

Case Study

Managing human-habituated bears to enhance survival, habitat effectiveness, and public viewing

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Abstract: The negative impacts on bears (*Ursus* spp.) from human activities associated with roads and developments are well documented. These impacts include displacement of bears from high-quality foods and habitats, diminished habitat effectiveness, and reduced survival rates. Additionally, increased public visitations to national parks accompanied with benign encounters with bears along park roads have caused more bears to habituate to the presence of people. In some contexts, habituation can predispose bears to being exposed to and rewarded by anthropogenic foods, which can also lower survival rates. The managers and staff of Yellowstone National Park located in Wyoming, Montana, and Idaho, USA, and Grand Teton National Park in northwestern Wyoming, USA have implemented several proactive strategies to mitigate the negative aspects of bear habituation. These strategies include providing park visitors with educational information on bear viewing etiquette, managing roadside viewing opportunities, installing bear-resistant infrastructure, hazing bears from developments, enforcing food and garbage storage regulations, and making human activities as predictable as possible to bears. Under the current management strategies, thousands of visitors are still able to view, photograph, and appreciate bears while visiting these parks each year. The opportunity to view bears provides a positive visitor experience and contributes millions of dollars to the local economies of park gateway communities. Positive bear viewing experiences also help build an important appreciation and conservation ethic for bears in people that visit national parks. For many years, managers were concerned about decreasing and threatened bear populations. Now more jurisdictions are facing new challenges caused by increasing bear populations. This paper highlights a successful attempt to address these issues.

Key words: bear management, bear viewing, black bear, displacement, Grand Teton National Park, grizzly bear, habituation, roads, *Ursus americanus*, *U. arctos*, Yellowstone National Park

THE NEGATIVE IMPACTS on grizzly bears (*Ursus arctos*) and American black bears (*U. americanus*) from human activities associated with roads and front-country developments are well documented in the scientific literature (Schallenberger 1980, Archibald et al. 1987, Garner and Vaughan 1987, Brody and Pelton 1989, Mattson 1990, McLellan 1990, and others). Negative impacts to bears include displacement from high-quality foods and preferred habitats, thereby reducing habitat effectiveness (Mattson et al. 1987, Green et al. 1997), and higher rates

of human-caused mortality (McLellan and Shackleton 1988, Mattson et al. 1992, Mace et al. 1996, Schwartz et al. 2010).

However, people, roads, and bears can be managed to reduce the negative impacts, even in areas with relatively high human densities (Gunther et al. 2015, 2017a), by providing park visitors with educational information on bear viewing etiquette, staffing and managing roadside bear viewing opportunities, installing bear-resistant infrastructure (e.g., bear-resistant garbage cans, food storage devices), consistently

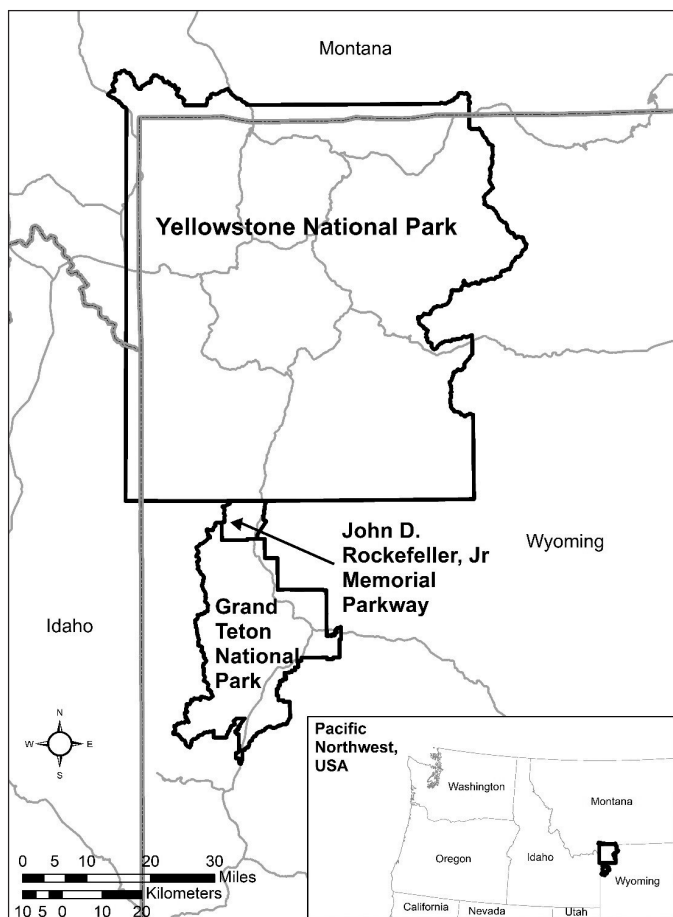


Figure 1. Yellowstone National Park located in Wyoming, Montana, and Idaho, USA, and Grand Teton National Park in northwestern Wyoming, USA.

hazing bears from developments, enforcing food and garbage storage regulations, and making human activities as predictable as possible to bears.

