Viewing an Iconic Animal in an Iconic National Park: Bears and People in Yellowstone

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Background

Yellowstone National Park (YNP) occupies 2.2 million acres of land (about 890,000 ha) in northwestern Wyoming, with some overlap into adjacent US states. It is centered near 44.5° N latitude and 110.5° W longitude. Established in 1872, the park forms the core of the Greater Yellowstone ecosystem, whose 18 million acres (7.3 million ha) also include three national wildlife refuges, five national forests, and Grand Teton National Park.

The unique geological features of the landscape, its flora and fauna, and the relative isolation of the park from the effects of human settlement all contribute to Yellowstone's enduring appeal to visitors. Especially notable among these contributing factors are the iconic animals found within the park boundaries. If the American West can be said to have an equivalent to Africa's "Big Five" list of fauna, the most likely candidates for are all present in YNP: bison, moose, elk, mountain lion, and grizzly bear, along with black bear, bald eagle, trumpeter swan, and many other spectacular animal species. In addition, there are approximately 1,300 endemic vascular plant species, some of which rely on the park's many geothermal features to survive the winters. Sixty percent of the world's geysers are within YNP, including several that erupt on a fairly regular basis, from 80 minutes apart to a few hours or longer.

The size, the thermal features, and the range of plants and animals all support YNP's iconic status as a representation of the early American West—the way it once was, or as it is now imagined. This iconic status is also evident from the more than three million visitors to the park each year, with two-thirds of those coming during June, July, and August.

Aims of this research

This special issue discusses issues facing some of the world's most iconic protected areas. Managers of such areas confront a complex challenge to preserve the features that draw visitors in great numbers, while seeking to enhance the overall visitor experience. Yet managers must also attend to protecting those very features, and the visitors themselves, from the sometimes ill-informed or ill-considered choices people might make when interacting with nature. Our focus in this paper is mainly on human–bear encounters, but in the context of human–animal encounters more generally. We briefly overview relevant bear management

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and visitor safety programs in Yellowstone, and then present results from a survey conducted at roadside "animal jams" in YNP in the summer of 2013.

Bear management in Yellowstone

Over time, the National Park Service (NPS) has initiated a number of programs at YNP to monitor and assist the stabilization or growth of particular species of both plants and animals. During the westward expansion by European descendants, several iconic animal species were virtually eliminated from much of the American West, including the grizzly bear as well as the bison and the wolf. All three of these species are again well established in YNP, in no small part as a result of the park's efforts.

The park has long maintained an active bear management program (see Gunther 1994). Both the American black bear (*Ursus americanus*) and the grizzly (*Ursus arctos horribilus*) reside in Yellowstone and the larger ecosystem. Although the focus of much of the current bear management within YNP is on the grizzly, the park's efforts for preventing human–bear conflict apply no less to black bears. The black bear is found throughout the US (except for a few of the mid-Plains states), while the grizzly is present in only 2% of its historical range in the lower 48 (NWF 2005). Within the USA outside of Alaska, the grizzly bear is now found only in Wyoming, Montana, Idaho, and Washington.

With the Endangered Species Act (ESA) of 1966, the US government began a new program in wildlife management, recognizing and providing some limited protection for endangered and threatened species. In 1975, the ESA established general criteria for determining the threatened or endangered status of a species by considering its limited numbers, the conditions of its range, and the degradation of its habitat. The grizzly bear fell into the "threatened" category, as its population in the lower 48 states had fallen from more than 100,000 at the time of European contact to less than 1,000, of which an estimated 136 were in the Yellowstone ecosystem. With the added protections of the ESA, along with the park's other bear management efforts, the Yellowstone grizzly population grew to around 245 by 1993, and had reached more than 700 bears by 2013 (White and Gunther 2013; Haroldson and Frey 2014).

The dilemma for park managers

As animal conservation programs grow in success, such as YNP's efforts for the grizzly bear and the wolf, visitors to Yellowstone increasingly expect to see a bear or a wolf on even a "drive-through" vacation. Indeed, a recent study (Richardson et al. 2014) found that YNP visitors would be willing to pay an extra $41 in entrance fees (in addition to the present $25 for up to a week's visit) if they could then be assured of seeing bears in their natural habitat (see also Steckenreuter and Wolf 2013).

