Greater Yellowstone Ecosystem wildlife approach study

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Abstract Every year, millions of people visit parks and protected areas to view wildlife. Human-wildlife conflicts typically occur when people approach animals at inappropriately close distances. Bison are involved in more dangerous interactions than any other species in the Greater Yellowstone Ecosystem (GYE), and conflict between people and elk is becoming increasingly concerning to managers. Most of these incidents occur when people approach bison at proximities less than the GYE regulation of 25 yards. Developing effective communication programs can aid in addressing peoples' perceptions about wildlife. The purpose of this study is to explore the effectiveness of distance-related human-wildlife interaction communication messages currently, and potentially employed by Grand Teton National Park and Yellowstone National Park. Additionally, this study will explore the effect that emotions have on park visitors' ability to estimate distances. The results of this study will inform solutions that managers can implement to prevent resource degradation and enrich visitor experience and safety.

Introduction

Background

Wildlife viewing is becoming an increasingly popular nature-based recreational pursuit (Cordell et al., 2008*b,a*; The Outdoor Foundation, 2017). More and more people are visiting parks and protected areas (PPAs) to have opportunities to interact with a variety of wildlife species in their native habitats (Anderson et al., 2010; Skibins et al., 2012). Many visitors are especially interested in viewing opportunities with free-roaming, charismatic megafauna (Skibins et al., 2016; Verbos et al., 2018). Opportunities to view wildlife are an important part of high-quality visitor experiences (Anderson et al., 2010; Hammitt et al., 1993; Lemelin and Smale, 2006). However, the management of visitor use in national parks and other publicly managed lands faces ever-increasing visita-tion coupled with the associated threat of resource and experience degradation. Managers are tasked with protecting natural and cultural resources while simultaneously provisioning opportunities for public use and enjoyment of those resources (Hammitt and Cole, 1998; Manning, 2011*a*). This tension is present in the management of human-wildlife interactions in PPAs, where high-quality visitor experiences must be balanced with the protection of ecosystems and their biodiversity (Kerley et al., 2003).

Visitor satisfaction is often related to visitors' motivations to be close to animals and to see them clearly (Hammitt et al., 1993; Pearce and Wilson, 1995; Schänzel and McIntosh, 2000; Verbos et al., 2018). This desire often fuels human-wildlife conflicts that occur when people and animals are in closer proximity than regulations set by PPA managers (NPS, 2020). Such inappropriate human behaviors threaten

visitor safety (Penteriani et al., 2016). Furthermore, anthropogenic disturbances can lead to deleterious impacts to wild animals, for example, through displacement, mortality, and disruption of breeding and reproduction (Brown et al., 2012; Gunther et al., 2018).

Direct and indirect management strategies have a long history in the field of visitor use management for addressing such recreational impacts. Direct management, as the name implies, uses tactics and practices that directly act on visitor behavior leaving little or no freedom of choice; indirect management practices aim to influence people's decision-making upon which they base their behaviors (Manning, 2011*b*). Direct management attempts to regulate and control behavior through restrictions, while indirect management attempts to influence or modify behavior while maintaining freedom of choice. Examples of direct management practices include regulations, fines, surveillance, zoning, reservations, and limiting use. Examples of indirect management practices can include education, messaging, and signage. Direct regulation can be inconsistent with the provision of unconfined recreation opportunities, especially given that recreation is a type of leisure pursuit founded on freedom of choice, thought, or action. Fiscal and staffing constraints can also inhibit the enforcement of rules and regulations employed under direct management. Indirect management practices tend to be favored by managers and visitors as they often require fewer resources, can enhance visitor experiences, and maintain wilderness characteristics associated with protected areas (Manning, 2011*b*). Indirect management strategies have been used to encourage visitors to act in ways that align with management objectives to address negative impacts to natural resources and visitor experiences in PPA through persuasion. Persuasive communication has its roots in the field of social psychology and broadly deals with understanding the factors that influence the effectiveness of a message (Ajzen, 1992).

Indirect management strategies are a necessary aspect of provisioning wildlife-related recreation opportunities in national parks and other public lands while protecting species (Roggenbuck, 1992). Persuasive communications have been used to understand and inform messaging to address a variety of human-wildlife conflicts, such as proper food storage in bear country (Lackey, 2003; Martin and McCurdy, 2009), wildlife feeding (Hockett & Hall, 2007), and carrying bear spray (Miller et al., 2019). In terms of proximity-related conflict between people and wildlife, recent work assessed messaging developed in an effort to test behavioral impacts of a safe wildlife viewing communication campaign based on community-based social marketing, Theory of Planned Behavior, and risk communication in four national parks (Abrams et al., 2019).