The ability of grizzly bears and black bears to survive in habitats adjacent to roads and developments that have relatively high levels of human activity can be attributed to their intelligence, behavioral plasticity, and opportunistic lifestyle, all of which contribute to their adaptability. Habituation to human presence is the behavioral expression of that adaptability. The responses of bears to humans are shaped by the predictability of human activities (Aumiller and Matt 1994, Knight and Cole 1995). When bears or other wildlife experience non-threatening human activities frequently enough that they become expected, they learn to show little overt response (Aumiller and Matt 1994, Knight and Cole 1995, Herrero et al. 2005). The

waning of a bear's flight response to repeated neutral interactions with people is an example of habituation (McCullough 1982, Jope 1985). Human-habituation (hereafter referred to as habituated) is adaptive and conserves energy by reducing unnecessary behavior (McCullough 1982, Smith et al 2005) such as fleeing from park visitors that are not a threat. Habituation allows bears to access and use habitats near areas with high levels of human activity, thereby increasing the availability of resources.

Evidence suggests that for many bears, habituation is situational context specific. For example, bears that are very tolerant of large numbers of people, traffic, and noise associated with busy park roads may be much more wary or intolerant of encounters with small numbers of people in quiet, remote back-country settings where they rarely encounter people (T. Smith, Brigham Young University, personal communication).

Habituation differs markedly from human food-conditioning, which is an entirely opposite learning process (Aumiller and Matt 1994, Herrero et al. 2005, Hopkins et al 2010). Human food-conditioned (hereafter referred to as food-conditioned) bears learn to seek out human activities and developments for food rewards (human, pet, and livestock foods, garbage), whereas human-habituated bears learn to ignore people after repeated, non-consequential encounters (Herrero et al. 2005). Human food-conditioning invariably gets bears into conflicts with people and ultimately, through management removals and defense of life and property killings, reduces their survival (Mattson et al. 1992, Gunther et al. 2004a, Schwartz et al. 2006). Unlike food-conditioning, habituation is less easily defined as good or bad for bears as it has both positive and negative aspects to both bears and people (Herrero et al. 2005). However, because of their reputations (i.e., bears sometimes attack people after

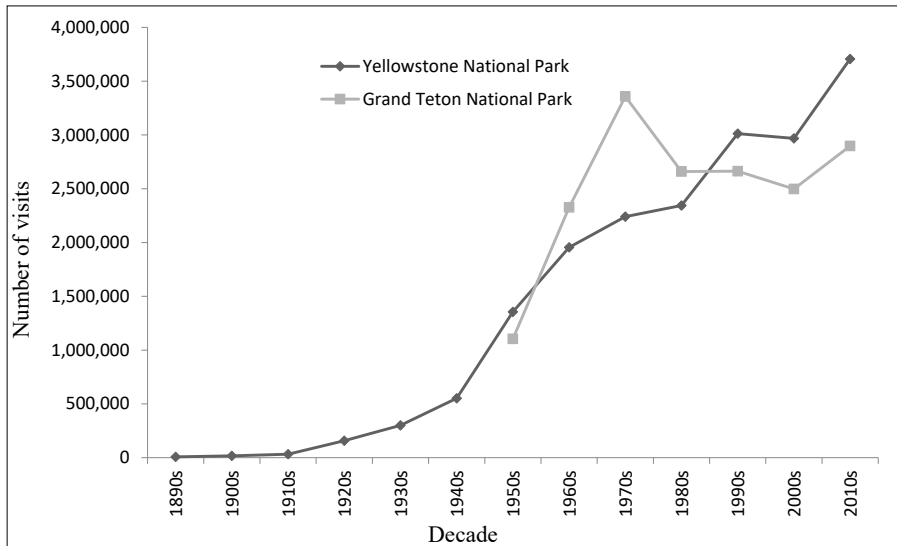


Figure 2. Average annual number of recreational visits by decade to Yellowstone and Grand Teton National Parks, USA, 1890s–2010s.

surprise encounters, and on rare occasions prey on and consume humans) and propensity to become conditioned to human foods (Gunther et al. 2017b), most wildlife management agencies do not tolerate habituated bears in habitats adjacent to human activity centers.

As a result of Herrero's (1970, 1985, 1989) early analyses on the dangers posed by human-habituated bears that were also conditioned to human foods, habituation and food-conditioning (which often do occur together) were considered by many as a single condition. The negative aspects of food-conditioning were also associated incorrectly with habituation. But, bears can be either human-habituated or human food-conditioned, or both (Jope 1983, Herrero 1985, Herrero and Fleck 1990). Aumiller and Matt (1994) presented strong evidence that bears that are human-habituated but not human food-conditioned pose minimal threat to human safety under some circumstances. However, it took time to convince many bear managers (including those in Yellowstone National Park) that habituation alone wasn't always a problem.

