

Evaluating the Impact of Photo Order on Perceptions of Crowding at Buffalo National
River

by

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Abstract

Visual-based research methods have become vital within outdoor recreation management because they provide researchers with an empirical basis to formulate norms for a variety of conditions. To better understand visitor's perceptions, we must better understand the methodology in how we gather this type of data. This study assesses whether photograph order within a visually-based method study in a field setting creates bias results.

To accomplish this goal, a study was conducted at Buffalo National River (BUFF) in northern Arkansas. The combination of surveys and visual-based photographs were used to determine whether there are differences in the acceptability of crowding between the control order (photographs displaying increasing amounts of use) and binders with non-sequential photograph order of crowding conditions. In addition to the primary comparison, this study also further analyzes the non-sequential binder data by case to determine whether there is a difference among the non-sequential orders and the control through the use of multiple statistical analyses (e.g. ANOVA, nonmonotonic values, interquartile ranges, and linear models). Through these tests, it was found that photograph order had little to no effect on the relationship between People At One Time (PAOT) and visitor acceptability which contradicts the findings of Gibson et al (2014), a similar study done in a lab setting.

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Chapter 1 - Introduction

According to the National Park Service (NPS), 2016 was the busiest year for visitation in its 100-year history (NPS, 2016). This influx in visitation is coming on the heels of a record setting year in 2015 where attendance had eclipsed the record established the year before. With over 330 million people entering U.S. national parks (NPS, 2016), crowding is becoming an increasing issue, potentially influencing the visitor's experience and related ecological conditions.

Crowding has become a perennial issue in the National Parks and in outdoor recreation areas (Nickerson, 2016). As more and more people use outdoor recreational areas, the quality of the resource may degrade, thus degradation in the quality of experience may erode with it. In order to measure the levels of crowding in a particular area, both subjective and objective data is collected. The objective data is taken by actual counts, with researchers in the field taking manual counts or by staging field cameras directed towards the entrances of recreational sites in order to capture images of crowding (Conlon, 2014). The objective data represents an indicator. The subjective data is collected by visitor survey. This data is considered to be subjective because the level of crowding is based on the individual visitor's recollection or self-reported amount of people in an area during their experience.

The use of visual-based methods has become commonplace in crowding research to aid in the collection of subjective data (Harper, 2004; Manning & Freimund, 2004; Lapenta, 2011). This method is meant to measure the social acceptability of a range of conditions that visitors are experiencing. Visual-based methods are key to developing indicators, the measurable and manageable variables that help define the quality of outdoor recreation areas, and thresholds, the minimum acceptable condition of the indicator, for both ecological and experiential conditions to

ensure their integrity (Manning, 2007). Traditionally, the process of visual-based methods involves presenting photographs in order, or all at once, from one having zero people (i.e. solitude conditions), to photographs displaying many people (i.e. saturated conditions). Visitors are then asked to answer a series of questions regarding a set of photographs to discover the visitor's level of acceptability, in this case, for People At One Time (PAOT) (Gibson et.al., 2014).

This study utilized some of the same methods as the lab based Gibson et.al. (2014) study, but was to be conducted in a field setting. The study examined visitors' acceptance for PAOT through visual-based research methods. By implementing a survey at the Lost Valley location at Buffalo National River (BUFF), this study investigated whether visitors can discern the differences between sequential and non-sequential conditions in a field setting. In the lab setting, it was found that there was no significant difference within the different non-sequential orders of the photographs when looking at the ANOVA results, however surprising results were discovered when using nonmonotonic values, interquartile ranges, and linear models (Gibson et.al., 2014). It was suggested, however, that these incongruent results may become more clear if a similar study were conducted in the field. This study was in direct response to that suggestion, to help improve upon the understanding of crowding through visual-based methods.

Research Objectives

Research Objectives

To test the visual-based methods outlined by Gibson et al. (2014) for different conditions represented by sequential and non-sequential order of photographs depicting different levels of use (PAOT) in a non-laboratory (field) setting (Buffalo National River).