Current national park messaging aims to address non-compliant visitor behavior, whereby people get too close to wildlife, which violates laws designed to protect resources and visitors. For instance, in the Greater Yellowstone Ecosystem, managers disperse communications that inform visitors to stay 25 yards, the equivalent of 2 bus lengths, away from ungulates such as bison and elk. Although the dual mandate of the national park service aims to provide high-quality visitor experiences while protecting natural resources such as wildlife, messaging aimed at reducing non-compliant behaviors has predominantly focused on protection of the resource (i.e., rules of the park) rather than communications that highlight satisfaction which can align with conservation efforts (Abrams et al., 2019). Research is needed to assess how alternative communication strategies impact distance-related behaviors during human-wildlife interactions in PPAs.

Background and relevant literature

Resource protection

Leave No Trace (LNT) provides an indirect management strategy for dealing with depreciative behaviors in park and protected area settings (Lawhon et al., 2019; Vagias et al., 2012, 2014). The LNT program aims to reduce recreation-related impacts through visitor education about how to recreate responsibly (Marion, 2014) and promotes specific considerations of how to recreate around wildlife. The program is managed by a 501c(3) not-for-profit known as

The LNT Center for Outdoor Ethics, which provides minimum impact guidelines for outdoor enthusiasts. The Seven Principles of LNT are distributed widely across many park and protected area settings including U.S. national parks and national forests. The efficacy of certain LNT principles have been empirically examined, such as Principle 2: *Travel and Camp on Durable Surfaces* (Schwartz et al., 2018; Settina et al., 2020), and Principle 3: *Dispose of Waste Properly* (Mateer et al., 2020; Miller et al., 2019), and Principle 4: *Leave What You Find* (Schwartz et al., 2018).

Principle 6: *Respect Wildlife* provides guidance on minimizing disturbance to animals, such as during observation, with proper food storage, and protecting habitats. In terms of viewing behavior, it provides numerous recommendations, such as observing wildlife from a distance, keeping groups small, and moving slowly and quietly (The Leave No Trace Center for Outdoor Ethics, 2021). These recommendations focus on low-impact behaviors that simultaneously protect personal safety by preventing bites, scratches, or other injuries that could lead to hospitalization. In other words, respecting wildlife achieves both resource and human protection through proper visitor behavior. The effectiveness of messaging based on Principle 6 has not yet been tested, and so an assessment of persuasive communications designed to keep visitors and wildlife at appropriate distances from one another is warranted.

Visitor experience quality

Message framing that promotes the visitor experience as it aligns with wildlife protection has recently received attention in the literature. Abrams et al. (2019) tested a campaign that focused on the benefits accrued from viewing wildlife from a safe distance that not only gives them space but allows them to experience a view that is unique to spending time in the national park. The campaign was effective at Assateague Island National Seashore, Rocky Mountain National Park, and Shenandoah National Park, but not at Grand Canyon National Park. However, they used a nonequivalent pretest-posttest design rather than a quasi-experimental design that would allow for more direct conclusions about whether messag-

ing was actually influencing behaviors.

One approach that may prove effective is message framing that takes into account dual-process models (Wieczorek Hudenko, 2012), such as the heuristic-systematic model (HSM). Message framing (i.e., positive - benefits gained, versus negative - consequences avoided) and personal relevance can impact whether a person employs systematic or heuristic processing of information. That is, when personal relevance is low, systematic processing occurs, and negatively framed messages are more persuasive; when personal relevance is high, heuristic processing occurs, and so positively framed messages are more persuasive (Meyers-Levy and Maheswaran, 2004). While Abrams et al. (2019) developed a communication campaign that focused on personal benefit, with keeping safe distances from wildlife framed as a desirable and beneficial part of the visitor experience rather than solely the benefit for wildlife (e.g., *"A great experience starts with a little distance."*), more rigorous research is needed to test how personal benefit language might compare to resource protection language on wildlife-related decision making.

Another important aspect of message framing is the focus on negative or positive emotions. Some researchers have attempted to use negatively framed appeals (e.g., fear arousal) to discourage dangerous behaviors such as wildlife feeding (Hockett and Hall, 2007). However, risk communication frames that focus on gains are linked to the generation of positive feelings. A recent study found evidence that positive emotional appeals can benefit the conservation of biodiversity; respondents were more willing to donate money and time to environmental organizations when receiving positively framed content (Jacobson et al., 2019).