Study area

Yellowstone National Park (YNP), located in Wyoming, Montana, and Idaho, USA, and Grand Teton National Park (GTNP), located in northwestern Wyoming, USA, have minimized the negative impacts of roads and developments while increasing habitat effectiveness, survival,

and bear viewing opportunities (Figure 1). Both YNP and GTNP have extant populations of grizzly (current population estimate 718 grizzlies in the Greater Yellowstone Ecosystem; Haroldson and Frey 2018) and black bears with stable to increasing populations (Schwartz et al. 2006, Haroldson and Gunther 2013). In addition, both parks have experienced increases in public visitations in recent years (Figure 2). From 2010 to 2017, YNP and GTNP averaged approximately 3.7 and 2.9 million visits per year, respectively. Concurrently, both parks have experienced increasing levels of bear habituation in roadside habitats. This, in turn, has led to hundreds of bear-jams occurring annually in both parks (Figures 3 and 4).

Methods

Bear-jam is a term used to describe the traffic congestion caused by visitors stopping to view and photograph habituated bears foraging close to roads (Haroldson and Gunther 2013). As bears become more habituated to people (Haroldson and Gunther 2013), and people become more complacent around habituated bears (Smith et al. 2005), the duration of bear-jams is becoming longer and the distances at which bears tolerate people and people tolerate and attempt to view bears are becoming shorter, raising concerns by park managers for the safety of both bears and visitors (Figure 5 and 6; Haroldson and Gunther 2013).

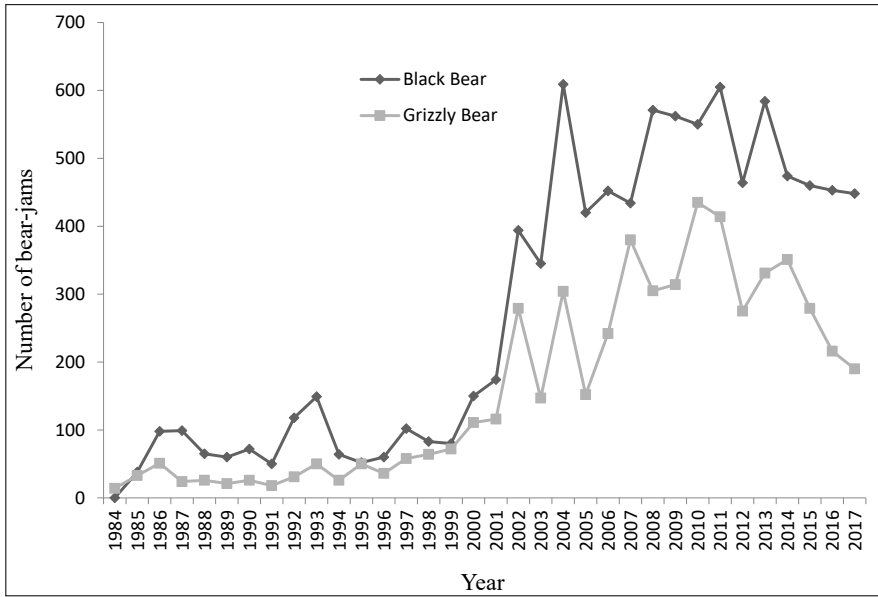


Figure 3. Number of grizzly (*Ursus arctos*) and black bear (*U. americanus*) roadside bear-jams reported in Yellowstone National Park, USA, 1984–2017.

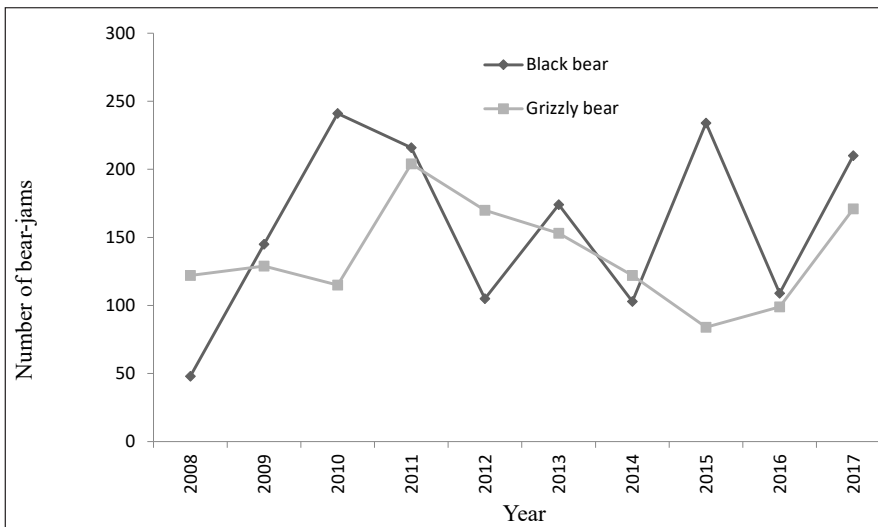


Figure 4. Number of grizzly (*Ursus arctos*) and black bear (*U. americanus*) roadside bear-jams reported in Grand Teton National Park, USA, 2008–2017.