Hypothesis (H_{1a})

Visitors' acceptance of PAOT will not change due to photograph presentation order at the ANOVA level.

Hypothesis (H_{1b})

Visitors' acceptance of PAOT will change due to photograph presentation order after conducting additional statistical analysis (e.g. nonmonotonic values, interquartile ranges, and linear relationships)

Chapter 2

Evaluating the Impact of Photo Order on Perceptions of Crowding at Buffalo National River

To be submitted to Leisure Science

Abstract

Visual-based methods are vital tools within outdoor recreation management. This method allows researchers to develop an empirical evaluation of social norms of outdoor recreationists. To better understand visitor's perceptions, and provide usable information to site managers, researchers must better understand their methodology. This study assessed whether photograph order, within a visually-based method, in a field setting, creates differential results relative to a lab setting by comparing our results to previous literature. To accomplish this, a study was conducted at Buffalo National River (BUFF), Arkansas, USA. Visual-based methods were used in a field setting to determine whether there are order effects in perceptions of crowding between sequential and non-sequential photograph presentation order. Results indicated that study setting may influence whether order effects are present. This research will contribute to the growing body of work in the study of research methods for protected area and visitor use management.

Keywords: crowding, photographs, social norms, visitor use management, visual-based methods

Introduction

The use of visual-based methods in social science research has been commonplace for many years (Daniel & Boster, 1976; Shuttleworth, 1980; Ribe, 1989; Manning, 2007). By using a series of photographs or other visual aids (e.g. diagrams or videos), researchers are able to represent a range of conditions that occur or may occur in a recreational area in order to evaluate visitor response (Lapenta, 2011). One of the most widely used applications of visual-based methods are to inform indicators, the measurable and manageable variables that help define the quality of outdoor recreation areas, and thresholds, the minimum acceptable condition of the indicator, of crowding within recreational areas (Manning, Valliere, Minter, & Wang, 2000;

Harper, 2002; Manning & Freimund, 2004; Manning, 2007; Manning, 2009; Gibson, Newman, Lawson, Fristrup, Benfield, Bell, & Nurse, 2014). This information is used by protected area managers as a key part of their assessment of the current level of use their area is receiving and the level of acceptability visitors have for those conditions (Manning & Freimund, 2004). This method is particularly effective in measuring the acceptability of ‘people at one time’ (PAOT) for a specific resource. By evaluating the acceptability of PAOT, protected area managers are able to identify thresholds at which crowding has become unacceptable for visitors, allowing for the formation of both spatial and temporal limits within a protected area.

For managers, the number of visitors in an area (and visitors’ perceptions of this amount) is important for conserving the experiential and ecological integrity of protected areas. One of the core missions of most parks is to provide opportunities for visitor enjoyment of these lands (United States of America, 1916). Alternately, an increase in visitation could lead to an increase in conflict between visitors due to crowding, diminishing visitor experience and promoting resource damage. Studies done on visitor perceptions of ecological and experiential conditions has produced several frameworks in which managers may monitor the amount of crowding within protected areas. Three of the most well-known and widely used are Limits of Acceptable Change (Stankey, McCool, & Stokes, 1984), Visitor Impact Management (Graefe, Kuss, & Vaske, 1990) and the Visitor Experience and Resource Protection (Hof & Liam, 1997). Recently, the Interagency Visitor Use Management Council (IVUMC, 2017); A collaboration between eight federal land management agencies, introduced an updated framework created using a combination of these frameworks. The IVUMC utilizes indicators and thresholds of quality to provide protected area managers data to make informed decisions.

For the first time, the major land management agencies in the United States are using the same framework to manage visitors. However, this has created a need to advance visitor use management research (such as visual-based assessments of crowding) and advance best practices of monitoring and evaluating natural and social resource impacts. This is important given that 2016 visitation levels to U.S. National Parks was the highest in its 100-year history (NPS, 2016). With more than 330 million people entering U.S. National Parks (NPS, 2016), crowding is emerging as an issue for the visitor experience and associated ecological conditions.