This strong desire to see bears can create what is known as the "bear jam" during the summer vacation months. Several times a day on one or another of YNP's narrow two-lane roads, traffic gets backed up when 10 to 100 cars (or more) come to a stop or move ever so slowly as the occupants try to glimpse a bear. Foot traffic adds to the congestion, and to the danger, as people often leave their vehicles to get a closer look. Most visitors have traveled

long distances to YNP, at considerable expense, and the resulting intensity of their desire to see a bear in its native habitat during their visit generates more than 1,000 bear jams each summer. There are also bison jams, wolf jams, owl jams, etc., but wildlife managers are especially concerned about the potential for serious injury to visitors when people interact so closely with bears.

The roadside bear jam can create an almost carnival-like atmosphere. Visitors may walk in the middle of a road or follow a ranger who is trying to stay between the bear and a crowd of observers while the bear searches for food sources, such as sedges, grasses, roots and bulbs, and ground squirrels. Some visitors might even find themselves within a few dozen yards of a bear, although the regulation minimum distance stated by the NPS is 100 yards.

The success of the grizzly bear programs since 1970 has disproportionately increased the chances for roadside encounters between bears and people. With the growth in the grizzly bear population, there are more male grizzlies roaming their preferred backcountry areas, mostly at night. The threat posed by the males leads some female grizzlies, which have also grown in number, to move with their cubs to human-occupied places and times. It also pressures some black bears to move closer to roads (see Schwartz et al. 2010). Hence there are simply more bears active near roadsides in daylight hours than there were in prior decades.

Nevertheless, human–bear conflicts in YNP have decreased sharply in the past 50 years, even as the number of bears has increased and park visitation has reached all-time highs (NPS 2014). From the 1930s through the 1960s, approximately 48 people per year were injured by bears in YNP, mostly by black bears (NPS 2014). With changes in park policies (especially new rules against feeding bears), the figure dropped to only 1.22 bear-caused human injures per year from 1980 through 2011. This number includes backcountry and frontcountry reports of injuries caused by both black and grizzly bears (NPS 2014).

Despite the decline in the injury rate, fatalities do sometimes ensue; for example, two people died in separate grizzly encounters in 2011. Considerable effort therefore goes into providing warnings and cautionary materials to park visitors, to minimize the risk to both people and bears from dangerous bear–human contacts. This information includes educa-

Figure 1. Left: A typical "bear jam" in YNP. Right: In YNP's Hayden Valley, an adolescent grizzly bear was seen several days in a row, walking close to the edge of the forest as the bison were grazing. This bear jam took 20 minutes to move through. Photos courtesy of National Park Service (left), Patricia A. Taylor (right).

tion on bear behavior as well as on the simple mechanics of viewing bears safely. For example, YNP and the bear program stress the 100-yard distance that needs to be maintained for viewing bears. Additionally, park literature covers the two main types of attacks on people (defensive and aggressive) and how to behave in each situation.

Whether park visitors are aware of the potential dangers when encountering wildlife of any sort, and whether they read park literature on recreating safely near Yellowstone's many animal species, are important topics to park managers for assessing the effectiveness of their informational efforts. To understand whether such safety messages are getting to and being remembered by the public, YNP recently sponsored a visitor survey led by the first author of this paper. Although the primary emphasis was on bear jams, the survey was designed more broadly to cover some safety issues for other kinds of human–animal encounters as well.

The survey

The purpose of the survey was to determine whether park visitors understand and follow various safety recommendations from NPS for viewing wildlife, such as the 100-yard rule for bears and wolves. For nearly three weeks in the summer of 2013, park roads were traveled in a systematic search for animal jams, stopping for interviews whenever one was located. As a practical matter, it was impossible to distinguish a bear jam from any other jam in advance. Still, 57.5% of the interviews were conducted with visitors who said they had stopped to watch a bear (see Table 1), either a black bear (46.2%) or a grizzly (11.3%). A total of 238 interviews were completed, at 114 different jam sites.

The survey design covered the entire park from public roads (but no backcountry sites). Time of day, roads traveled, and driving direction were all varied systematically. Surveying was broken into morning (6 am to 9 am), noontime (11 am to 2 pm), and early evening (5 pm to 8 pm). Roads taken and directions traveled varied over the days, never repeating the same road on consecutive days. Interviewing was carried out from June 14 to July 6, nearly every day (except June 23–25), for 16 days of data collection. These dates captured a period of high roadside visibility for both black bears and grizzlies. All paved roads were covered at least once, but most of the traveling and interviewing were concentrated along the eastern roads of the park, where bears were most active during that period. In particular, the roads between Canyon and Mammoth visitor centers, from Fishing Bridge toward the East Entrance,

Table 1. Animals viewed by respondents at a jam.