Bear-jam management in YNP

The first roadside bear-jams in YNP were reported in 1910, when a black bear began approaching tourists along the road and begging for human food handouts (Schullery 1992). By the 1920s, bear-jams caused by bears panhandling for handouts were common at many points along Yellowstone’s grand loop road (Schullery 1992). The bears causing the traffic jams were both conditioned to anthropogenic foods and habituated to human

presence. Traffic jams involving these food-conditioned and habituated bears were common until 1970, when YNP implemented a new management plan designed to prevent bears from obtaining human foods, garbage, and other attractants (Leopold et al. 1969, Cole 1971, Meagher and Phillips 1983).

Under the new plan, visitors were no longer allowed to feed bears along roads or anywhere else in the park, all garbage cans and dumpsters were converted to a bear-resistant design,

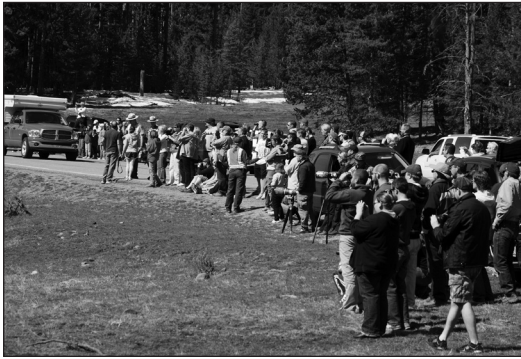


Figure 5. A bear management technician manages visitors at a grizzly bear (*Ursus arctos*)-jam in Yellowstone National Park, USA. The objectives of managing visitors at bear-jams include keeping visitor behavior as predictable as possible to bears, keeping visitors at least 100 m from bears, and preventing visitors from feeding, approaching, encircling, or following bears.



Figure 6. A visitor approaches a human-habituated grizzly bear (*Ursus arctos*) for a photo at an unstaffed bear-jam in Yellowstone National Park, USA. At current visitation levels, visitors are unsupervised at approximately 20% of bear-jams occurring in the park.



Figure 7. The Wildlife Brigade manages traffic and visitors viewing and photographing a human-habituated grizzly bear (*Ursus arctos*) in a roadside meadow in Grand Teton National Park, USA.

all garbage dumps within YNP were closed, and regulations requiring that all food and garbage be stored in a bear-resistant manner were implemented and enforced (Meagher and Phillips 1983). Bears that persisted in trying to obtain human foods and garbage were captured and killed or sent to zoos. By 1979, most bears conditioned to human foods had been removed from the park and newly installed bear-resistant infrastructure was mostly successful at preventing additional bears from becoming food-conditioned (Meagher and Phillips 1983). In the early 1980s, bear-jams resurfaced as a management concern, though the bears involved were not conditioned to human foods (Gunther and Wyman 2008).

As visitation and numbers of grizzly and black bears increased following the high mortality associated with the closing of the park's garbage dumps, bears that were habituated to people, but not conditioned to human foods, began to appear in roadside meadows foraging for natural foods (Haroldson and Gunther 2013). The presence of these bears in roadside meadows created large traffic jams caused by visitors stopping to view and photograph them. When habituated bears that were not food-conditioned first began appearing along roads in the early 1980s, the park managed them much the same way they had managed food-conditioned bears in the 1970s.

Initially, these roadside bears were not tolerated and were translocated to more remote areas of the park or hazed (with rubber bullets, bean bag rounds, and cracker shells) away from roads by park officials out of concern they would eventually get fed by visitors, damage property, attack people, or get hit by cars (Gunther and Wyman 2008). Translocation was rarely successful because YNP is not large enough to ensure that translocated bears would not return to their original home ranges. Bears have strong fidelity to their home ranges and attempt to return after being relocated (Murie 1944, Miller and Ballard 1982, Blanchard and Knight 1995). No matter where in YNP bears are translocated, they can usually return in <1 week. Moving bears to locations outside of the park far enough to ensure that they cannot find their way back to their home range may work but is not a viable option for other reasons.

Because the goal of translocating bears was

to keep them alive and out of conflicts with people, moving them outside of the park where there is a much higher risk of conflicts with people (Gunther et al. 2004a) and human-caused mortality (Schwartz et al. 2006, 2010) is contrary to that goal. In addition, many people do not support having grizzly bears translocated into the areas where they live or engage in recreational activities. After it became apparent that translocating habituated bears was not working, park managers tried aversive conditioning in an attempt to teach bears to avoid roadside meadows during daylight hours.