The purpose of this study was to examine the influence of photograph order effects on visitor's perceptions of crowding. Order effects refers to how photographic order in a survey, either sequential or non-sequential, influences visitors' response. In this case, researchers tested if the order of PAOT photographs affect visitor's acceptability of those conditions. If order effects are present, these may inhibit the researcher's ability to accurately measure visitor's perception of crowding, thus potentially influencing management actions.

This study is a direct response to the Gibson et al. (2014) study where similar methods were used to measure visitor perception of crowding in a protected area setting. Like Gibson et al. (2014), this study used visual-based methods to determine if there are any order effects in visitor response to crowding based on the order that photographs are presented to them. However, unlike Gibson et al. (2014), this study was conducted in a field-based setting which may present different results from the controlled lab study.

Literature Review

Crowding in Outdoor Settings

Since the late 1940's, the rise in popularity of outdoor recreation has concerned protected area managers about the impacts increasing visitation has on a recreational area, the visitor experience, and the natural environment (Manning et al., 2000). Too many people in an area is often referred to as crowding. Manning (2007) describes crowding as the negative evaluation of density, which then can be used as a contextual evaluation of resource conditions. Responses are typically categorized as being unacceptable/acceptable, based on PAOT, which is an expression of carrying capacity. The use of social carrying capacity has been a common measurement in protected area management research (Manning et al., 2000). Social carrying capacity is based on the theory of biological carrying capacity, in which an ecosystem supports a maximum use by a species before resources become negatively affected (Wager, 1964). This concept was adapted to an outdoor recreational setting, where an area can only support a finite number of visitors before the resources (experiential/ecological) begin to degrade.

The concept of social carrying capacity provides a theoretical and empirical base for crowding research (Graefe, Kuss, & Vaske, 1984). Early studies done on social carrying capacity point to a level of visitor use that, if exceeded, will begin to degrade the quality, of not only the recreational experience, but the physical environment in which the recreation activity takes place (Manning et al., 2000). This experiential limit can be closely tied to the idea of norms. Norms, or normative behavior, refer to the human social construct of what is right and wrong and what constitutes acceptable behaviors or conditions (Cialdini, Kallgren, & Reno, 1991). As such, crowding can be analyzed within the framework of normative theory. Normative theory speaks to the theoretical construct used in sociology and social science that

explains how people come to developing what is inherently “normal behavior”. The theory is divided into three parts; 1) the variables that activate norms and bring them into focus, 2) how norms influence behavior, and 3) the formulation of standards (Manning, 2007).

In previous crowding studies, a common finding is the monotonic, or trending, relationship between PAOT and acceptability (Altman, 1975; Nielsen & Shelby, 1977; Anderson, D.H., 1984; Shelby, Vaske, & Heberlein, 1989; Manning & Valliere, 2001; Vaske & Shelby, 2008), in other words, as PAOT rises, visitor acceptability decreases. This relationship is demonstrated in the shape of a social norm curve (Figure 1). A social norm curve is a representative model where the acceptability level of a variable is represented on the y-axis and the range of the indicator is displayed on the x-axis (Price, Blacketer, Brownlee, 2018). The top of the curve represents the optimal conditions or the most accepted level of the indicator variable. The range from the highest point on the curve to where the curve crossed zero is considered to be the range of acceptability where the point of intersection is considered to be the threshold or the minimal accepted condition (Manning, 1999).

