

BLACK BEAR/HUMAN CONFLICTS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

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Abstract: An evaluation was made of 1,028 reports of black bear (*Ursus americanus*)/human incidents involving personal injuries, property damage, and bear control actions in Great Smoky Mountains National Park, 1964-76. Respective totals for personal injuries and incidents of property damage were 107 (range, 1-23 per year) and 715 (range, 9-116 per year). Captures and relocations for the period numbered 332, and 18 bears were destroyed. Seventy-six percent of the nuisance bears were males. Improper food storage, violations of park regulations, and high levels of visitor use at certain campsites, shelters and along a few main roads and trails are factors contributing to bear/human conflicts.

Conflicts between black bears and humans have steadily increased in Great Smoky Mountains National Park since its establishment in 1932. Black bears were not common when the park was first established, but populations increased under the protection provided by the park (LaFollette 1974). Likewise, visitor use of the park increased tremendously from 1953 to 1973, averaging nearly 7 percent increase per year (National Park Service 1976). The purpose of this paper is to review black bear/human conflicts in Great Smoky Mountains National Park between 1964 and 1976.

REPORT COLLECTION

Great Smoky Mountains National Park maintained reports of human injuries, property damage incidents, and all bear control actions. We evaluated 1,028 of these reports for the 1964-76 period. Data for 1965 were not available.

Visitor use of backcountry sites was estimated by the number of legal permits issued for each site. Sizes of backcountry sites were taken from a survey conducted in 1975-76 by the staff of Uplands Field Research Laboratory.

BEAR/HUMAN CONFLICTS

Personal Injuries

The number of personal injuries due to black bears ranged from 1 to 23 per year between 1964 and 1976. Personal injuries were more common in years when other bear conflicts increased (Fig. 1). Seventy-six (71 percent) of 107 personal injuries for that period occurred along Newfound Gap Road and Clingman Dome Road. These roads receive the heaviest traffic in the park.

Violations of National Park Service regulations often occur along the roads and are a contributing factor to personal injuries. In 32 instances the person(s) were feeding the bear and in 3 instances the person was petting

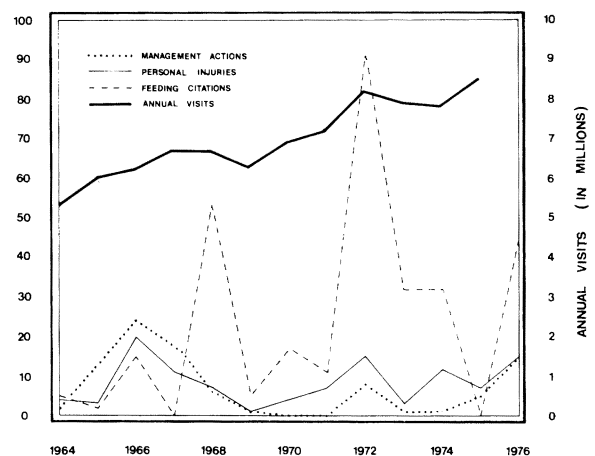


Fig. 1. Annual fluctuations in total damage incidents by black bears contrasted with annual fluctuations in visitor use, Great Smoky Mountains National Park, 1964-76.

the bear. Other injuries were incidental to bear concentration and involved visitors photographing bears or picnicking.

Few personal injuries, only 7, occurred in the park's backcountry, all at the most heavily used sites. Thirty-one injuries occurred at frontcountry sites and 4 along heavily used day-hiking trails.

Apparently, the defensive behavior of sows with young increased the likelihood of an injury, as Herrero (1970) and Cole (1972) noted for grizzly bears (*U. arctos*). In order to test this pattern, we compared the number of productive sows involved in personal injuries, 18 (17 percent) the productive sows involved in all other nuisance problems, 37 (6 percent), and found the association significant ($X^2 = 34.96 > 3.84, P < 0.05$).

Damage Incidents

Incidents of property damage attributable to black bears totaled 715 in the period 1964-76. The number of

incidents in any particular year ranged from 9 to 116 (\bar{X} = 59, SD = 40.2). These fluctuations may represent different reporting emphasis as much as any actual change in incident rates.

Food storage was a contributing factor in many incidents (Table 1). Food was stored in a fashion other than that recommended by park literature and required by park regulations in 214 (30 percent) of the incidents. Misconceptions were common about what constitutes proper food storage. For example, food was often stored in the passenger section of a car or in a separate tent or trailer under the misconception that food was protected there. Even though food and backpacks were suspended from trees in the backcountry, bears often obtained the food by climbing the trees, breaking the limbs, or chewing through tie ropes.