Roadside habituated bears were hazed with 37-mm rubber batons fired from riot guns and with 12-gauge beanbag rounds, rubber bullets, and cracker shells fired from shotguns. Unfortunately, bears seemed to learn to recognize park vehicles, uniforms, and individual staff, as well as the distance at which hazing rounds could be effectively fired (Gunther and Haroldson 2015). Also, rather than learning to avoid specific areas that have food resources, many habituated bears used a time share approach and foraged in roadside habitat when what they likely perceived as a more dominant animal (the ranger with hazing rounds) wasn't there. Hence, bears learned to avoid the rangers that hazed them, rather than to avoid the roadside habitats. It was also difficult to get bears to associate high quality natural foods in roadside meadows with the discomfort caused by aversive conditioning.

Animals easily form associations between aversive conditioning stimuli and sound cues; however, they do not easily form associations between stimuli that are not evolutionary relevant, such as between food and discomfort/stress (Homstol 2011). Food rewards, even from natural foods, simply overwhelm the effects of the negative hazing stimulus (Gillin et al. 1994, Mazur 2010). When translocation and aversive conditioning failed to prevent habituation, habituated bears were often removed (killed or sent to zoos) from the park, reducing survival rates.

Beginning in 1990, managers adopted an entirely different management strategy focused on managing visitor behavior instead of the bears (Gunther and Wyman 2008). Rather than trapping, translocating, hazing, or removing roadside habituated bears, rangers were

dispatched to bear-jams to ensure visitors parked their vehicles safely, did not approach, encircle, follow, or feed bears, and behaved in a predictable manner around bears (Figures 5 and 6). Although habituated bears were tolerated along roads under this management paradigm, they were not tolerated inside of park developments, and were still hazed, translocated, or removed when they entered developed areas.

Bear-jam management in GTNP

The GTNP supports a stable population of black bears and, to date, an increasing number of grizzly bears as the population continues to expand in numbers and range (Pyare et al. 2004, Bjornlie et al. 2014). Prior to the early 2000s, grizzly bears were rarely observed outside the northern canyons of the park. However, observations increased steadily as grizzly bears expanded their range to the south boundary near Jackson, Wyoming, USA. Observations of habituated grizzly bears followed this trend, first in high visitor-use areas such as Jackson Lake Lodge, Oxbow Bend, and Colter Bay, and eventually to the Moose developed area and the Moose-Wilson Road corridor.

The first documented observation of a habituated grizzly bear foraging naturally along roadside habitat occurred in 2004. Recognizing the success of YNP's bear management program, the GTNP adopted a similar strategy of managing humans at bear-jams and tolerating habituated bears that haven't been food-conditioned near roads. In 2007, as demands for managing bear-jams escalated, the park created a Wildlife Brigade of paid and volunteer staff to manage visitors at the human–bear interface and provide food storage patrols and public education in front-country campgrounds (Figure 7).

Since 2008, the first year for which reliable bear-jam statistics are available, personnel in Grand Teton have managed at least 1,585 black bear-jams and 1,369 grizzly bear-jams. To date, grizzly bear-jams have been dominated by females with cubs and subadults, classes of bears generally considered to be lowest in the bear dominance hierarchy (Stonorov and Stokes 1972, Mattson et al. 1987, Craighead et al. 1995). This observation has led us to speculate that these bears are using roadside habitats to avoid more dominant adult

Table 1. Comparison of the number of human–bear conflicts, bear (*Ursus* spp.) attacks, bear removals, and vehicle strike mortality of grizzly (*U. arctos*) and black (*U. americanus*) bears during 2 different eras of habituated bear management in Yellowstone National Park, USA, 1979–2017.

Time period	Habituated bear management strategy	Mean park visits per year	Number per million visits							
			Property damages ^a		Bear attacks		Bear removals		Vehicle strike mortality	
			Grizzly	Black	Grizzly	Black	Grizzly	Black	Grizzly	Black
1979–1989	Prevent habituation	2,303,894	3.9	2.5	0.6	0.1	0.4	0.1	0.1	0.4
1990–2017	Tolerate habituation	3,195,074	1.4	1.3	0.3	<0.1	0.2	0.1	0.1	0.3

^aIncludes incidents where bears damaged property or obtained anthropogenic foods.



Figure 8. A bridal party stops to watch a human-habituated American black bear (*Ursus americanus*) foraging along the road in Grand Teton National Park, USA (photo by P. Potter).

males that sometimes kill cubs and smaller bears. The number of grizzly bear-jams was highest in 2011 and 2017 due to the presence of 2 adult females with cubs that foraged naturally along roadside habitats. To date, it appears annual grizzly bear-jam numbers fluctuate based on the habituated bears' reproductive status, such as the presence or absence of cubs or yearlings, and survival of a small number of resident females. Not surprisingly, bear-jam numbers also seem to reflect the condition of natural foods that occur near roads. For example, years with high numbers of black bear-jams corresponded with years of excellent huckleberry (*Vaccinium* spp.), black hawthorn (*Crataegus douglasii*), or chokecherry (*Prunus virginiana*) production along the GTNP Signal Mountain Summit and Moose-Wilson roads. Therefore, food distribution and abundance can influence the frequency of bear-jams in different ways. As observed in YNP, abundant whitebark pine seed production can reduce the number of bear-jams by pulling bears

away from roadside meadows and into forested areas where they are less visible. However, as observed in GTNP, abundant berry crops can attract bears to roadside meadows where they are readily visible to park visitors.