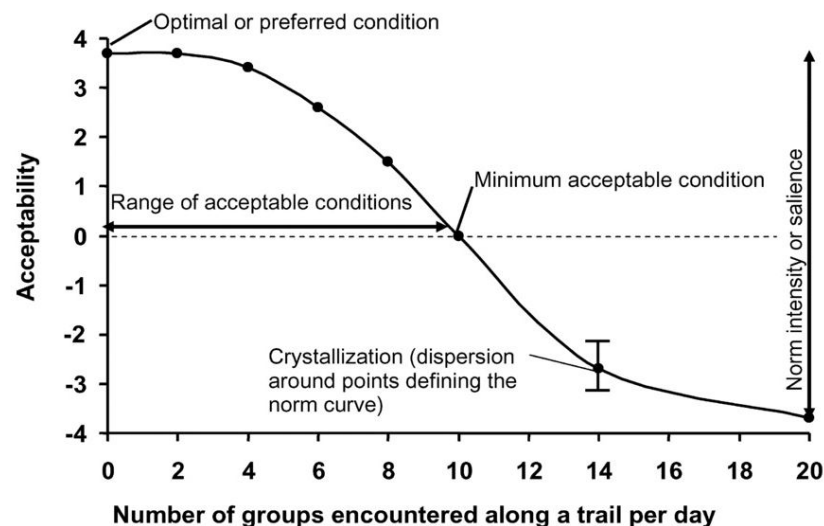


Figure 1 Example of a hypothetical social norm curve (Manning, 1999)

Norms in Visual-Based Methodology

Based on the normative nature of crowding, researchers are able to utilize social norm curves to illustrate the acceptability of PAOT at different levels for a specific location. Social norm curves can then be used to construct a socially acceptable carrying capacity for the particular area of study. The effectiveness of visual-based methods to measure PAOT thresholds makes it a vital tool to determine crowding norms for protected areas.

Gibson et al. (2014) states that “when using visual-based methods to determine crowding norms for recreation, it is beneficial if the respondents have well-formed norms about the recreation setting conditions depicted.” (p.187). The level of visitors’ normative agreement is critical for researchers to understand, because if the respondents are not familiar with context and/or scenarios depicted in the photographic panels, their responses may not be reliable or valid (Krymkowski, Manning, & Valliere, 2009). Ideally, respondents’ norms are crystalized or have reached a point of agreement about their ideal conditions (Jackson, 1965; Krymkowski, et al. 2009; Shelby et al., 1989). Norm crystallization refers to the amount of agreement a population has on a set norm (Manning, 2007). Crystallization can be measured by using interquartile ranges, standard deviations, or the Potential for Conflict Index (Manfredo, Vaske, & Teel, 2003). By choosing respondents that have crystalized norms for the site in question, researchers can explore other variables that may influence perceptions of crowding. The best way to ensure that respondents are familiar with a particular site is to conduct visitor norm studies in a field setting.

Visitor’s Perceptions of Crowding and Potential for Bias

There are several variables that can influence a visitor’s perception of crowding, such as motivations, expectations, and experience. Ditton, Fedler, and Graefe (1983) found Buffalo

National River visitors were more sensitive towards crowding based on their recreational motivations. In other studies, expectations played a significant role. For example, visitors felt crowded because they did not expect to encounter that amount of people (Schreyer & Roggenbuck, 1978; Ditton et al., 1983; Shelby, Heberlein, Vaske, & Alfano, 1983; Andereck & Becker, 1993; Zehrer & Raich, 2016; Luque-Gil, Gómez-Moreno, & Peláez-Fernández, 2018).

Not only do personal biases cause perceptions of crowding to differ, but actions of other visitors have also been shown to affect crowding perceptions (Manning et al., 2000). Variables such as group type, group size, behavior, and how alike the group is perceived to be can account for a visitor's perceived level of crowding. Again, it is critical for the continuation of methodological refinement in order to better understand the visitors of protected areas and their perceptions of crowding.

