisance black bears per year were translocated from frontcountry to backcountry areas within YNP (Table 2). In addition, YNP personnel removed an average of 1 ( $\pm 1.3$  SD) grizzly bear and 0.4 ( $\pm 0.5$  SD) black bears per year.

From 1983 to 1993, only 37% (14 of 38) of the grizzly bears trapped and translocated for management reasons were conditioned to human foods. The other 63% were habituated to people and were feeding on natural foods within developed areas or along roadsides. These bears were translocated due to concern for human safety.

Outside YNP, an average of 3 ( $\pm 1.6$  SD) grizzly bears per year involved in bear-human conflict situations were removed. All of these bears were removed by wildlife management agencies.

## DISCUSSION

### 1960-67

From the 1930s through the 1950s, a large number of bear-caused human injuries (Fig. 1) and property damages (Fig. 2) occurred within YNP. Yellowstone National Park personnel also removed a large number of nuisance bears, especially black bears, during this period (Fig. 3). In 1960, the park implemented a bear management program designed to reduce the number of bear-caused human injuries and property damages that occurred within YNP. This program was directed primarily at the management of black bears (Craighead and Craighead 1967). Black bears had been involved in most bear-caused human injuries that occurred before 1960. Under this program, most management efforts were directed at the removal of potentially hazardous bears, habitual beggar bears, and those bears that damaged property in search of human foods. The 1960

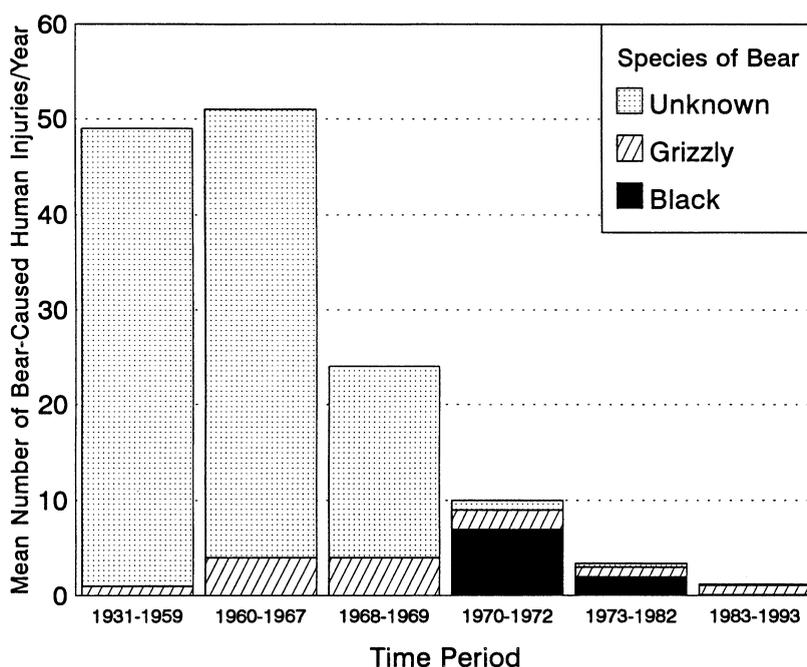


Fig. 1. Average number of bear-caused human injuries occurring per year during different time periods in Yellowstone National Park, 1931-93.

program also included efforts to educate park visitors about methods to reduce bear-human conflicts as well as some efforts to reduce the attractants that brought bears into close contact with people. These bear attractants (unsecured human food and garbage in developed areas as well as human food handouts along roadsides) were the primary cause of most bear-human conflicts that occurred before 1960. After 8 years (1960-67) of the program, many nuisance bears (mostly black bears) had been removed from the population (Fig. 3). However, the number of bear-caused human injuries and property damages had increased from previous levels (Figs. 1 and 2). The increase in the number of bear-human conflicts was probably a result of increasing visitation to the park, in combination with a reduction (but not elimination) in the availability of human foods and garbage that bears had become accustomed to obtaining within developments and along roadsides.

#### 1968-69

In 1968 and 1969, the park continued to operate under the 1960 bear management program, and in addition, began to reduce the amounts of garbage being dumped at the Trout Creek dump. The reductions were done as an experiment before the closing of the dump in 1971. During this period, YNP personnel continued

to remove many bears involved in bear-human conflict situations (Fig. 3). In addition, many nuisance bears were trapped and translocated from developed areas and roadside corridors to remote areas of the park (Fig. 4). The number of bear-caused human injuries and property damages, especially those by black bears, decreased substantially during this period (Figs. 1 and 2). The reduction in the number of bear-human conflicts was probably a result of the translocations and removals of many nuisance bears, in combination with stricter enforcement of regulations that prohibited the feeding of bears. Park efforts to reduce bear attractants in developed areas and to educate visitors on how to reduce bear-human conflicts also contributed to the reduction of bear-human conflict situations that occurred during this period. These actions were all components of the 1960 bear management program.