One positive emotion that is beginning to receive attention in the field of outdoor recreation research is awe. Art, music, and natural wonders elicit many feelings, but the shared response to all of these experiences has been conceptualized as awe (Keltner and Haidt, 2003). Awe has two primary cognitive appraisal dimensions: perceived vastness and the need for mental accommodation. Vastness refers to a stim-

ulus that appears much larger than the self, challenging a person's customary experience or frame of reference. The need for accommodation involves changing current mental schemas to mentally process an experience. A number of studies have assessed awe experiences in nature-based tourism settings, identifying this emotion as an important aspect of the quality of the visitor experience (Coghlan et al., 2012; Pearce et al., 2017; Powell et al., 2012; Wang and Lyu, 2019). Awe has been identified as a salient aspect of human-wildlife interactions (Hicks and Stewart, 2018). Human emotions can drive inappropriate behaviors that lead to conflict with wildlife (Wieczorek Hudenko, 2012), and so appealing to such emotions in risk communications needs to be tested. Harnessing awe as a positive aspect of the wildlife viewing experience, and a potential leverage point in risk communication, has yet to be demonstrated in the literature.

Study purpose

Research is needed to test how persuasive communication strategies impact wildlife viewing behaviors in PPAs. Additionally, the current body of knowledge has not tested the efficacy of LNT Principle 6 for wildlife viewing contexts. Studies of the differential impacts message framing that focuses on visitor experiences versus resource protection for addressing noncompliant wildlife viewing behavior are also lacking. The purpose of this study is to test how wildlife viewing persuasive communication messages impact distances that visitors choose to maintain from wildlife.

Methods

Sampling design

The sampling design, including sample locations selected in each park, was developed in consultation with park managers. Sampling was distributed across one site in Grand Teton National Park and one site in Yellowstone National Park over two months during the summer of 2021. Twelve days of sampling were allotted for data collection in each park, which were stratified by time of day (AM/PM), weekday or weekend, and treatment condition. In Grand Teton,

AM shifts occurred from 7AM to 5PM, and PM shifts took place from 9AM to 7PM. The field season for Grand Teton spanned from June 15 – July 12. Due to delays in the shipment of field equipment, data collection began on June 23. In Yellowstone, AM shifts took place between 7AM to 3PM, and PM shifts from 9AM to 5PM, as the exceptionally high visitor turnover in Mammoth made it possible to achieve the desired sample size during slightly shorter shifts than those in Grand Teton. Data collection in Yellowstone occurred from July 13 – August 8. In each park, treatment message conditions were distributed such that each of the three conditions were allotted four days of data collection.

Study sites

Researchers collected data from 2 Greater Yellowstone Ecosystem locations: Elk Ranch Flats in Grand Teton National Park and Mammoth in Yellowstone National Park. GYE managers recommended these locations given the high visitation levels; furthermore, bison presence is high at this location in Grand Teton, and elk encounters are also frequent in this area of Yellowstone. Therefore, the density of visitors and the species of interest made these sites ideal for the study of human-ungulate interactions.

Survey design

The survey instrument was designed through a collaborative, iterative process between researchers and NPS staff. The questionnaire consisted of a pre- and post-survey. Survey questions were vetted by the Office of Management and Budget (OMB) in compliance with the Paperwork Reduction Act (PRA) (OMB Control Number: 1024-0224). Earlier in the development process, the survey instrument was pretested to improve question wording, layout, and clarity. Prior to finalizing and deploying the survey in the field, the instrument was field-tested with park visitors before data collection. Question topics included trip characteristics, wildlife-related emotions, wildlife-related experiences, wildlife-related knowledge, information sources, social media, and demographics.

Messaging treatments

A message elicitation study was used to develop and test 16 treatment messages (i.e., 8 visitor experience framed, 8 resource protection framed) in the spring of 2021. A Qualtrics survey was administered to undergraduate students in the Recreation, Park, and Tourism Management Department at Penn State University. Participants were asked to rate the persuasiveness of each message (1 = Not at all persuasive, 5 = Mildly persuasive, 9 = Very persuasive). They were also asked to rate how likely they would be to maintain safe distances from wildlife after reading each message (-4 = Less likely, 0 = No effect, 4 = More likely). Results were used to select the wording for each treatment message in the field study.

