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RH: Rogers • Diversionary Feeding of Black Bears

Does Diversionary Feeding Create Nuisance Bears and Jeopardize Public Safety?

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ABSTRACT Diversionary feeding of black bears (*Ursus americanus*) around campgrounds and residential areas has received little study because of concerns it might create nuisance bears and jeopardize public safety. To evaluate those concerns and assess its effectiveness in mitigating human-bear conflict, we studied diversionary feeding at a U. S. Forest Service campground/residential complex that had been a perennial focus of human-bear conflict. Before the study began, 6 bears were removed from the complex in 1981-1983. During 8 years of diversionary feeding tests (1984-1991), the only bear removed was a transient sub-adult male that had not yet found the diversionary feeding site. Nuisance problems were greatly reduced throughout the study despite the fact that garbage continued to be available and study bears were intentionally habituated and food-conditioned. The study included 1985—the year with the lowest bear food index recorded for Minnesota. In this study and other examples of diversionary feeding across North America, nuisance complaints, house break-ins, attacks, and bear removals were fewer, often drastically fewer, than elsewhere, and residents became more willing to coexist with bears. Habituated, food-conditioned did not become nuisances and did not jeopardize public safety. There is a need to reevaluate policies toward these bears in this light. Further study is needed to determine the situations in which diversionary feeding can be most effective in mitigating human-bear conflict.

KEY WORDS black bear attacks, campgrounds, diversionary feeding, food-conditioning, habituation, house break-ins, natural bear food, nuisance complaints, problem bears, supplemental feeding, *Ursus americanus*.

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As human residences spread into bear habitat, the potential for human-bear conflict increases (Conover 2002). Black bears (*Ursus americanus*) have a high tolerance for anthropogenic activities and readily adapt to artificial food sources (Spencer et al. 2007). It is well known that garbage, bird seed, and other human foods can lure bears into campgrounds and residential areas (McCullough 1982, Garshelis 1989, Beckman and Berger 2003), but there has been little study of how food can be used to lure bears away from problem situations (Rogers 1989). One reason for this lack of study is a concern that habituated, food-conditioned bears might become nuisances or jeopardize public safety. However, in Slovenia, bear damage in diversionary feeding areas was only a third that in non-feeding areas despite bear populations up to 6 times greater (Klenzendorf 1997). Diversionary feeding has proved effective in reducing black bear

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damage to trees in the Pacific Northwest (Ziegltrum 2004, 2008) and in reducing crop damage by ducks, white-tailed deer (*Odocoileus virginianus*), and rats (*Rattus* sp.) (Conover 2002).

To evaluate diversionary feeding as a means to mitigate human-bear conflict and to evaluate the associated concerns about habituation and food-conditioning, we conducted diversionary feeding tests at a U. S. Forest Service campground and residential complex near Ely, Minnesota, USA, in 1984-1991. We compared conflicts in that area before and during the study, and we compared behavior of bears in the study area with that of bears in an adjacent 25-year study without diversionary feeding.

Habituation, as used in this paper, is the waning of bears' responses to humans. Food-conditioning refers to bears learning that certain locations, situations, or humans are likely to provide food. We intentionally used food-conditioning to facilitate habituation at the diversionary feeding site.

STUDY AREAS

The diversionary study area was a 4.4 km stretch of residences and campsites along the south shore of the Kawishiwi River in the Superior National Forest, 18 km southeast of Ely, Minnesota. This was an area of perennial bear problems. We placed the diversionary feeding site near the middle of this area at the U. S. Forest Service (USFS) Kawishiwi Field Laboratory (47 degrees 49'N, 91 degrees 44'W). Problem areas were the following distances from the feeding site:

- 1) 0.25 km to the northeast was a roadside rest area and non-bearproof dumpster beside Minnesota State Highway 169,
- 2) 0.5 km to the northeast was a USFS swimming beach and picnic area with a non-bearproof dumpster and 2 non-bearproof garbage cans,
- 3) 0.5 to 1.0 km to the northeast was a 31-site USFS campground with a non-bearproof dumpster and 3 non-bearproof garbage cans,
- 4) 0.3 to 2.0 km to the north and northeast were 16 private residences,
- 5) 1.2 to 3.4 km to the southwest were 26 residences on leased USFS lots with food attractants including a non-bearproof dumpster and numerous garbage cans, bird feeders, barbecues, and fish-cleaning areas.