In order to empirically measure the perception of crowding, many studies have adopted the use of visual-based methods (Manning et al., 2000; Harper, 2002; Manning & Freimund, 2004; Manning, 2009; Gilbert et al., 2014). This method has been found to be effective in understanding visitor's perception of their level of acceptability related to the amount of use in a recreational setting (i.e. crowding) (Freimund, Vaske, Donnelly, & Miller, 2002; Hall & Roggenbuck, 2002; Krymkowski et al., 2009; Manning, 2011, Manning & Freimund, 2004; Manning, Lime, Freimund, & Pitt, 1996; Manning, Valliere, & Jacobi, 1996; Manning, Valliere, & Wang, 1999; Needham, Wood, & Rollins, 2004; Needham & Rollins, 2005; Needham, Szuster, & Bell, 2011). Photographs allow for the expression of ideas or conditions that subjects may have difficulty expressing without the use of visual aids, and specific targeting of PAOT.

Visual-based method studies utilize a series of photographs (usually 5 or 6) that can depict varying degrees of changes PAOT. These photographs are then presented to visitors

either all at once (i.e. photo panel) or one at a time (i.e. photo binder) with increasing PAOT. Gibson et al. (2014) believe that “...presenting all photographs...in the same order, may be aspects of the visual method that bias acceptability ratings and lead to the conclusion there is a stronger relationship between PAOT and acceptability than actually exists.” (p.188). If this is true, the results from previous literature may come into question. Therefore, it is important for current research to begin to address the potential of order effects.

Order Effects

Order effects have been studied and investigated for many years in the field of survey methods and design (Cronbach, 1946; Rokeach, 1973; Schwarz, Hippler, Deutsch, & Strack, 1985). The idea of starting point bias was developed by dichotomous choice studies and applied to visual-based research in the protected area management field (Manning, Lawson, Laven, & Valliere, 2002). In Manning et al. (2002), the authors used reverse order photograph presentation to determine if order effects affected acceptability ratings. That study found few differences between acceptability ratings when photographs were in increasing or decreasing sequential order and that presentation order had little effect on visitor acceptance. These results were developed by analyzing descriptive data, but was challenged by Gibson et al (2014). Gibson et al. (2014) propose the relationship between PAOT and acceptability is more complex than previously thought. Although Manning et al. (2002) did not investigate non-sequential presentation orders, Gibson et al. (2014), in response, further investigated how multiple non-sequential orders affect visitor acceptability ratings for PAOT.

In Response

Gibson et al. (2014) used visual-based methods to determine order and range effects of PAOT, in a lab setting (i.e. not at the location depicted in the photographs). The study objective was to discover if the current visual-based methods, that identify the visitors' thresholds for unacceptable level of crowding, can be influenced by presentation order of photographs or presentation range of PAOT within each photograph (Gibson et al., 2014). For the purpose of this study, only order effect was examined. External logistical constraints prevented the exploration of range effects in this study.

This study addressed each of the methodological improvement recommendations suggested by Gibson et al (2014). The first recommendation is the use of non-sequential presentation of photographs. This study aimed to further explore whether results of visual-based studies are truly reflective of the visitor's normative preference or if it reflects a possible faulty methodology. This study also adopted the recommendation of using a broad range of PAOT in photo-panels. The ranges developed for this study were created to not only reflect actual use conditions, but management objectives of Buffalo National River managers. The final recommendation addressed by this study was to continue the use of more robust analysis strategies analyzing the relationship between PAOT and acceptability. This study analyzed data using the same statistical approach used by Gibson et al. (2014) (ANOVA, non-monotonic, interquartile ranges, and linear modeling).

Gibson et al. (2014) state the "replication of (visual-based method studies) under field conditions may add credence to their conclusions, because first-hand knowledge of this site depicted in the study may drastically alter the results." (p. 202). Gibson et al. (2014) found that although previous visual-based method studies could have produced different results if photo-

order and non-sequential representations would have been used, the artificiality of the lab setting may have influenced results. Therefore, one objective of this study was to respond to the Gibson et al. (2014) study and replicate the order effects portion in a field setting (i.e., at the location depicted in the photographs). Thus, the primary research question for this study was what effect does photograph presentation order have on photograph acceptability rating (as determined by visitors) in a field setting.