Treatment 1 reflects framing around resource protection and safety, and Treatment 2 demonstrates framing around the visitor experience and awe. A control message used no persuasive appeal, relying on the distance recommendation already employed by both park units. After receiving the instructions, the participants were instructed:

1. Treatment 1: "[Wildlife species] are unpredictable and can cause serious injury by biting, kicking, or goring you. Animals that are provoked by people may need to be relocated or killed. When an animal changes its behavior in response to your presence, that means you're too close. **When you give wildlife the space they need to survive, you encourage their natural behaviors and also keep yourself safe.** Please **approach the [wildlife species]** to the point at which you feel you can keep yourself and the animal safe, and then stop at that point."

2. Treatment 2: "This park offers amazing opportunities to view natural wildlife behaviors in native habitats. However, when people disturb wildlife, they might flee, ruining your ability to enjoy and see them clearly. **When you give wildlife space, it allows you to enjoy their natural behaviors. The best experience is one that allows you to truly appreciate the awe and wonder of nature.** Please **approach the [wildlife species]** to the point at which you feel you can keep yourself and the animal safe, and then stop at that point."

3. Control: "The National Park Service recommends you stay a minimum of 25 yards, the equivalent of 2 bus lengths, away from bison. Please **approach the [wildlife species]** to the point that best represents the recommended distance."

Data collection

The research team employed visitor intercept surveys to randomly sample potential respondents. Technicians employed random sampling methods using a random number generator. At the beginning of their shift, they randomly generated 3 numbers between 0 and 60, resulting in the 3 times on each hour that would intercept a visitor. Each was approached and asked to complete an on-site survey regarding human-wildlife conflicts in the GYE. In GRTE, intercepts occurred in the grassy area in front of the fencing at Elk Ranch Flats next to the parking lot, and in YELL, data collection took place in Mammoth on the lawn in front of the Terrace Grill. Individuals or groups who were unwilling, unable, or refused to complete the full survey were asked if they would be willing to answer a question that would be used to check for non-response bias. If a group of more than one person was intercepted, only one person was selected from the group to participate. To avoid self-selection, the person with the most recent birthday was asked to complete the survey. Those who do not speak enough English to complete the survey were excluded from the study.

All visitors agreeing to participate will be asked to

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
No	147	37.2	167	39.2	314	38.2
Yes	248	62.8	259	60.8	507	61.8
Total	**395**	**100.0**	**426**	**100.0**	**821**	**100.0**

Table 1. Descriptive statistics of first-time visitors to the park

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Number of times visited	144	20.3	107.4	162	8.7	42.4	306	14.2	79.9

Table 2. Descriptive statistics of number of times respondents visited the park

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Number of nights	392	1.0	0.1	426	1.0	0.1	801	2.7	5.1

Table 3. Descriptive statistics of the number of nights respondents stayed in the park or surrounding area

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
I sense things momentarily slow down	381	5.2	1.5	401	5.1	1.4	782	5.1	1.5
I notice time slowing	379	4.7	1.60	400	4.5	1.5	779	4.6	1.5
I feel my sense of time change	377	4.5	1.6	400	4.34	1.5	777	4.4	1.6
I feel my sense of self become somehow smaller	377	5.2	1.6	398	4.7	1.8	775	4.9	1.7
I feel small compared to everything else	378	5.2	1.6	398	4.8	1.7	776	5.0	1.7
I feel my sense of self shrink	378	4.4	1.7	397	3.9	1.7	775	4.1	1.7
I have the sense of being connected to everything else	378	5.5	1.4	398	5.4	1.3	776	5.4	1.3
I feel closely connected to humanity	378	4.5	1.6	397	4.5	1.7	775	4.5	1.6
I have a sense of complete connectedness	377	5.0	1.3	397	4.8	1.3	774	4.9	1.3
I feel that I am in the presence of something grand	377	6.5	0.9	397	6.3	0.9	774	6.4	0.9
I experience something greater than myself	376	6.3	1.0	396	6.1	1.2	772	6.2	1.1
I perceive vastness	377	6.1	1.2	397	5.8	1.3	774	5.9	1.3
I feel challenged to mentally process what I am experiencing	377	4.5	1.7	397	4.2	1.8	774	4.3	1.8
I find it hard to comprehend the experience in full	377	4.2	1.8	397	3.9	1.8	774	4.0	1.8