The diversionary study area was adjacent to a study area in which bears were not intentionally given diversionary food and were studied for 25 years (Rogers 1987). For comparative purposes, bears were monitored in both study areas and beyond. The entire region was within the Canadian Shield ecological complex. Vegetation was mixed coniferous/deciduous forest with little oak (*Quercus* spp.) and no beech (*Fagus grandifolia*) or hickory (*Carya* spp.). Soils are shallow and non-calcareous with low fertility (Rogers 1987). Preferred foods included ant brood, hornet larvae, hazelnuts (*Corylus cornuta*), and berries, all of which varied in abundance from year to year due to weather, insect outbreaks, and other factors (Rogers 1987).

METHODS AND MATERIALS

The diversionary feeding site was a box of food placed on a pad of tracking sand 8 meters from an overlooking 35-foot-wide window and flood lights. The building included living quarters for USFS observers and volunteer observers day and night. Beef fat was the primary diversionary

food with the exception of 50 kg of grapes added during 6-21 July 1984. We replenished beef fat in unlimited amounts during 1984-1985 and in limited amounts during 1986-1991.

We identified bears by ear-tag number and placement, radio-collar frequency, sex, coat color, muzzle color, chest blaze, eyebrow patches, and scars. In the few instances when observers were not present at night, track characteristics were used for identification.

During 15 July to 30 September 1984, we weighed the box of food before and after each bear fed from it. On nights when observers were not present, we weighed the box in the evening and morning and pro-rated amounts eaten among the 0-3 bears we identified by tracks.

Bears first observed as dependent young were of known age. We determined ages of other bears from cementum annuli in a first upper premolar or by a combination of head shape, baculum length, testicle size, nipple characteristics, weight, body length, width of a forepaw, and distance from gum to the cementum-enamel interface on an upper canine tooth (Brooks et al. 1998, McMillin et al. 1976, McRoberts et al. 1998).

To avoid confounding results, we did not reduce attractants in the study area. Dumpsters and garbage cans remained non-bear-proof and were often over-flowing. Campers were not warned about bears. Residents continued to feed birds. In addition, we intentionally habituated and food-conditioned bears at the diversionary feeding site by acclimating bears to our presence and by hand-feeding and stroking bears that would tolerate it.

We monitored bears by telemetry, ear tag returns, and direct observations. Observers included residents, USFS campground employees, hunters, and researchers. Nearly 200 volunteers and researchers accompanied certain habituated bears up to 48 hours at a time beginning in September 1985 (Rogers 1987; Rogers and Wilker 1990). To the extent possible, we monitored study bears until their deaths to determine the extent to which their behaviors and fates were altered by diversionary feeding, habituation, and food-conditioning. For comparisons, we used DNR statewide bear nuisance summaries and kill records (Garshelis and Noyce 2007), reports from District Wildlife Managers throughout the region, newspaper accounts, and data from the long-term ecological study we conducted simultaneously (Rogers 1987).

RESULTS

1984

Natural food abundance in the region.— Bear food in northeastern Minnesota was moderately abundant in 1984 (Garshelis and Noyce 2007) and included ant pupae in late spring and early summer, and hazelnuts, blueberries (*Vaccinium* spp.) and wild sarsaparilla (*Aralia nudicaulis*) berries in mid to late summer.

Nuisance activity in the region.— There were few nuisance complaints in 1984.

Visits to the feeding site in 1984.— Eight bears visited the feeding site from the time observations began on 1 June until the last bear visit of the year on 30 September. Visitors included 2 adult females (each with 2 yearlings), a 2-year-old male (405), and a 5-year-old male (430) that walked through on 21 June (mating season) without stopping to eat.

One of the mothers, 6-year-old radio-collared female 403, held a territory to the south that included the 26 residences on USFS land. She brought her 2 yearlings (females 401 and 429) to the feeding site 8 times during 1-13 June, separated from them the evening of 13 June,

and left for 5 days of the mating season (14-18 June). She returned on 19 June and visited the feeding station briefly on 12 of the 56 days from that date to 13 August. Her longest absences during that period were 13 and 16 days with no visits after 13 August. After family break-up on 13 June, the only visit by either of her daughters was by female 401 on 18 June.