Table 1. Property damage incidents related to food storage, Great Smoky Mountains National Park, 1964-76.

Category	Number	Percent
Food/cooler left out	114	16
Food in passenger section of vehicle	51	7
Food in tent	37	5
Food in tent-trailer	35	5
Backpack unguarded	20	3
Illegal campsite	12	2
Unknown	201	28
Food stored properly	245	34
Total	715	100

Frontcountry damage incidents were in the majority until 1973. Since 1973, the majority of damage incidents have occurred in the backcountry (Fig. 2). The proportion of total damage incidents was chosen as an indicator

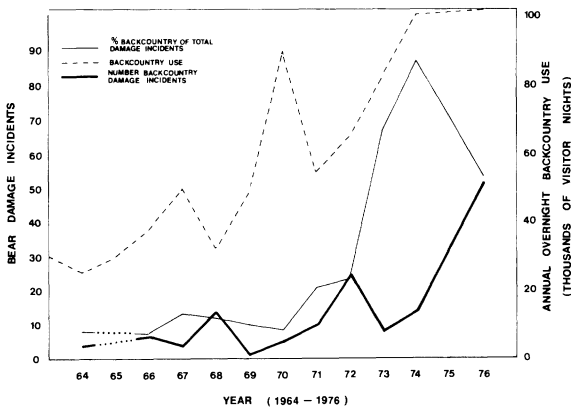


Fig. 2. Trends in proportion of damage incidents occurring in the backcountry and increases in backcountry overnight use, Great Smoky Mountains National Park, 1964-76.

of the extent of damage because reporting emphasis was inconsistent between years but tended to be consistent within a year. The increase in backcountry use in the park has far exceeded the increase in total visitor use. For example, between 1963 and 1975, total visitor use increased 62 percent and frontcountry camping increased only 23 percent, whereas backcountry camping increased 250 percent, from 30,088 to 105,220 visitor-nights (National Park Service 1976).

Backpacking in the Great Smoky Mountains is concentrated along certain sites and trails. In 1973, 54 percent of nights on the trail were spent in shelters along the Appalachian Trail, which total only 18 percent of the designated backcountry sites (National Park Service 1976). It was hypothesized that bear damage incidents in the backcountry were related to heavy visitor use. To test this hypothesis, the presence or absence of bear incidents for 1975 and 1976 were compared with visitor-nights for the preceding year, 1974 (Table 2), since visitor data for 1975 and 1976 were unavailable. A chi-square test of independence indicated that occurrence of black bear damage incidents was associated with the number of visitor-nights at a site ($X^2 = 22.89 > 5.99, P < 0.05$).

Table 2. Occurrence of black bear incidents in 1975 and 1976 at backcountry sites with high, moderate, and low levels of visitor use (numbers of visitor-nights) in 1974, Great Smoky Mountains National Park.

	Backcountry sites			Total
	High use (>1,000)	Moderate use (400-1,000)	Low use (<400)	
Sites with reported bear incidents	15 (65%)	8 (35%)	0	23 (100%)
Sites without reported bear incidents	18 (21%)	28 (32%)	41 (47%)	87 (100%)

Black bear incidents are apparently related to the area of ground trampled at backcountry campsites. Although few (13 percent) of the very small sites (less than 100 m² of vegetation damage) had incidents and many (42 percent) of the very large sites (greater than 20,000 m²) had incidents, the pattern broke down in the case of the moderate-sized sites. Sites of 5,000-20,000 m² had about the same percentage of incidents (23 percent) as sites of 1,000-5,000 m² (24 percent). Some of the smaller sites that had bear incidents have recently been moved to new locations and the bears have apparently moved with the sites — or the small sites belong to cluster areas of legal or illegal sites with bear problems.

Many black bear incidents occurred in 4 major clusters of backcountry sites in the park. These problem areas typically involved 3-5 heavily used sites located close together. All 4 areas included Appalachian Trail shelters and nearby sites just off the main ridgeline of the park. Heavy use at many of these sites near shelters was caused by limited visitor capacity at the shelters and the rerouting of surplus campers to the nearest sites.