Results

YNP case study

Because YNP bear-jam management strategy has been in place for 28 years (1990–2017), it provides a unique opportunity to evaluate its efficacy. During this period, 5,272 grizzly bear and 8,979 black bear roadside-jams were documented. In total, 14,251 grizzly and black bear-jams have been reported in YNP since 1990, with no bear attacks on the visitors that stopped to view and photograph the habituated bears. In addition, the number of bear-caused property damages, bear attacks on people anywhere in the park, management removals (bears euthanized or sent to zoos) of bears involved in conflicts, and bears being struck and killed by vehicles in the park have all remained low or even decreased from previous decades when habituation was not tolerated (Table 1).

Human–bear conflicts have remained low (Table 1) despite increasing visitation (Figure 2) and smaller increases in the grizzly (Schwartz et al. 2006) and black bear (Haroldson and Gunther 2013) populations. Thus, the concern that tolerating habituated bears along roadways would lead to increases in human–bear conflicts was unfounded (Table 1). Interestingly, humans and vehicles turned out to be more dangerous than roadside bears. There have been several minor vehicle accidents, and at least 6 people sustained injuries when they were hit by vehicles at bear-jams.

Table 2. Number of human–bear conflicts, bear (*Ursus* spp.) attacks, bear removals, and vehicle strike mortality of grizzly (*U. arctos*) and black (*U. americanus*) bears occurring in Grand Teton National Park, Wyoming, USA, 2008–2017, a period when habituated (but not food-conditioned) bears were tolerated in the park.

Time period	Habituated bear management strategy	Mean park visits per year	Number per million visits							
			Property damages ^a		Bear attacks		Bear removals		Vehicle strike mortality	
			Grizzly	Black	Grizzly	Black	Grizzly	Black	Grizzly	Black
2008–2017	Tolerate habituation	2,824,532	0.2	2.2	0	0	0	0.3	0.1	0.2

^aIncludes incidents where bears damaged property or obtained anthropogenic foods.

However, this strategy of focusing management on people instead of bears presents challenges for managers because it is labor-intensive and expensive. Approximately 2,500 to 3,500 personnel hours are spent annually managing bear-jams. As the number of bear-jams has increased, they have exceeded park staff's ability to respond to every jam. In recent years, personnel have been able to respond and manage approximately 80% of the bear-jams reported. Park visitors are unmanaged and unsupervised at approximately 20% of bear-jams annually (we acknowledge that unstaffed bear-jams are likely under-reported in our data). Without supervision, many visitors park vehicles and set up camera tripods in the lane of traffic, walk among moving traffic, and approach, encircle, follow, and block the path of bears at distances of <100 m (Figures 6 and 8).

The number of bear-jams occurring annually in YNP was influenced by the availability of bear foods (Haroldson and Gunther 2013). For example, in years when whitebark pine (*Pinus albicaulis*) produces abundant cones, bears move away from roadside meadows to high-elevation forest stands to feed on the nutritious seeds of whitebark pine. Due to the horizontal cover provided by the forest, bears are not readily visible while feeding on whitebark pine seeds. However, during years of poor whitebark pine seed production, the number of bears foraging in roadside meadows where they are highly visible, and the number of bear-jams, increase significantly (Haroldson and Gunther 2013). Therefore, natural foods found in roadside meadows may be important to the survival of some individual bears during years exhibiting poor whitebark pine cone crops (Haroldson and Gunther 2013).

Haroldson and Gunther (2013) predicted

that the number of late summer and fall season bear-jams will likely increase if the abundance of whitebark pine seeds available to bears is compromised by tree mortality from mountain pine beetle (*Dendroctonus ponderosae*; Gibson et al. 2008) or white pine blister rust (*Cronartium rebicola*; Schwandt 2006). Global climate warming could also reduce the availability of whitebark pine seeds through replacement of whitebark pine stands with tree species more tolerant of warmer, dryer conditions (Mattson et al. 2001, Schwandt 2006). If whitebark pine declines significantly in YNP, bears are expected to switch to alternative foods found in lower-elevation meadows, many of which occur near roads, resulting in an increase in the annual number of bear-jams (Haroldson and Gunther 2013).

Human-habituated bears are more prone than human-wary bears to enter developments, either to forage natural foods or to travel through. Once within developments, they may encounter improperly stored food, garbage, or other anthropogenic attractants. Therefore, when managing habituated bears, it is important to set limits to where they will and will not be tolerated (Aumiller and Matt 1994). In YNP, bears are not tolerated within developed areas and are actively excluded through hazing and other management actions. During the 28-year period from 1990 to 2017, bears were hazed out of developments 755 times, an average of 27 incidents per year.