The other mother, 10-year-old female 812, held a territory to the east that included 16 private residences, the highway rest area, and the USFS picnic area, swimming beach, and campground. She had been a nuisance in the campground the year before. She brought her 2 yearlings (a black male and a brown male) to the feeding site on 10 June and separated from them by the end of that day. She left for 4 days of the mating season (11-14 June) and returned on 15 June to visit the feeding site briefly on 26 of the 46 days from that date to 31 July. Her longest absences during that period were 8, 5, and 5 days with no visits after 31 July. By that time, blueberries and sarsaparilla berries were at peak ripeness, and hazelnuts were beginning to ripen.

After family break-up on 10 June, both of 812's sons visited the feeding site. Her black son was twice seen passing by the campground heading toward the feeding site, but he did not approach people or attempt to obtain food from the campground. He visited the feeding site briefly 4 times between 21 June and 18 July with no visits after that. However, 812's brown son visited on 74 of 112 days between family break-up and 30 September and was the only visitor after 13 August. His longest absence was 5 days (17-21 August) during the peak of the hazelnut season. He became the most habituated, food-conditioned visitor at the feeding site, but the one time he was seen passing by the campground heading toward the feeding site he did not approach people or attempt to obtain food from the campground. As he decreased his activity in September in preparation for hibernation, he became increasingly timid, nocturnal, and selective of what he ate, preferring omental fat to subcutaneous fat. On 14 September, he grazed on clover (*Trifolium repens*) at the feeding site and rejected fat. He ate nothing on his final 3 visits 28-30 September. He grew from an estimated 20 kg at family break-up to 77 kg on 28 September.

Male 405, a 2-year-old male, was first seen in the study area on 10 July when he passed through a yard in the USFS residential area and fed from an open dumpster. Two days later, he found the feeding site and was not seen in a problem area again. He visited the feeding site on 10 of 18 days during 12-29 July with no visits after that.

Average consumption per visit to the feeding site was 0.92 kg/visit. During the period from 15 July to 30 September, when amounts eaten were recorded, 4 bears ate 127 kg of beef fat and 17 kg of grapes. Most of that (93 kg of fat and 13 kg of grapes) was eaten by the brown yearling male. Female 403 ate 12.8 kg of fat and 0.3 kg of grapes. Female 812 and Male 405 shared the remaining 21.2 kg of fat and 3.7 kg of grapes). Beef fat is not a highly preferred food, and most bears abandoned the feeding site when preferred berries and hazelnuts became available.

Nuisance activity before and during the first year of study.— In the 3 years (1981-1983) before diversionary feeding, nuisance activity was common in both the campground and residential area. Open dumpsters, garbage cans, and bird feeders attracted several bears each year. Bears approached people for food. Officials removed 2 bears in each of the 3 years.

In 1984, the first year of diversionary feeding, no bear was considered a problem, including 812 that had been a nuisance in the campground the year before. USFS campground manager Joseph Lekatz wrote in his 1984 year-end report that diversionary feeding is “working well in the Kawishiwi Campground vicinity” and that no bear approached him for food.

Bears that were habituated and food-conditioned at the feeding site avoided campers and residents elsewhere, and none was killed by hunters in the September-October hunting season. Seven of the 8 bears that visited the feeding site did so only briefly and occasionally, especially after berries and hazelnuts ripened. The radio-collared female (403) held a territory similar in size to those of bears without diversionary food in the adjacent study area (Rogers 1987). Behavior at the feeding site varied from timid and nervous to trusting but was not threatening.

1985

Natural food abundance in the region.— 1985 contrasted with 1984 in being the year with the lowest bear food index recorded by the Minnesota Department of Natural Resources (DNR) in 23 years of surveys (Garshelis and Noyce 2007). In May and June, rainfall in the study area was 48% higher than the 32-year average (Doran 2009), hampering ant reproduction and flooding swamplands where wild calla (*Calla palustris*) and blue joint grass (*Calamagrostis canadensis*) would normally be available. Record low temperatures of -6C (Soudan, MN) and -8C (Embarrass, MN) on 3 June killed berry and hazelnut blossoms, reducing mast production in July and August. The food shortage extended throughout northeastern Minnesota (Garshelis and Noyce 2007) and hundreds of kilometers north on the Canadian Shield.