Table 4. Descriptive statistics of awe

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
...excited	378	4.5	0.7	387	4.4	0.8	765	4.4	0.7
...attentive	378	4.4	0.7	386	4.3	0.7	764	4.4	0.7
...alert	378	4.4	0.8	386	4.3	0.8	764	4.4	0.8
...enthusiastic	377	4.5	0.7	386	4.4	0.7	763	4.4	0.7
...inspired	377	4.1	0.9	386	4.0	1.0	763	4.1	0.9
...nervous	377	2.3	1.2	387	2.2	1.1	764	2.3	1.1
...distressed	376	1.6	0.8	387	1.6	0.8	763	1.6	0.8
...scared	377	1.6	0.7	387	1.5	0.8	764	1.6	0.8
...hostile	377	1.3	0.6	387	1.3	0.6	764	1.3	0.6
...afraid	376	1.5	0.8	386	1.4	0.8	762	1.5	0.8
...awe	376	4.3	0.8	387	4.2	0.9	763	4.3	0.8

Table 5. Descriptive statistics of PANAS

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
No	88	22.4	156	36.6	244	29.8
Yes	305	77.6	270	63.4	575	70.2
Total	393	100.0	426	100.0	819	100.0

Table 6. Descriptive statistics of whether respondents previously encountered [wildlife species]

complete an on-site survey and walking exercise. For those who accept, the surveyor first administered a pre-survey, asking the respondent to follow along using a paper copy while the technician recorded their answers electronically via iPad. The pre-survey contained questions about trip characteristics, wildlife-related emotions, and wildlife-related knowledge. Following the completion of the pre-survey, participants proceeded with a walking exercise. Technicians checked the sample schedule at the start of their shift to determine which treatment message condition to administer throughout the shift: Treatment 1 (i.e., resource protection and safety), Treatment 2 (i.e., visitor experience and awe), or Control (i.e., NPS distance regulation). Participants read along with the message instructions while the technician read them out loud. After receiving the mes-

sage, the participant walked a 100-yard transect toward a life-sized bison cutout (in GRTE) or a life-sized elk cutout (in YELL), and a range finder was used by the technician to capture the distance they chose. Upon completion of the walking exercises, the post-survey was then administered. The post-survey included questions about treatment message helpfulness, information sources, social media, and demographics. Survey items used language specific to the wildlife of interest and the park that the survey takes place in (i.e., bison in GRTE, elk in YELL).

Preliminary results

Trip characteristics

Researchers examined the trip characteristics for participants visiting Grand Teton and Yellowstone National Parks. To examine whether respondents were first-time visitors to either park, researchers asked visitors the following prompt: *Is this your first time visiting [Park name]?* Across both parks, the majority of respondents (61.8%) reported that they were first-time visitors (Table 1).

For those who were not first-time visitors, researchers explored how many times respondents had visited Grand Teton or Yellowstone National Park by asking:

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Previous encounters	276	3646.5	60191.6	266	38.2	138.0	542	1875.6	42952.5

Table 7. Descriptive statistics of number of previous encounters

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
No	14.8	14.8	66	15.5	124	15.1
Yes	85.2	85.2	360	84.5	695	84.9
Total	100.0	100.0	426	100.0	819	100.0

Table 8. Descriptive statistics of whether respondents encountered [wildlife species] in the park

Including this visit, how many times have you visited [Park name]? The descriptive statistics indicated that on average, visitors to Grand Teton reported visiting approximately 20 times, while visitors to Yellowstone reported visiting approximately 9 times (Table 2).

Researchers were also interested in how many nights respondents stayed overnight during their trip. Participants were asked: *During this trip, how many nights have you stayed in [Park name] or the surrounding area outside the park thus far?* In both parks, the average number of nights was M = 2.7 (Table 3).

Wildlife-related emotions

Researchers were also interested in wildlife-related emotions. To measure awe, respondents were asked to respond to the following prompt: *Please indicate how much you disagree or agree with the following statements. Please select only one response for each item. When I view [wildlife species] in a setting like [park name]...* This battery of questions was adapted from Yaden et al. (2019). Responses were recorded on a Likert-type scale (1 = strongly disagree 4 = neither agree nor disagree, 7 = strongly agree). On average, across both parks, responses to each item were above the neutral point on the scale (Table 4).