#### 1970-72

In 1970, a new, much more intensive bear management program was implemented (Meagher and Phillips 1983). The 1970 program put more emphasis on the elimination of unsecured human food and garbage that attracted bears into developed areas. Bear-proof tops were installed on all garbage cans within YNP. Regulations that prohibited the feeding of bears were strictly enforced, as were regulations that required

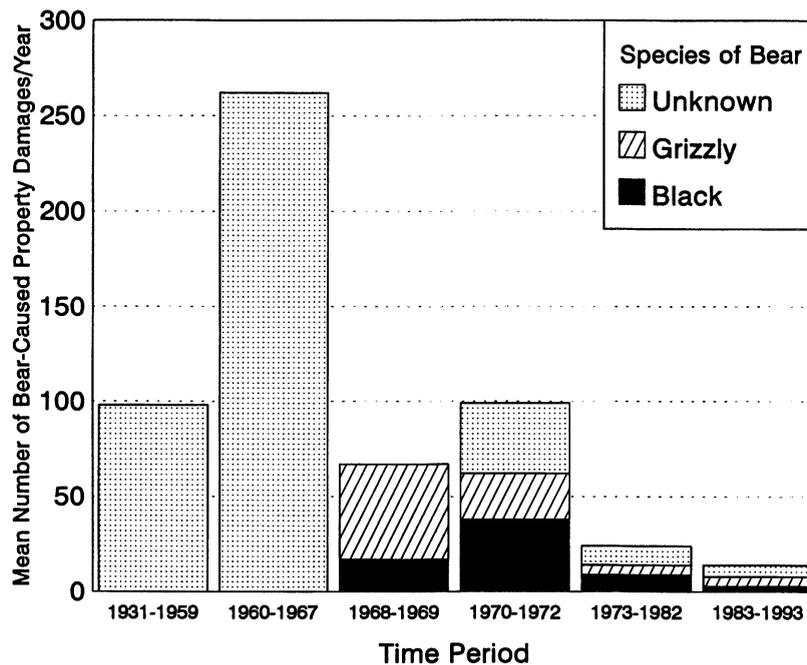


Fig. 2. Average number of bear-caused property damages occurring per year during different time periods in Yellowstone National Park, 1931-93.

human foods and garbage be kept secured from bears. In addition, 2 large dumps within YNP and 1 dump outside YNP were closed. Under the 1970 program, the number of bear-caused human injuries continued to decrease from previous levels. However, the number of property damages that occurred within YNP increased slightly from the 1968-69 period. The reduction in human injuries was accomplished primarily through the elimination of black bear-caused human injuries along roadside corridors, most of which occurred when people attempted to feed or approach bears that were begging for human food handouts. The strict enforcement of regulations that prohibited the feeding of bears eliminated this problem. The enforcement of food-storage regulations and the bear-proofing of all garbage storage facilities within park developed areas, as well as the prompt removal of bears that persisted in trying to obtain human foods, also contributed to the reduction in bear-caused human injuries. The increase in bear-caused property damages that occurred during this period may have been due to bears accustomed to feeding at park dumps dispersing into park developments and damaging property in search of human foods.

A large number of bears that persisted in trying to obtain human foods were trapped and translocated (Fig. 4) or removed (Fig. 3) from the population during

the first 3 years (1970-72) of the 1970 management program. The number of nuisance grizzly bears being removed outside YNP also increased during this period. This was to be expected when a concentrated, easily accessible food source (human foods and garbage) that had been available to and used by bears for over 80 years was significantly reduced (through closure of the Rabbit Creek, Trout Creek, and West Yellowstone dumps) over a 3-year period (1970-72), and then completely eliminated (through closure of the Gardiner and Cooke City dumps) within the next 7 years (1973-79). This was undoubtedly a very stressful period for both the grizzly bear and black bear populations within the ecosystem, due to the high number of management removals and the loss of the dumps as concentrated food sources that supplemented natural foods.