Nuisance activity in the region.— Nuisance complaints in 1985 were the highest recorded by the DNR (2,859) in 22 years of such record-keeping (Garshelis and Noyce 2007). Bears in Canada and northeastern Minnesota migrated south in a pattern similar to migrations of past years of food shortage. They migrated south to Lake Superior and into cities along the shoreline (Schorger 1946, 1949; Rogers 1987). Landowners and officials shot hundreds of nuisance bears around residences, including 70 in Thunder Bay and 90 in Duluth (Rogers 1987).

Three bears killed in Duluth from the 25-year study were 90, 107, and 107 km outside their usual home ranges. Female 664's trip to Duluth was the first known trip this 24-year-old made outside her territory in 11 years of radio-tracking. Of 11 bears killed from that study in 1985, 11 were 20-107 km outside their usual ranges. Study bears were killed in larger numbers and farther from their usual ranges than in any other year of that study (Rogers 1987). They included a disproportionate number over 14 years of age (Rogers 1987).

Some bears traveled around the tip of Lake Superior into the oak forests of Wisconsin and east central Minnesota (Rogers 1987) as has been observed in the past (Schorger 1946, 1949). Bears were forced to turn to less preferred foods, including human foods, and an unusual numbers were attracted to garbage dumps where fights over food resulted in a broken leg, a 12-cm laceration, and a nose pad bitten off (Rogers 1987). An unusual number were also attracted to hunters' baits during the September-October bear-hunting season. Hunter success rose from 20% in 1984 to 52% in 1985 (Joselyn and Lake 1987). The number killed by hunters in northeastern Minnesota rose from 180 in 1984 to 424 in 1985 (Joselyn and Lake 1987), in addition to the hundreds killed before hunting season began.

Natural mortality in the region.— Food shortage and increased travel caused the greatest annual weight loss among adults and the highest starvation among cubs and yearlings in the 25-year study. Of 10 cubs observed with mothers that did not visit the feeding site, only 4 cubs survived through August. Four females 11-20 years old averaged 68.2 kg (61.4-75.5 kg)

in March 1985 and only 51.6 kg (49.5-54.5 kg) in March 1986. Of 7 yearlings that accompanied 3 of those females, only 1 yearling survived. Two cubs that accompanied the fourth female died, and it took the mother until 1988 to produce another litter. Two of the other females also delayed producing cubs for 1-2 years beyond what would be expected. The oldest female of the 4 (20-year-old female 641) fared the best. One of her 2 yearlings was the yearling that survived, and she produced a litter of 3 cubs in 1986, 1 of which survived.

Visits to the Feeding Site.— Natural food shortage and rampant nuisance activity across the region provided an unusual opportunity to study diversionary feeding. Beef fat was made available at the feeding site from early April until late October, which included the period of bear activity.

Seven of the 8 bears that had visited the feeding site in 1984 returned in 1985. 2-year-old female 429 arrived shortly after emergence even though she had not visited after family break-up in 1984. Her female sibling (401) arrived 11 May. On 23 May, 11-year-old female 812 arrived with 3 cubs (1 male, 2 females). 3-year-old male 405 arrived 25 May. 812's 2-year-old black son came briefly on 3 and 4 June and then presumably dispersed as would be expected of a male his age. 6-year-old radio-collared female 403 and her 2 cubs (females Patch and Terri) did not arrive until 12 June even though their den was only a kilometer away. 6-year-old male 430 was the last returnee to arrive (20 June). Surprisingly, the most frequent visitor of 1984—812's brown son—did not return in 1985 and is presumed to have dispersed.

Five new young males and no new females (excluding cubs) visited in 1985. The males were first seen on 27 May (Morris), 30 May (4-year-old 428), 12 June (Schnoz), 12 June (Jimmy), and 23 June (Donald).

Each day a bear visited was considered a visitor-day. Visits by 2 bears in a day were 2 visitor-days. Multiple visits by a single bear were a single visitor-day. There were 7 visitor-days during 17-30 April, 52 in May, 138 in June, and 64 during 1-25 July. During the 202 visitor-days from 1 June to 25 July, the 12 bears ate 502 pounds of beef fat.