Researchers were also interested in people's emotions during wildlife encounters, as measured on the

PANAS scale (Watson et al., 1988). Study participants were given the following prompt: *When thinking in terms of your emotions, please indicate how much you disagree or agree with the following statements related to your previous encounters with bison. When I saw [wildlife species] I felt...* Each item was rated on a 5-point Likert-type scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree). Across both parks, participants agree that they felt positive emotions and disagreed that they felt negative emotions when they saw wildlife (Table 5). Only those who respondent affirmatively that they had seen bison/elk on their trip answered this question.

Wildlife-related experiences

Researchers were also interested broadly in participants' wildlife-related experience both prior to and during their trip. In terms of their prior experience, respondents were asked: *Before this trip to [park name], have you ever encountered any [wildlife species]?* Descriptive statistics indicated that the majority of respondents had previously encountered bison in GRTE (77.6%) and elk in YELL (63.4%) (Table 6). Descriptive statistics for those who did have previous encounters are presented in (Table 7).

In terms of study participants' experiences during their trip, respondents were asked: *On this visit to [park name], have you encountered any [wildlife species]?* The majority of respondents in Grand Teton did encounter bison on their trip (85.2%), and the majority of respondents in Yellowstone did encounter elk (84.5%) (Table 8). Descriptive statistics of the number of encounters respondents had on their trip are provided in (Table 9).

Furthermore, respondents were asked about considerations they made while viewing wildlife. The following prompt was given: *When considering the bison you encountered on your trip, please indicate how*

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Encounters on trip	333	3.9	8.7	359	7.9	54.1	692	6.0	39.5

Table 9. Descriptive statistics of number of encounters on trip

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
. . . my personal safety	334	3.4	1.3	358	3.2	1.3	692	3.3	1.3
. . . the safety of others	334	3.6	1.3	358	3.5	1.3	692	3.5	1.3
. . . the welfare of the [wildlife species]	334	4.2	0.9	358	4.2	1.0	692	4.2	1.0
. . . the impacts of visitors' behaviors on [wildlife species]	334	4.3	0.9	358	4.2	1.0	692	4.2	0.9
. . . my ability to see the [wildlife species] as well as I wanted to	332	3.8	1.0	358	3.7	1.0	690	3.7	1.0
. . . my ability to take the photograph I wanted	332	3.7	1.2	357	3.5	1.2	689	3.6	1.2
. . . other	3	3.7	1.2	14	4.3	0.9	17	4.2	1.0

Table 10. Descriptive statistics considerations made while viewing [wildlife species]

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
No	61	15.5	51	12.0	112	13.7
Yes	332	84.5	375	88.0	707	86.3
Total	**393**	**100.0**	**426**	**100.0**	**819**	**100.0**

Table 11. Descriptive statistics of awareness of regulations of distances

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
No	116	29.5	59	13.8	175	21.4
Yes	277	70.5	367	86.2	644	78.6
Total	**393**	**100.0**	**426.**	**100.0**	**819**	**100.0**

Table 13. Descriptive statistics of seeing messaging about safe distances

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
100 yards	111	41.1	66	20.4	177	29.8
50 yards	38	14.1	58	18.0	96	16.2
25 yards	120	44.4	198	61.3	318	53.6
10 feet	1	0.4	1	0.3	2	0.3

Table 12. Descriptive statistics of knowledge of the recommended distance

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
Treatment 1	133	34.9	138	33.1	271	34.0
Treatment 2	128	33.6	137	32.9	265	33.2
Control	120	31.5	142	34.1	262	32.8
Total	**381**	**100.0**	**417**	**100.0**	**798**	**100.0**

Table 14. Descriptive statistics of treatment message conditions

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Distance from [wildlife species]	343	80.9	18.2	384	71.1	19.5	727	75.8	19.5

Table 15. Descriptive statistics of distance in yards

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
The message I received during the distance exercise was helpful in determining the safest distance I should maintain between myself and [wildlife species].	344	5.7	1.4	382	5.9	1.1	726	5.8	1.3

Table 16. Descriptive statistics of message helpfulness

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
Brochure/map	51	13.4	72	17.1	123	15.4
Newspaper	4	1.1	5	1.2	9	1.1
Website	78	20.5	80	19.0	158	19.7
Ranger/employee	19	5.0	14	3.3	33	4.1
Interpretive program	2	0.5	2	0.5	4	0.5
Signs	11	2.9	9	2.1	20	2.5
Other visitors	6	1.6	10	2.4	16	2.0
Social media	12	3.2	8	1.9	20	2.5
Educational groups	4	1.1	2	0.5	6	0.7
Word of mouth	13	3.4	12	2.9	25	3.1
Other	16	4.2	27	6.4	43	5.4
I did not seek information	164	43.2	180	42.8	344	42.9
Total	**380**	**100.0**	**421**	**100.0**	**801**	**100.0**