The timing of the dump closures contributed further to the nutritional stress on the bear populations (Knight et al. 1983). Before the closing of the dumps, the available biomass of elk (*Cervus elaphus*) and bison (*Bison bison*), 2 important, high-quality food sources for bears, were substantially lower than at present (Despain et al. 1986). In addition, the availability of cutthroat trout (*Oncorhynchus clarki*), another important, high quality food source for bears, may have been lower than at present (Reinhart and Mattson 1990). Elk and bison numbers had been kept at low

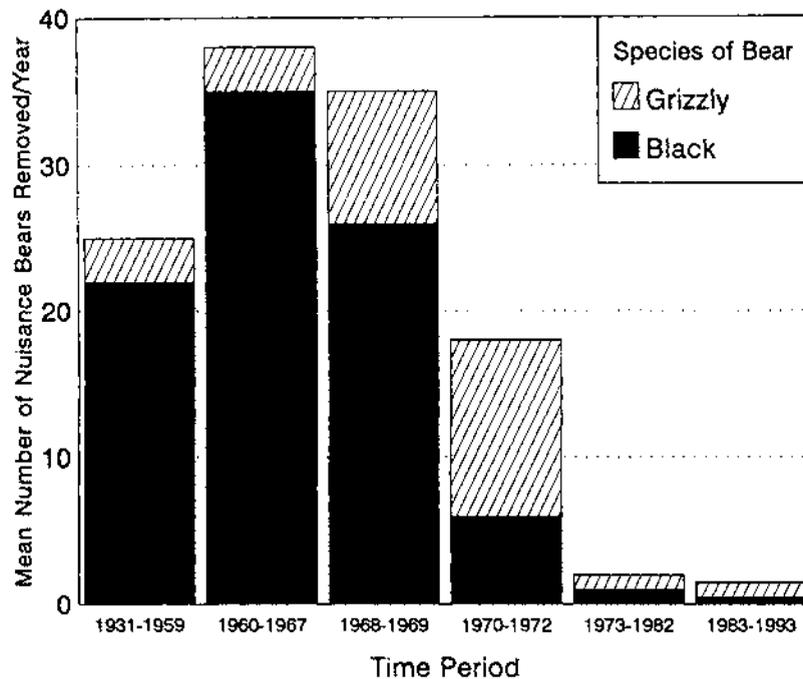


Fig. 3. Average number of nuisance bears removed per year during different time periods in Yellowstone National Park, 1931-93.

levels by the park's herd reduction program (Houston 1982) and the population dynamics of the cutthroat trout population in Yellowstone Lake had been severely affected by overharvest (Gresswell and Varley 1988). After termination of the ungulate herd reduction program in 1968 (Houston 1982), population numbers of elk and bison have increased significantly (Singer and Mack 1993). Changes in YNP fishing regulations have led to a population of older, larger cutthroat trout in Yellowstone Lake (Gresswell and Varley 1988). Bears within YNP are now known to feed extensively on winter-killed elk and bison in spring and on bulls weakened by the rut in fall (Mattson et al. 1991). Bears within YNP also prey extensively on elk calves in late spring (French and French 1990, Gunther and Renkin 1990). Predatory behavior by bears on elk calves may have increased since closure of the dumps and termination of the ungulate herd reduction programs (French and French 1990, Gunther and Renkin 1990). Bear predation on spawning fish may also have increased since closure of the dumps and changes in the park's fishing regulations (Reinhart and Mattson 1990).

#### 1973-82

The 1973-82 period represented a transition from elimination of bear attractants (non bear-proof garbage

cans and human food handouts) in developed areas and removal of bears that persisted in trying to obtain human foods, to a high level of management designed to prevent bear-human conflicts from occurring (Meagher and Phillips 1983). The last 2 dumps, 1 within, and 1 outside YNP were closed during this period. The number of bear-caused human injuries and property damages as well as the number of nuisance bears translocated and removed declined significantly during this period (Figs. 1, 2, 3, and 4). However, most of the bear-human conflicts that did occur still involved food-conditioned bears seeking human foods.

Black bear-caused injuries to humans had been mostly eliminated by 1973. From 1973 to 1982, there was a small reduction in the number of grizzly bear-caused human injuries in developed areas. However, this reduction was partially offset by an increase in grizzly bear-caused injuries in backcountry areas. The increase in backcountry injuries was probably due to the large increase in backcountry use of the park that occurred in the 1970s (Gunther 1990).