Visits declined during July despite the regional food shortage. All 6 of the immigrant males, including returnee 405, made their last visits by July 25 and never returned. The 5 resident bears (812 and cubs, 403 and cubs, 2-year-old females 401 and 429, and 6-year-old 430) made only 3 visits between 25 July and 8 September. Radio-collared female 401 and radio-collared female 403 and her cubs fed on natural foods, apparently preferring berries and hazelnuts over beef fat despite their scarcity. The berries and hazelnuts essentially disappeared in early September and both these radio-collared bears resumed visits to the feeding site until they denned. Female 403 and her 2 cubs returned on 8 September and denned about 23 September. Female 401 returned on 12 September and denned on 8 October.

Nuisance activity in the study area.— Despite the large number of nuisance complaints across the region, residents and campground workers reported no problem in the study area. Isolated incidents that did not rise to the level of nuisance behavior included an unknown bear feeding once from an open dumpster on 29 June and Schnoz passing through the campground without causing a problem on 13 July.

Nuisance activity in other areas with diversionary food.— Although nuisance activity was rampant throughout the region in 1985, 3 areas in addition to the study area had few or no bear problems, and all 3 had diversionary food.

One area was a 10-km radius around the Colville dump near Grand Marais, MN, where the only reported problem was a bear sleeping in a yard (Wm. Peterson, pers. comm. 1985). A record 44 bears were seen at the dump at once (Rogers 1989).

The second area was around Armstrong Lake in Eagles Nest Township where resident Ed Orazem had been feeding bears for 2 decades. On 26 August 1985, the Ely Echo Newspaper stated “*There have been a lot of problems with bears in and around Ely this year, tipping over garbage cans and getting into gardens, but south of town, on Armstrong Lake, the bears just aren't interested in causing problems. The main reason is that the bears are being served at an outdoor restaurant, owned and operated by Ed Orazem*” (Wognum 1985). Orazem is shown sitting next to a bear. The article said that Orazem began feeding bears in the mid-1960's to divert a bear from his neighbor's garbage. The feeding worked, and Orazem and others continued it.

The third area was the neighborhood around the home of Mrs. Toini Salminen who began feeding a mother and 3 cubs that spring. The mother had a withered right front leg and walked on 3 legs, making her easily identifiable. The mother had tried repeatedly to break in until Mrs. Salminen put food outside. The bear stopped damaging her house and developed a trusting relationship that lasted 12 years. Neighbors visited Mrs. Salminen, met the bear, and developed protective attitudes. The bear caused no problem in the neighborhood. It survived far beyond the average age of 3 years at which female bears are killed by hunters in Minnesota. It was in its late teens when it finally succumbed to a hunter's bait several miles from Mrs. Salminen's house.

1986-1991

During these 6 years of follow-up studies, we provided limited food at the feeding site and continued to monitor nuisance activities, diets, travels, and fates of the resident bears.

Natural food abundance.— DNR surveys showed bear foods to be generally normal in northeastern Minnesota throughout this period (Garshelis and Noyce 2007). However, rainfall in the study area in August 1991 was only 20 percent of normal (2.3 cm vs. 11.2 cm) (Doran 1009), creating a severe berry shortage in late summer.

Nuisance activities in the study area.— With 2 exceptions, reduced amounts of diversionsary food apparently were enough to divert bears from becoming problems in the study area when natural foods were of average abundance. One exception was a captive-raised female (Gerri) released into the study area in 1989 at the request of the Michigan Department of Natural Resources and the Minnesota DNR. She ate mainly natural foods but was enough of a nuisance in 1990 and 1991 that we returned her to captivity in spring 1992. Her antics are excluded from all statements in this paper. The other exception was a sub-adult male that immigrated into the study area and attempted to break into an occupied house before discovering the diversionsary feeding site during the berry failure of 1991. We translocated him the next day on 10 September.

Intensive habituation and food-conditioning.— By the end of 1985, we had learned the benign meanings of ferocious-looking displays and began to realize that behaviors we had earlier interpreted as threats or aggression were merely harmless expressions of nervousness. By that time, radio-collared Female 401 had become trusting enough that researchers could walk with

her for 24–48 hours at a time as described by Rogers and Wilker (1989). Four other bears and their cubs provided similar opportunities over the next 6 years. These included the 2 daughters of Female 403 born in 1985 (Patch and Terri) and Terri's 2 adopted daughters (Gerri and Mary) born in 1989. Observations of these bears revealed how habituated, food-conditioned bears with access to supplemental food spend their time in the forest.