Table 17. Descriptive statistics of primary information source used to find information about viewing [wildlife species] during planning

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
The information made me aware of appropriate behaviors while viewing [wildlife species]	212	4.1	1.0	238	4.0	1.0	450	4.0	1.0
The information made me think about appropriate behaviors while viewing [wildlife species]	212	4.2	0.9	238	4.1	0.9	450	4.1	0.9
The information made me interested in appropriate behaviors while viewing [wildlife species]	212	4.1	0.9	238	4.1	0.9	450	4.1	0.9
The information changed my behavior regarding viewing [wildlife species]	212	3.1	1.2	238	3.2	1.1	450	3.2	1.2

Table 18. Descriptive statistics of assessments of primary source

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Twitter	382	1.2	0.7	419	1.2	0.6	801	1.2	0.7
Facebook	381	2.8	1.8	420	2.6	1.7	801	2.7	1.7
Instagram	382	2.4	1.7	420	2.5	1.7	802	2.5	1.7
Snapchat	382	1.5	1.2	420	1.5	1.2	802	1.5	1.2
YouTube	381	1.2	0.7	419	1.2	0.6	800	1.2	0.7
Pinterest	379	1.1	0.5	417	1.0	0.3	796	1.1	0.4
Other	27	2.9	1.9	16	2.2	1.6	43	2.6	1.8

Table 19. Descriptive statistics likelihood of posting on social media sites

much you disagree or agree with the following statements. I considered... Responses were marked on a 5-point Likert-type scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree). Notably, in both parks, the highest mean scores were related to the welfare of the wildlife (M = 4.2). the impacts of visitors' behaviors on wildlife (M = 4.2), or other (Table 10).

Wildlife-related knowledge

Researchers also assessed participants' wildlife-related knowledge. Participants were asked whether they were aware of distance regulations with the following: *Are you aware that there are regulations regarding the recommended distance individuals should be from [wildlife species]?* Descriptive statistics revealed that the majority of participants in both parks were aware of regulations (86.3%) (Table 11).

For those who reported that they were aware of regulations, they were then asked the following follow-up question: *How far is the recommended distance?* In Grand Teton, 44.4% of people chose the correct answer, and in Yellowstone, 61.3% chose the correct answer (25 yards) (Table 12).

Furthermore, participants were asked about seeing messages about safe distances. The following prompt was provided: *Have you seen any messaging regarding safe distances from which to view wildlife **during this visit?*** In both parks, approximately three-quarters of respondents affirmed that they had (78.6%) (Table 13).

Distance exercise

During the walking exercise, even numbers of respondents were split into either Treatment 1, Treatment 2,

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Approval of selfies	379	3.5	2.1	417	3.1	1.9	796	3.3	2.0

Table 20. Descriptive statistics of approval of selfies with wildlife

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
Individual	35	9.2	12	2.9	47	5.9
Family only	292	76.6	311	74.2	603	75.4
Friends only	31	8.1	31	7.4	62	7.8
Family plus friends	23	6.0	56	13.4	79	9.9
Tour or other group	0	0.0	9	2.1	9	1.1
Total	**395**	**100.0**	**419**	**100.0**	**800**	**100.0**

Table 21. Descriptive statistics of traveling party

or the Control group for a total of 798 completed exercises (Table 14).

In Grand Teton, on average, respondents maintained 80.9 yards away from the bison cutout; in Yellowstone, respondents maintained 71.1 yards away from the elk cutout Table 15, both of which are much more conservative than the 25-yard regulation set by the park for ungulates.

Respondents were asked to rate how helpful the treatment message they received was: *Please indicate your level of disagreement or agreement with the following statement. Please select only one response for each item. The message I received during the distance exercise was helpful in determining the safest distance that I should maintain between myself and [wildlife species].* Responses were measured on a 7-point Likert-type scale (1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree). In both parks, respondents found the treatment messages to be helpful (M = 5.8) (Table 16).

Information sources

Participants were asked about information sources they used during trip planning. First, respondents were asked *When planning your trip to [park name],* which was the **primary source** *you used to find information about viewing [wildlife species]? (Please select only one.)* Although the majority of respondents did not seek information, the highest-rated category was Website in both parks (19.7%) (Table 17).