#### 1983-93

From 1983 to 1993, bear management within YNP continued to emphasize preventing bear-human conflicts from occurring, rather than translocating or removing bears after bear-human conflicts had occurred. This

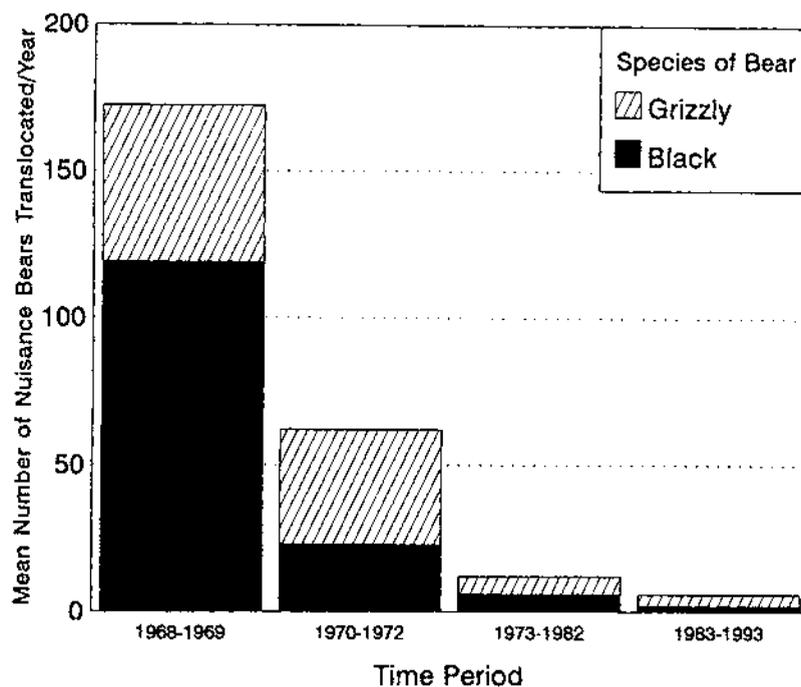


Fig. 4. Average number of nuisance bears translocated per year during different time periods in Yellowstone National Park, 1968-93.

period was characterized by continued low numbers of bear-caused human injuries and property damages (Figs. 1 and 2) as well as low numbers of nuisance bears that had to be translocated or removed (Figs. 3 and 4). It was uncommon for bears to obtain human foods within YNP during this period.

The number of grizzly bear management actions during the 1983-93 period did not change significantly from the 1973-82 period. This suggests that the number of nuisance bear management actions has been reduced to as low a level as possible under the current management program. Further reductions in the number of bear management actions required in YNP may be difficult to achieve and will require new management strategies.

Black bear injuries remained a rare occurrence during this period. Grizzly bear injuries remained at an average of 1 per year. Most grizzly bear-caused human injuries occurred in backcountry areas during sudden, close encounters between bears and hikers. It will be difficult to further reduce the frequency of this type of injury, especially if backcountry recreational use in YNP continues to increase.

In contrast to earlier years, nuisance bear problems during this period were primarily due to bears that were habituated to people, feeding on natural foods within developments and along roadsides. The spatial and

temporal overlap between human and bear activity in these areas predisposes bears to habituation to people, the possibility of becoming food conditioned, and to being involved in potentially dangerous bear-human encounters. If the grizzly bear population increases and recovery goals are met, the problem of bears foraging within developed areas and along roadsides is likely to increase. The continuing increase in visitation to the park further increases the potential for habituation of bears to people, bear-human conflict, and subsequent bear management control actions. Temporary closures, trapping and translocation, and aversive conditioning are the management tools currently being used to address this problem. Unfortunately, these management actions have had only limited success. New, innovative management strategies for dealing with habituated bears will be needed to ensure the continued existence-recovery of the grizzly bear population within the Yellowstone ecosystem.

### Management Implications

Most incidents of bear-human conflict in the Yellowstone ecosystem involve food-conditioned bears that damage property while attempting to obtain human foods or garbage. Subsequently, these bears are often trapped and translocated or removed from the ecosystem. Public education programs and programs

designed to prevent bears from obtaining human foods and garbage must remain a permanent bear management priority within YNP. In an effort to reduce bear-human conflict and promote grizzly bear recovery throughout the Yellowstone ecosystem, public cooperation and the bear-proofing of food and garbage storage facilities must also become a management priority in areas outside YNP. Most incidents of bear-human conflict, bears obtaining human food, and translocations of nuisance bears now occur outside YNP (Gunther et al. 1993, 1994).

Habituated, but not food conditioned, bears are now the cause of most bear-human conflicts occurring within YNP. At McNeil River, Alaska, management of people and habituated bears in a small, highly controlled, supervised situation has been successful in allowing bears and people to co-exist within close distances of each other (Aumiller 1994). Similar management of people and habituated bears over large areas with high numbers of unsupervised visitors has not been attempted. Management strategies designed to address the human safety concerns of having habituated grizzly bears foraging within developments and along roadsides must be developed to ensure the continued survival of the grizzly bear population within the Yellowstone ecosystem.

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