Yellowstone National Park has demonstrated that given adequate staff, habituated bears can be managed along roads in a manner that is relatively safe for both bears and park visitors (Gunther and Wyman 2008, Haroldson and Gunther 2013). As a result, hundreds of thousands of visitors are able to view, photograph, and appreciate roadside bears while visiting the

park each year. The opportunity to view bears not only provides a positive visitor experience (Taylor et al. 2014), it also contributes millions of dollars to the local economies of gateway communities (Richardson et al. 2014).

GTNP case study

Although GTNP's history with habituated bear management is still relatively short, human–bear conflicts have remained very low (Table 2). There have been no bear-inflicted human injuries associated with bear-jams and no increase in bears killed by vehicle strikes. However, several offspring (confirmed via DNA, marks, and/or radio-collars) produced by habituated female grizzly bears have died as a result of circumstances possibly exacerbated by habituation; this included 2 vehicle strike mortalities, 1 management removal due to frequenting human developments, 1 illegal kill by an ungulate hunter, and 1 control kill for cattle depredation. However, because recently weaned bears and subadults tend to have higher mortality rates in general, often related to dispersal and avoidance of more dominant bears, it is difficult to know how much of the additional risk to young bears can be directly linked to habituation.

The size of the protected areas in which habituated bears are managed may also play a role in their survival. In contrast to YNP, which is approximately 7 times larger and positioned in the center of the Yellowstone Grizzly Bear Primary Conservation Area, habituated bears in GTNP may be more likely to leave the protected confines of the park and be more susceptible to human-caused mortality associated with inadequate bear-attractant storage or attempts to use habitats in close proximity to people.

Bear viewing opportunities are popular with local residents and visitors. Some bears are so popular they have their own Facebook pages. A program large enough to adequately manage the human–bear interface using paid employees is cost prohibitive, and the Wildlife Brigade has been supported largely by volunteers since its inception. In 2017, the Wildlife Brigade consisted of 3 paid staff and 28 volunteers, which provided human–bear interface coverage 7 days a week for >7 months of the year. While the program has been successful, this level of commitment will require substantial financial support into the future.

Discussion

Aspects of bear habituation

In determining the extent to which human-habituated bears are tolerated, managers must consider several factors. Habituation can benefit some bears by allowing them to access high-quality food resources adjacent to roads and developments, habitat that is avoided and underutilized by human-wary bears (Herrero et al. 2005). Therefore, tolerance of habituated bears may allow national parks to support a higher density of bears. In addition, since habituation increases bear exposure to park visitors, it may increase public appreciation of bears and build support for conservation and habitat protection (Herrero et al. 2005).

The habituation of some bears also benefits people by providing enjoyment (Taylor et al. 2014) and offering opportunities for bear viewing, photography, and filming, which can promote an appreciation of bears in people that never have a chance to visit a park with bears (Herrero et al. 2005). Habituated bears provide excellent opportunities for teaching park visitors about bears, their ecology, and conservation. Public viewing of habituated bears also provides economic benefits to gateway communities, park concessions operations, and the wildlife tour industry (Richardson et al. 2014). In addition, habituated bears are less likely to respond with defensive aggression and attack and injure people during surprise encounters (Jope 1985, Aumiller and Matt 1994, Herrero et al. 2005).

However, there are also negative aspects of bear habituation to people. When habituated bears are foraging near roads or developments, they often create traffic congestion that leads to angry and frustrated drivers, accidents, and potentially to bear- or vehicle-inflicted human injuries and fatalities. Although habituated bears may be less prone to react aggressively out of fear during encounters with people, the number of human–bear encounters and, therefore, the cumulative odds of a bear attack, may increase (Jope 1985, Herrero et al. 2005). In addition, habituation increases the odds that people who don't understand habituation and the importance of the neutral context of predictable interactions might feed, approach for closer photos, or otherwise behave inappropriately around bears, which could lead to injury or death of people and management removal of

bears (Herrero et al. 2005). Habituated bears may also wander into developed areas where they are more likely to encounter unsecured human foods, increasing the likelihood of them becoming food-conditioned (Herrero et al. 2005).

Managing habituation

How wildlife managers deal with habituated bears depends on the location and situation (Gunther et al. 2015, 2017*b*). On some public lands, where humans are temporary visitors and their activities and developments are highly controlled, habituated bears have been managed to reduce human–bear conflicts, allow for popular recreational bear viewing, and maximize the effectiveness of available habitat by reducing human-caused displacement from prime food sources (Aumiller and Matt 1994, Gunther et al. 2004*b*, Herrero et al. 2005). Public lands managed under this philosophy include the McNeil River State Game Sanctuary, in Alaska, USA, as well as GTNP, YNP, and Katmai National Park, Alaska, USA (Aumiller and Matt 1994, Gunther et al. 2004*b*). Both YNP and GTNP have been successful in decreasing the presence of food-conditioned bears because of strict food storage regulations, relatively high compliance from visitors, and a large staff that patrols developed areas on a daily basis. On other public and private lands, human activities are regulated less strictly, and habituation can greatly increase the probability of bears being rewarded with human foods, struck by vehicles, or being involved in other types of conflicts that put both humans and bears at risk. Habituation is not tolerated by managers in these areas, with examples including Glacier National Park, Montana, USA, and private lands in Idaho, Montana, and Wyoming (Gunther et al. 2004*b*, Herrero et al. 2005).