Methods

Site Description

Located in northern Arkansas, the Buffalo National River (BUFF) was the first designated National River in the United States and is managed by the National Park Service (NPS). In 2017, the park had a total visitation of 1,471,330 visitors (National Park Service, 2018). Established in 1972, the park spans 135 miles from the Ponca Upper Wilderness to the Lower Wilderness where the Buffalo River meets with the White River. The NPS allows visitors to float the river, and hike or horseback ride the more than 100 miles of designated trails. This study focused on a section of BUFF called Lost Valley and the Lost Valley Trail (Figure 2). The trail is 2.4 miles round trip, and the valley has numerous attraction points including Cob Cave, Eden Falls, and Falls Cave (National Park Service, 2017). Visitors spend an average of two to four hours hiking and exploring within Lost Valley (Brownlee, Sharp, Peterson, Cribbs, 2018). Categorized as an easy to moderate trail, the Lost Valley hiking trail (Figure 3) is one of the most popular hikes within BUFF and represents high potential for crowding and conflict.

Participants

Participants for this study were chosen through sampling stratification procedures. Participants were at least 18 years old and were visiting the Lost Valley location. Data were collected on thirteen separate trips to the location with a total of 309 participants and a response rate of 86%. Data collections occurred from August 2016 to June 2017. Visitors were intercepted at the Lost Valley Trailhead upon completion of their recreational activities. By surveying visitors after they had used the resource, participants had some form of experience and familiarity at the Lost Valley site. By surveying participants at the actual location, as opposed to a lab setting (i.e., off-site), respondents should be more capable of contextualizing the photographic images, and thus provide results that are more contextually relevant. Gibson et al. (2014) propose, this approach may lend itself to gathering more accurate normative data.

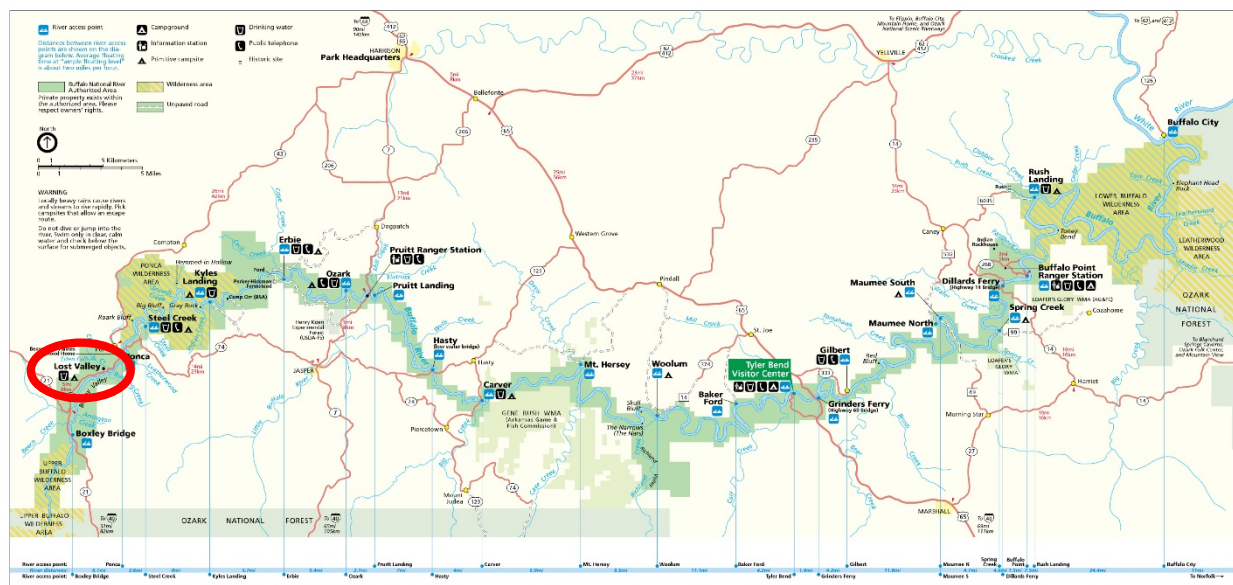


Figure 2 Map of BUFF and Survey Location (National Park Service, 2017)