Interviews with backcountry visitors in 1976, followed by checks on bear incidents reported in park files, indicated that official reports were many times less than the actual number of bear incidents. Low reporting rates for the backcountry were due to (1) lack of manpower to adequately contact visitors in the backcountry, (2) lack of emphasis upon reporting incidents, (3) visitors leaving the park at a number of points that are unmanned by rangers, and (4) absence of notices encouraging visitors to report incidents.

Management Actions on Bears

A total of 332 captures and relocations of black bears were made for the period 1964-76, and 18 bears were disposed of. Research personnel from the University of Tennessee made 41 captures for the purpose of park management. Large numbers of relocations and disposals consistently occurred in Cades Cove (130 actions, 40 percent), and the Newfound Gap-Clingmans Dome Roads (63 actions, 19 percent). Some problem areas were corrected by permanent closure of sites or by installation of bearproof garbage cans.

A total of 27 bears were captured and relocated 37 times during 1975 and 1976. Transplant success was 86 percent for bears transferred 16-30 km and only 9 percent for bears transferred 3-15 km. The difference is significant ($X^2 = 6.59 > 3.84, P < 0.05$). Beeman and Pelton (1976) analyzed relocations in the park for

1967-74 and also found a strong inverse relationship between distance to relocation site and probability of returning.

Sex ratio of nuisance bears handled was 76 percent males and 24 percent females, which differs significantly ($X^2 = 12.72 > 10.81, P < 0.001$) from the ratio of free-ranging bears in the park population, which is 52 percent males and 48 percent females (Beeman 1975). Yearling and cub ratios were identical in the nuisance and free-ranging populations.

DISCUSSION

Information and warnings concerning black bears may be lacking both in quantity and effectiveness. Violations of National Park Service regulations were a major contributing factor in personal injuries, as were violations and misconceptions of proper food storage in damage incidents. Pelton et al. (1976) also found that many visitors receiving property damage from bears were guilty of rule violations.

Occurrence of black bear incidents at backcountry sites was associated with high numbers of visitor-nights. A disproportionately high number of visitors use backcountry sites along the Appalachian Trail and adjacent drainage heads, the same areas with clusters of bear problem sites. The highest densities of black bears (1 bear per 0.42-0.54 km²) in the park apparently occur along these same mountain crest areas (Marcum 1974), further increasing the likelihood of bear/human conflicts. The Appalachian trail, with attendant trail shelters, is a major backpacking attraction in Great Smoky Mountains National Park. A challenge to park management will be to redistribute or to minimize the bear/human conflicts resulting from ever-expanding visitor use along this trail.

LITERATURE CITED

- BEEMAN, L. E. 1975. Population characteristics, movements, and activities of the black bear (*Ursus americanus*) in the Great Smoky Mountains National Park. Ph.D. Thesis. Univ. of Tennessee, Knoxville. 218pp.
- , AND M. R. PELTON. 1976. Homing of black bears in the Great Smoky Mountains National Park. Pages 87p95 in M. R. Pelton, J. W. Lentfer, and G. E. Folk, Jr., eds. Bears — their biology and management. IUCN Publ. New Ser. 40.
- COLE, G. F. 1972. Preservation and management of grizzly bears in Yellowstone National Park. Pages 274-288 in S. Herrero, ed. Bears — their biology and management. IUCN Publ. New Ser. 23.
- HERRERO, S. 1970. Human injury inflicted by grizzly bears. Science 170(3958):593-598.
- LAFOLLETTE, J. D. 1974. Some aspects of history of the black bear (*Ursus americanus*) in the Great Smoky Mountains. M.S. Thesis. Univ. of Tennessee, Knoxville. 149pp.
- MARCUM, L. C. 1974. An evaluation of radioactive feces tagging as a technique for determining population densities of the black bear (*Ursus americanus*) in the Great Smoky Mountains National Park. M.S. Thesis. Univ. of Tennessee, Knoxville. 95pp.
- NATIONAL PARK SERVICE. 1976. Environmental assessment of the alternatives for the general management plan, Great Smoky Mountains National Park. Gatlinburg, Tenn. 331pp.
- PELTON, M. R., C. D. SCOTT, AND G. M. BURGHARDT. 1976. Attitudes and opinions of persons experiencing property damage and/or injury by black bears in the Great Smoky Mountains National Park. Pages 157-167 in M. R. Pelton, J. W. Lentfer, and G. E. Folk, Jr., eds. Bears — their biology and management. IUCN Publ. New Ser. 40.