Visitor expectations and the economics of bear viewing

The YNP and GTNP (including the John D. Rockefeller Memorial Parkway) are 2 of only 3 national parks in the contiguous United States that are currently part of viable grizzly bear populations. Bear viewing opportunities in these parks are not simply an opportunity to see an iconic carnivore, but also a wilderness experience (Taylor et al. 2014). Many visitors feel a sense of kinship with the first human explorers

to these areas, with their awareness of nature heightened by viewing wild predators up close and personal (Taylor et al. 2014). As a result, bear viewing can be a valuable addition to family life, lore, and vacation memories (Figure 7).

Visitation to YNP exceeded 4 million visits for the first time in 2015, has exceeded that number each year thereafter, and is expected to continue to increase into the foreseeable future. Most YNP visitors participate in geyser viewing (97%), sightseeing (88%), and wildlife viewing (81%, Richardson et al. 2015). Bears are the wildlife species visitors most want to see (Richardson et al. 2014). Nearly all visitors (99%) expect to see a bear and about two-thirds (67%) actually do (Richardson et al. 2014). Surveys indicate most visitors that see a bear are inspired to support the conservation of bears and protection of their habitats (Richardson et al. 2015). Nearly half of surveyed visitors conveyed the level of habituation or wariness of a bear did not matter to them (Richardson et al. 2015). Ten percent of visitors indicated they would take fewer trips to the park if management changed and bears were no longer readily visible from roads (Richardson et al. 2015).

Spending by visitors to YNP contributes significantly to the economies of gateway communities and the states of Idaho, Montana, and Wyoming (Richardson et al. 2014). Visitors spent an estimated \$498.8 million during 2017 in communities surrounding the park, and their expenditures supported approximately 7,354 local jobs and had a cumulative benefit of about \$629.6 million to the area's economy (Cullinane Thomas et al. 2018). By itself, bear viewing contributes about \$10 million to the economies of park gateway communities and supports about 155 local jobs (Richardson et al. 2014). Surveys indicated visitors were willing to pay about \$40 more in park entrance fees to support the management of roadside bear viewing opportunities (Richardson et al. 2014).

Future considerations

The habituation of some bears to people in YNP and GTNP is inevitable and likely to increase with more visitors in the future. Thus, the safety of visitors and habituated bears along roadways is a growing concern for managers (Gunther et al. 2004*b*). To be successful, management strategies need to consider not only human safety and

potential risks to bears (Haroldson and Gunther 2013), but also the energetic needs and nutritional state of habituated bears (Robbins et al. 2004), their contribution to population viability, and the aesthetic value of public bear viewing and the conservation awareness this brings (Herrero et al. 2005). The economic value of bear viewing to gateway communities (Richardson et al. 2014) is also an important consideration with implications for bear conservation.

Although the ability of grizzly bears to adapt to increasing visitation undoubtedly has some limits, their behavioral flexibility allows them to exist across a broad continuum of human presence and activities. As a general rule, when human activities in bear habitat increase, staff time and budgets dedicated toward human–bear management require a commensurate increase. Based on our experiences and those of Aumiller and Matt (1994), the key components of a successful program to manage habituated bears include preventing bears from becoming conditioned to human foods and garbage, removing native bear foods from human developments, making human activities as predictable as possible, and setting certain boundaries for both bears and people. Appropriate boundaries for habituated bears include conditioning them (through hazing) not to enter park developments and campsites or to approach people too closely. Appropriate boundaries for people include teaching them to store attractants such as food in a bear-resistant manner, not to feed bears, and to maintain a minimum distance of at least 100 m when viewing bears. Although signs, printed material, and website posts are the least expensive media for teaching bear safety and viewing etiquette to visitors, research shows that retention of safety messages is highest from face-to-face interactions with uniformed park staff (Taylor et al. 2014).

Management implications

The most formidable challenge for managing habituated bears in national parks is not managing the bears, but sustaining and expanding as necessary the people management programs that have made management of habituated bears successful to date. Managing visitors around habituated bears is a long-term commitment. Human-habituation by bears is a relatively new challenge faced by land

and wildlife managers throughout the world. Many of these managers are considering the approaches used in YNP and GTNP while formulating their own strategies for managing human-habituated bears on public lands. For a long time, bear managers were concerned about decreasing and threatened populations and the challenges these raised. Now more jurisdictions, including YNP and GTNP, are facing a different set of challenges caused by increasing bear populations combined with increasing visitation.

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