In 1989, 3 USFS officials observed the bears and assessed public safety. The officials included Deputy Chief George Leonard (July 30, 1989), North Central Forest Experiment Station Director Ronald Lindmark (July 16, 1989), and Superior National Forest Biologist Edward Lindquist (June 5, 1989). The USFS then enlisted nearly 200 volunteers to walk with the bears and expand research coverage. In 1991, the USFS asked the DNR to close the study area to hunting—an area of 50 square kilometers—to protect the study, bears, and observers. Volunteers were interested members of the general public, including grandmothers, secretaries, hunters, teachers, etc., without close-up experience with bears. When a volunteer joined a bear, he or she gave the bear a handful of food containing a marker and began recording data when the bear went back to foraging on wild foods. Volunteers collected scats to determine passage rates of markers. Volunteers spent hundreds of hours alone with the bears. The bears roamed wild with uncontrolled access to the public. No one was harmed.

The bears maintained territories, daily activity cycles, travel patterns, and diets similar to those described for bears in the 25-year study (Rogers 1987, Rogers and Wilker 1989). In that study, 40 percent of the females and 67 percent of the males made forays more than 7 km outside their usual areas. Bears in the diversionary feeding study made similar forays. For example, on 30 July 1991, 6-year-old Terri and her 2 cubs began traveling 66 km to an unusually productive hazelnut stand where they foraged for the remainder of August before returning to their territory. At the same time, 3 of 6 radio-collared bears from the 25-year study moved similar distances to the same area of hazelnut abundance. On 4 September, the habituated family arrived back in their territory. In another example, 7-year-old male 430 was killed by a hunter 173 km outside his usual area on 6 September 1986.

Fates of study bears.— None of the resident bears (excluding captive-raised Gerri) became nuisances. None of them jeopardized public safety. Of the 8 resident bears, 5 were killed by hunters, a 4-year-old female was killed by an older female in a territorial dispute, and the fates of 2 bears aged 2 and 9 are unknown. Despite being habituated and food-conditioned, the study bears survived over twice as long as bears in the general population. The average age of bears killed by hunters in Minnesota is 2 for males and 3 for females (Garshelis and Noyce 2007). By contrast, resident male 430 was shot by a hunter at the age of 7, and the average age of 4 resident females killed by hunters was 7.

The hunting death of 6-year-old Mary is of special interest. Over 100 people had walked with her and hand-fed her from the time she was a cub (1989–1991). Her radio-collar expired in late 1991 as the project was ending. People watched for this radio-collared bear to show up in the residential area or campground in her territory. Years passed without a sighting. 1995 was the second worst food year in DNR records (Garshelis and Noyce 2007). Still she did not appear. On 4 September 1995, 6-year-old Mary succumbed to a hunter's bait and was killed 58 km southeast of her territory. Presumably, she traveled far outside her territory in that year of poor food, as is usual, preferring to feed on natural food rather than seeking less preferred human food in her territory.

DISCUSSION

Bears that visited the diversionary feeding site continued to forage for natural foods and did not become nuisances. This was in sharp contrast with the frequent bear problems before the study began and the bear problems in other areas during the study—especially in 1985 when natural food reached record lows. The fed bears did nothing to jeopardize public safety despite being habituated and food-conditioned. The data indicate that hunger—not habituation or food-conditioning—is the driving force behind nuisance behavior.

Probably the most revealing aspects of this study are what the bears did not do. Study bears did not become “hooked” on easy handouts and become lazy and dependent. They continued to demonstrate a strong preference for natural foods as has been found in Minnesota (Rogers 1989), Virginia (Gray et al. 2004), and Washington (Ziegltrum 2008). They sought a variety of natural foods where possible and sought less preferred foods, including human foods at the feeding site, where necessary. Being habituated and food-conditioned did not cause them to change their food preferences.

They did not become increasingly aggressive in trying to obtain food from people. Instead, they became more trusting and allowed nearly 200 volunteers to accompany mothers with cubs, day and night, for up to 48 hours at a time. Part of the belief that food-conditioned bears become increasingly aggressive in trying to obtain human foods may stem from misinterpretations of bear behavior. Harmless nervous bluster is often misinterpreted as an indication that a bear is aggressive and a threat to public safety rather than a frightened, nervous bear performing ritualized displays with no intention of attacking. Trustful bears seen in daytime are often misinterpreted as bold rather than as bears exhibiting normal circadian activity patterns. Habituation to humans is the normal response of bears that see many people and are not aversively conditioned.