	Frequency	%	Cumulative %
Black bear	110	46.2	46.2
Elk	33	13.9	60.1
Bison	31	13.0	73.1
Grizzly bear	27	11.3	84.4
Wolf or Coyote	17	7.1	91.6
All other	20	8.4	100.0
Total	238	100.0	

and from Roosevelt Lodge through Lamar Valley were traveled frequently. In all, we contacted 243 visitors, with a completion rate of 97.9%. A description of the research design and sampling results is provided in an online appendix (available at http://www.georgewright.org/313taylor2_appendix.pdf)); a copy of the full survey instrument is available from the authors on request.

During the three weeks of survey work, we saw numerous violations of regulations regarding animal viewing. Episodes observed at our animal-jam stops included a young man walking after a black bear into a thicket; a crowd walking on a road parallel with the movement of a black bear and cub, only 40 yards away in a lightly wooded area; parents placing a child within 10 yards of a resting male elk; four students jumping from a quickly stopped car and running toward a resting bison to take pictures, less than 20 yards distant; and a large group of photographers attempting to get a picture of an adult badger and two kits, set up about 15 yards from the entrance to a badger hole.

Descriptive results

To determine whether the park's safety messages were registering with visitors, we asked a number of questions related to the rules regarding safe wildlife viewing and recreation while in Yellowstone.

When we asked visitors whether they knew the safe distance regulations on black bear, grizzly bear, and wolf (100 yards) as well as on bison, moose, and elk (25 yards), only 21.4% stated the correct distance for all six animals. However, 87.4% identified the right viewing distance for black bears, and 89.1% did so for grizzlies. For bison, moose, and elk, visitors tended to state *longer* (therefore safer) viewing distances than the park regulations prescribe.

Some of this overestimate of the safe distance for viewing the ungulates may be related to the "social desirability bias" phenomenon in social research (Crowne and Marlowe 1960). Park visitors want to appear knowledgeable and cooperative. Therefore, they may overstate the viewing distance as evidence that they are mindful of the park's emphasis on safety. As 100 yards was both the longest distance given in the response set and the longest distance mentioned in the park's safety literature, the visitors tended to select that distance as the safest response.

A second set of questions that give some indication of how well the park message of safe viewing was getting to the visitors focused on the ways they had received such information. These questions covered receiving an oral explanation regarding safe recreation; seeing safety information on the park's website; reading information on safety from the entrance station or from a campground or a lodge; and finally, whether the visitor had seen any warning signs about safety and animals.

The messages most likely to be noted by visitors to the park were those on warning signs, as almost 93% of the respondents reported having seen such a sign (see Table 2). As a partial validity check, this last item was followed by the question, "And where was that?" Only 10%of the respondents who said they saw a sign were unable to name a likely place that the sign had been seen.

Table 2. Ways of receiving safety information.	
Survey Question	**% Yes**
Did you receive an explanation about safe recreation in an area with wild animals?	35.3
Did you read any material on the park website that discussed your safety when visiting?	58.1
Did you read material from the entrance, campground, picnic area or lodge regarding safe recreation in an area with wild animals?*	75.4
Have you seen any signs warning you about safety and animals in the park?	92.7
*This item in the table abbreviates the full wording in the questionnaire.	

More than three-quarters of the respondents said they had read written material received at the park entrance, a campground, or a lodge. Of all respondents, 39.8% stated that they had read all the material, and 35.6% stated that they had read some of it. The website reached 58.1% of the respondents in the survey, while oral explanations reached only 35.3%.

Receiving information is one thing; remembering it and acting on its warnings can be quite different. The survey therefore included a number of questions covering beliefs about iconic animals, in general, as well as the respondents' knowledge of bear behavior, in particular.

For example, we asked the visitors how strongly they agreed or disagreed with several statements that directly contradict NPS warning materials. Almost all of the respondents (96.6%) strongly disagreed with the incorrect statement that "It is okay to leave food for roadside animals." The further results in Table 3 also indicate that large majorities reject other statements that contradict the official warnings. Thus 83.4% said they strongly disagreed that grazers like moose and bison do not constitute a threat to humans, and only 5.5% responded to that statement with any level of agreement. Similarly, only 6.9% agreed at all with the statement that moose and bison are only dangerous when they have calves with them, while just 8% thought it was okay to imitate wolf howls or elk bugling.

We also asked about bear behavior. While most respondents reported ideas consistent with the park's message about bears, a number of statements show considerable departure from that message. Indeed, the risks that we observed some visitors taking at bear jams are clearly reflected in the survey findings reported in Table 4.