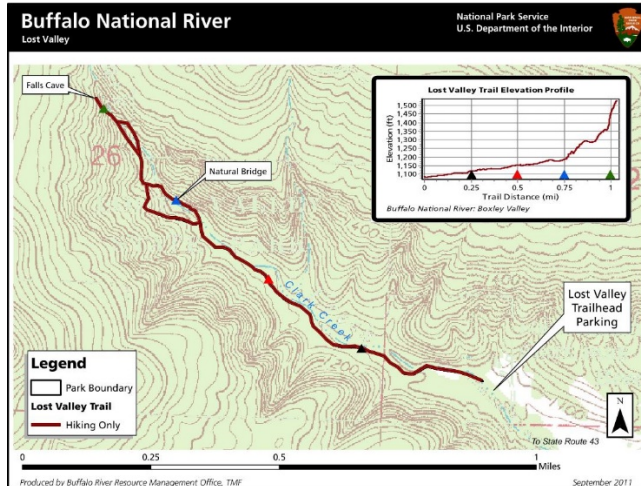


Figure 3 Map of Lost Valley Trail (National Park Service, 2017)

Research Design

Data were collected using a combination of surveys and photographs consistent with previous visual-based method studies (Stankey, 1980; Cooke, 1994; Manning, 2000; Manning & Valliere, 2001; Manning & Freimund, 2004; Gibson et.al.,2014). Participants were given quantitative survey that contained questions related to a series of five digitally edited photos and asked to rate each photograph based on a nine-point Likert scale from -4 (very unacceptable) to +4 (very acceptable). Participants were also asked the following stated preference questions to identify 1) conditions where they believe park managers should take action to improve the area, 2) conditions that are so unacceptable that you would no longer use the area, and 3) highest level of use that you believe park managers should allow. Total survey response time was 10 – 15 minutes.

Photograph Order Effect

A set of 10 photo-binders were constructed with five digitally edited photos in each binder (Gibson et al., 2014) which represented a range of PAOT conditions (Table 1). The photo

binders consisted of PAOT conditions for Eden Falls, which is located on the Lost Valley trail. This site was chosen because park managers have identified it is a known location of congestion, user conflicts, and crowding may take place.

The photographs represented a range of conditions from solitude (zero visitors) to saturated (72 visitors) (Figure 4). The photos for the binders were developed and manipulated for the number of people based on best practices for this method (Manning et al., 1996; Manning et al., 1999; Krymkowski et al., 1999; Gibson et al., 2014) Participants received photo-binders that were either sequential from unsaturated PAOT (zero people) to saturated PAOT or non-sequential (Table 2). Participants had the ability to view each photograph as long and as many time as they chose.

Analysis

Data were analyzed using SPSS version 24 statistical software. The data were summarized and displayed using standard visual-based method procedures used by other studies (Manning, 2007; Gibson et al., 2014). Previous studies have reported examining data by only using frequencies and means to identify the relationship between PAOT and acceptability (Manning, 2007).

This study, however, wanted to further examine the data (as suggested by Gibson et al. 2014) with more statistically robust tests than just the conventional ANOVA tests and the reporting of descriptive statistics. Researchers also utilized nonmonotonic relationship comparisons, interquartile ranges, and linear modeling to determine the strength of normative assumptions.