The belief that habituated bears are a threat to public safety runs contrary to a growing body of data (Tate 1983; Rogers and Wilker 1990; Becklund 1999; DeBruyn 1999; Herrero et al. 2005; Stringham 2009). Habituated bears are less likely to flee and less likely to attack on a per encounter basis (Herrero et al. 2005). The same is true for bears that people observed without being attacked at garbage dumps for decades (Rogers 1989). In 1989, I asked over 200 attendees at an International Bear Conference if they had ever heard of anyone being attacked at a garbage dump. None had. Habituation to people is to be expected as more and more people move into bear habitat.

The fed bears showed no evidence of illness such as might be spread at the feeding site. A broad search of the literature revealed no evidence of any communicable disease epidemics among black bears and no evidence of disease being spread at garbage dumps (Rogers and Rogers 1976, Rogers 1983).

Young males dispersed from their mothers' territories at the same ages as non-fed bears in the 25-year study (Rogers 1987). Female 403 shifted her territory away from the feeding site when her territory became crowded with 3 maturing daughters as was also reported in the 25-year study for mothers with growing daughters (Rogers 1987). Fersterer et al. (2001) reported that home range sizes of bears that ate diversionary food in Washington did not differ from home ranges of bears in other areas.

Both habituation and food-conditioning were specific to location and situation. Any broadening of tolerance beyond the feeding site required additional habituation or conditioning. For example, a mature male that calmly accepted petting and hand-feeding in a specific location

feared people who appeared in unexpected locations or behaved in unexpected ways. While being petted and hand-fed by 6 people, he noticed someone approaching over 100 m away on a driveway. He immediately bolted from the area. Even in areas where bears expected to see people, the bears continued to assess the behavior of people as they would assess other bears. Bears that were calm and trusting when people behaved in predictable, non-threatening ways fled when people behaved aggressively or approached too quickly. Each new situation and location required additional habituation.

Some bears were calmer and more easily habituated than others. Some bears eventually became sufficiently habituated to tolerate close observation away from the feeding site. During observation, bears foraged calmly and seldom looked at observers that were close enough for easy identification. However, they were disturbed by observers that fell behind, requiring the observers to re-identify themselves by speaking. The bears eluded researchers who attempted to approach quietly without voice identification.

While accompanied by observers, the bears eluded or fled from people in unexpected locations. For example, On 20 July 1989, 4-year-old Terri and her cub Mary were accompanied by 2 observers when Terri detected people talking quietly about 200 meters away. Terri stood up, listened, and led Mary over 200 meters away before foraging resumed. Terri and Mary gradually became habituated to any observer that behaved according to expectations. During September 1989 to September 1991, they were accompanied by nearly 200 volunteers.

A problem bears and bear managers faced in the study area before diversionary feeding was that residents would not coexist with animals they feared. The feeding site enabled residents to meet the bears and set aside the ferocious images of the media, the unnatural snarls of taxidermy, and the ubiquitous warnings they had heard. They saw firsthand the timid wariness that typifies black bears, the harmless bluster of nervous bears, and the calm trust some bears developed. They learned firsthand that mothers with cubs are not likely to attack. Residents who visited the feeding site shared their experiences with their neighbors, and mere sighting of a bear was no longer a reason to call the DNR with a complaint.

MANAGEMENT CONSIDERATIONS

Fearful public attitudes and widespread misconceptions are a major detriment to bear management. Diversionary feeding provided an opportunity for residents to meet the bears they feared and to develop more tolerant attitudes. In the study area, diversionary feeding reduced nuisance problems despite the fact that the bears were habituated and food-conditioned. The fact there was also continued availability of garbage in potential problem areas indicates that any efforts to mitigate problems by reducing attractants and/or aversive conditioning are likely to be more successful if coupled with diversionary feeding. There is a need for decision-makers to reevaluate policies toward habituated bears, recognizing that habituation is a normal response to people in the bears increasingly fragmented environment and that habituated bears have not shown themselves to be a greater threat to public safety than non-habituated bears. There is a need for further study to determine the situations in which diversionary feeding can be most effective in mitigating human-bear conflict.

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