More than 20% of the respondents were in some agreement that they would leave their car to take a picture of a bear less than 100 yards away. Similarly, just a scant majority (52.6%) strongly disagreed with the claim that roadside bears are not really disturbed by the presence of humans. More substantial majorities disagreed with the other statements in Table 4 but, overall, the results suggest that when bears are close to human areas of the park, many visitors think they are not as threatening.

Multivariate analyses

Park managers also need to know whether the responses to such statements are affected by any of the methods for distributing information available to the park (oral explanations, written materials, and signs). To provide this analysis, we first developed a scale of each of the

Table 3. Beliefs about wildlife.					
Survey Question	**% Strongly disagree**	**% Disagree somewhat**	**% Neutral**	**% Agree somewhat**	**% Strongly agree**
It is okay to leave food for roadside bears.	96.6	0.0	0.0	3.0	0.4
Animals that are grazers (like moose and bison) are not a threat to humans.	83.4	10.2	0.9	3.4	2.1
Moose and bison are only a threat if they have calves with them.	78.8	12.2	2.2	5.2	1.7
It is okay to imitate wolf howls or elk bugling; just don't approach them.	72.8	17.8	1.5	5.0	3.0

Table 4. Knowledge of bears.					
Survey Statement	**% Strongly disagree**	**% Disagree somewhat**	**% Neutral**	**% Agree somewhat**	**% Strongly agree**
Roadside bears are used to humans so it's okay if people circle a bear to view it	90.2	8.5	1.3	0.0	0.0
Grizzly bears are the only bears that are really a threat to humans.	86.1	11.4	1.3	1.3	0.0
I have read so much on bears that I can predict when a bear will turn aggressive.	83.3	11.1	2.1	3.4	0.4
It's okay to stand closer to a roadside bear than to a bear in the backcountry.	78.0	13.4	4.3	4.3	0.0
If I thought it safe I'd leave my car to take a picture of a bear that was < 100 yards away.	55.7	16.2	5.1	20.0	0.3
Bears foraging near roads are not really disturbed by the presence of humans.	52.6	30.3	10.1	6.1	0.9

two sets of questions just discussed. We found a Cronbach's alpha of .769 for beliefs about wildlife (Table 3), and an alpha of .602 for knowledge of bears (Table 4). These alpha values demonstrate the high reliability (internal consistency) of the two scales; the questions are tapping an underlying similarity within each set of attitudes and beliefs. We summed the respondents' answers to each statement so that the higher the score on the scale, the more the responses conform to the warnings in official park materials.

We hypothesized that those individuals whose beliefs or opinions conform most closely with the official park positions on wildlife viewing and bear behavior would be older (since the young are generally greater risk-takers), more educated (hence more likely to read and understand the materials), more often female (more risk-averse), accompanied by children (more protective) and likely to have traveled shorter distances to get to the park (lower investment, so less intense desire to see animals). We further hypothesized that the respondents'

stated acceptance of official park warnings would increase with exposure to the warning materials, whether orally, in writing, or on signs.

In Table 5 we present the results of two multiple regression analyses, predicting both the beliefs about wildlife and the knowledge of bears scales. The table provides the standardized estimates of effects from the independent variables on these two dependent variables. Age, gender, distance to Yellowstone, and oral explanation are all significantly related to the beliefs about wildlife scale. As hypothesized, older visitors expressed beliefs more consistent with official park information, while younger visitors held riskier beliefs about wild animals and safety. Women were also significantly more likely to express park-consistent beliefs, as expected from studies that suggest males are more inclined to take risks, both as adolescents and as adults (Morrongiello and Rennie 1998; Zuckerman and Kuhlman 2000). And again as hypothesized, those who had traveled a greater distance to Yellowstone were more likely to hold beliefs contrary to park information and guidelines on animal viewing. Finally, of the three methods of information access, only oral explanation was significantly related to the beliefs about wildlife scale. Visitors who had heard directly from a representative in the park (such as campground concessionaire or a ranger) about wildlife safety were more likely to express beliefs consistent with official park positions on the subject.

The regression results for the knowledge of bears scale are quite similar. Gender, distance to Yellowstone, and oral explanation are all significantly related to this scale (though age is not). Women were again more likely to express opinions consistent with park-provided information, and visitors who traveled farther to Yellowstone were again more likely to express contrary opinions. As before, receiving an oral explanation of park policies was positively related to expressing opinions consistent with the official warnings.

Neither of the other modes of information-transfer (written materials and signs) was significantly related to either of the scales. The high regard for park personnel expressed in various national surveys, and the interactive nature of oral discourse, are two likely reasons for the greater impact of oral explanations on the beliefs and opinions of park visitors.