For those who did seek information during the planning phase, they were asked: *How much do you disagree or agree with the following statements regarding the* **primary source** *you used to find information about viewing [wildlife species] in [park name]? (Please select only one response for each item.)* Responses were recorded on a 5-point Likert-type scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree). Although participants agree that the information made them aware of, think about, and interested in appropriate behaviors while viewing wildlife, mean scores were closer to the neutral point on whether the information changed their behavior (Table 18).

Social media

Social media-related questions were also posed to respondents. On a 5-point Likert-type scale (1 = not at all likely, 3 = moderately likely, 5 = extremely likely), respondents were asked: *How likely are you to post photographs or comments related to this visit to [park name] on the following social media sites?* Overall,

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Group size	381	3.3	2.4	420	5.0	3.8	801	4.2	3.3

Table 22. Descriptive statistics of group size

	GRTE			YELL			Both Parks		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Age	375	44.5	15.2	419	41.7	13.9	794	43.0	14.6

Table 23. Descriptive statistics of age

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
Male	191	50.0	219	52.3	410	51.2
Female	191	50.0	200	47.7	391	48.8
Total	**382**	**100.0**	**419**	**100.0**	**801**	**100.0**

Table 24. Descriptive statistics of gender

mean scores indicated a low likelihood of posting on the various sites (Table 19).

Furthermore, selfie behavior with wildlife was of interest. On a 7-point Likert-type scale, respondents were asked *Please rate your overall level of approval of visitors taking "selfies" with wildlife in [park name]*. Mean scores indicated slight disapproval of taking selfies with wildlife (Table 20).

	GRTE		YELL		Both Parks	
	N	%	N	%	N	%
English	359	93.7	388	92.4	747	93.0
Other	24	6.3	32	7.6	56	7.0
Total	**383**	**100.0**	**420**	**100.0**	**803**	**100.0**

Table 25. Descriptive statistics of language

Demographics

Study sample demographics were also collected. To collect information on traveling parties, the following prompt was used: *Please select the choice below that best describes your traveling party. (Please se-*

lect only one choice). The majority of respondents in both parks were traveling with family only (75.4%) (Table 21).

Participants were asked about their group size: *How many people were in your [personal, organized, tour] group, including you?* The average group size was 4.2 people (Table 22)

Respondents were also asked how old they were: *What is your age?* The average respondent was 43 years old across both parks (Table 23).

Gender was also recorded with the following prompt: *What is your gender?* Nearly half of respondents answered either male or female in both parks, with slightly more males than females (Table 24).

Primary language was also obtained from respondents: *Which one language do you and members of your personal group primarily use to communicate with each other?* The majority of respondents spoke English (93.0%) in both parks (Table 25).

Conclusions

Preliminary results indicate that the majority of respondents are first-time visitors, and on average, stayed overnight fewer than three nights. In terms of their emotions, park visitors reported positive emotions towards bison and elk rather than negative emotions, and awe is likely a relevant emotion to the wildlife viewing experience. Most respondents had previous experiences with the wildlife species of interest in the respective park. Furthermore, an over-

whelming majority had encountered bison in Teton and elk in Yellowstone up to that point during their trip. During wildlife viewing experiences, wildlife welfare and impacts to wildlife were relevant considerations as indicated by the descriptive statistics. Most participants were aware that the park had regulated distances from which they should view wildlife and most had also seen messaging about safe distances from which to view wildlife. However, less than half of respondents in Teton could identify the correct distance, while almost two-thirds could cite the regulation in Yellowstone. Both treatment conditions led participants to choose conservative distances from which to view wildlife compared to the actual GYE ungulate regulation. Furthermore, the messages were deemed helpful by respondents. Websites were the most often used information source at the planning phase of the trip. Responses indicated a low likelihood of posting on social media about their trip and disapproval of selfie behaviors with wildlife. Most respondents were traveling with family. On average, participants traveled in groups of 4 and were approximately 43 years old. Nearly half were female and most spoke English.

Future work

Future work will assess the difference in responses across treatment conditions as well as across parks. The effect of treatment messages on distance estimation is of interest. The impacts of social media behavior on wildlife viewing perceptions will also be explored. Qualitative data analysis of open-ended interviews regarding awe as an aspect of the wildlife viewing experience will also be explored.

Acknowledgements

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