Table 5. Variables related to the scales for beliefs about wildlife and knowledge of bears (standardized regression coefficients).

Independent variables predicting scale values	Beliefs about Wildlife		Knowledge of Bears	
	Beta	P-value	Beta	P-value
Age	.169	.008*	.034	.308
Education	–.084	.115	–.089	.098
Female	.176	.006*	.106	.008*
Children	.037	.300	–.111	.051
Distance to YNP	–.228	.001*	–.134	.026*
Oral Explanation	.141	.025*	.097	.026*
Written Material	–.004	.478	–.031	.326
Warning Signs	.046	.255	–.051	.228

* Statistically significant ($p < .05$, one-tailed t-tests).

Summary

Nearly all of the survey respondents said they had seen warning signs about the animals in Yellowstone; by substantial majorities, they also said they had gotten written material on the subject either at the park or on the park website. A much smaller fraction of them (about a third) said they had received an oral explanation on recreating safely in wildlife country.

Most of the respondents identified minimum safe distances for viewing wildlife that were at least as great as those in the official park guidelines, and they generally disagreed with statements posed to them that contradicted park policies about safety around wild animals. However, only a slim majority strongly disagreed with the statement that roadside bears are not really disturbed by the presence of humans. Indeed, more than a fifth of the respondents acknowledged that they would leave their car to take a picture of a bear that was closer than the recommended safe viewing distance. Such risky opinions were also reflected in some of the visitor behaviors that were observed during the course of the interviews at animal jams.

Controlling statistically for age, education, presence of children, written warning materials, and signs, we found that gender, distance traveled to Yellowstone, and receiving an oral explanation of wildlife safety all affected the visitors' expressed beliefs and opinions about Yellowstone's animals in general, and about its bears in particular.

Discussion

A bear jam—or indeed, any animal jam—is not simply an occasion for viewing an iconic animal. For park visitors, it may be perceived as part of a shared "wilderness" experience. It provides a feeling a kinship with the first human visitors through the area, as well as with the first European explorers. It is the bonding of children and parents through travel, with the heightened awareness of nature that sometimes comes from viewing a wild animal "up close and personal." The bear jam becomes part of the "remember when?" of family life, adding to family holidays and family lore. These social sources of its appeal all contribute to the intransigence of the bear jam as a problem for park management.

In responding to the attraction of the animal jam experience, park managers need to deliver their message of safe animal viewing in a manner that will be remembered and heeded by park visitors. The results of this research suggest ways to enhance those efforts.

A visitor's gender and travel distance are, of course, not subject to influence by park management. However, awareness of how those two variables affect beliefs and knowledge about wildlife safety can be useful in targeting informational campaigns for safe viewing of park animals (Bath and Enck 2003). And allocating park personnel to places where they can deliver information orally *is* within management control. Personnel cost more than printed materials or signs, but have more impact. Indeed, over half the federal budget for Yellowstone is devoted to personnel costs (GAO 2005). Even so, the park estimates that it has a shortfall of over 200 personnel, or approximately one-fifth of the support needed to run and monitor programs and visitors. Hearing from the human icon of the national parks (a park ranger) about an iconic animal (the grizzly bear) in the nation's iconic park (Yellowstone) seems to drive home the key messages about wildlife safety (see Swearington and Johnson 1995).

Management of resources is always a difficult task, especially during times of tight fund-

ing. Yet to further program interests, using park rangers to enhance personal contact with visitors, along with devoting more resources to hiring rangers, both need to be considered in light of these findings. More generally, parks that achieve iconic status have effects far beyond their boundaries (see Carter et al., this issue), even setting a standard for the park system as a whole. YNP is one of the iconic parks of the US national park system. With its iconic animals, it draws visitors domestically and internationally, many of whom hope for a sighting of the emblems of America's western wilderness. The large size of the park means its budgetary and personnel resources are always spread thin. And yet, by virtue of its size and its iconic status, Yellowstone has more total dollars and people at its disposal than smaller parks. Effective allocation of those resources is essential for managing the park's iconic features, for informing and protecting visitors, and for supporting research to evaluate all of those efforts. YNP also actively disseminates the results of such research to managers of other parks throughout the US national park system, and indeed, throughout the world. These other parks face their own unique challenges, and our case study of human–bear safety may not be directly applicable to their specific circumstances. Nevertheless, every protected area can take something of value from the process we have described for addressing this particular management issue at America's first national park.

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