Table 1 Eden Falls PAOT Photograph Ranges

Photo Number	PAOT
1	0
2	18
3	36
4	54
5	72

Table 2 Order Number and Photograph Presentation Order

Order Number	Photo presentation order
1	1, 2, 3, 4, 5
2	4, 1, 3, 5, 2
3	2, 5, 4, 1, 3
4	1, 3, 5, 2, 4
5	3, 5, 1, 4, 2
6	5, 2, 4, 3, 1

Figure 4 Digitally Edited Photographs of Eden Falls on the Lost Valley Trail in Buffalo National River Used to Test PAOT Acceptability



Photo 1 (0 PAOT)



Photo 2 (18 PAOT)



Photo 3 (36 PAOT)



Photo 4 (54 PAOT)



Photo 5 (72 PAOT)

Results

The 309 participants were randomly given one of ten photograph presentation order binders. Binders 1 through 5 contained sequential photograph presentation orders (Order 1). A total of 147 (48%) participants received sequential photograph presentation orders. The remaining 162 (52%) participants received Binders 6 through 10 which contained non-sequential photograph presentation order (Orders 2-6). Each of the non-sequential orders had anywhere from 31 to 36 participants where Order 2 received 36, Order 3 had 33, and Orders 4-6 had 31 participants. Mean age for participants was 38 years ($SD = 16.1$). Gender distribution was almost equal with 155 identifying as male and 154 identifying as female. Figure 5 shows that a vast majority of visitors to BUFF were from within 3-4 hours of that park with 27% of visitors reporting that it was their first time at the park and 73% of respondents reporting having some level of annual visitation (Brownlee, Sharp, Peterson, Cribbs, 2018).

ANOVA

Table 3 displays a summary of means or acceptability for each of the photographs by presentation order. Based on the results of Table 3, there were no significant effects of presentation order on photograph acceptability.

Nonmonotonic Values

Nonmonotonic values refer to the values that do not fit a set or defined trend (Gibson et al., 2014). The trend in previous studies is that as PAOT increases, acceptability rating decreases (Vaske & Donnelly, 2002). The purpose of analyzing nonmonotonic values is to



Figure 5 Map of the United States of zip codes reported by survey participants (Brownlee, Sharp, Peterson, Cribbs, 2018)

Table 3 Summary of Means and ANOVA Results of Acceptability Ratings for Each Photo Order by Photo Number

Order	Photo 1	Photo 2	Photo 3	Photo 4	Photo 5
1	3.21	1.71	0.3	-0.62	-1.34
2	2.69	1.29	-0.4	-1.03	-1.67
3	3.09	1.61	0.18	-0.33	-1.15
4	2.94	1.16	0.29	-0.13	-0.35
5	2.87	1.41	-0.26	-0.81	-1.47
6	2.97	0.65	-0.3	-0.74	-0.81
F	0.605	1.484	0.873	0.572	1.234
η^2	0.01	0.024	0.015	0.009	0.021
df	5	5	5	5	5
Sig.	0.696	0.195	0.5	0.722	0.293

Baseline p-value = 0.05

Each photograph was rated on a scale from +4 (very acceptable) to -4(very unacceptable)

identify to what extent different presentation orders supported the expected relationship between PAOT and acceptability (Gibson et al., 2014).

Figure 6 shows the plotted raw data comparing photograph number (PAOT increases with each photograph) to acceptability with each individual participant's acceptability curve. It was suggested by Gibson et al. (2014) that it is important to view the raw data to determine if there are any general trends that may reveal themselves. By plotting all 309 individual acceptability curves on the same graph, it is difficult to identify any trends that may be present within the sample population between PAOT and acceptability rating or any nonmonotonic values that may exist. In order to identify which individuals had nonmonotonic acceptability curves, each of the responses had to be assessed individually. Through visual inspection, 21 nonmonotonic values were discovered. Six of these values were found within the sequential photograph presentation order and 15 were found in the non-sequential photograph presentation orders.

In order to quantify nonmonotonic values, researchers included the Mahalanobis distance as another indicator of nonmonotonic values. Mahalanobis distance is the measurement or distance of an individual's acceptability curve from the rest of the distribution. At a confidence level of .001 (Mahalanobis distance greater than 20.52), a total of 11 nonmonotonic values were found, one in the sequential photograph presentation order and ten in non-sequential order ($\chi^2(2360) = 2368.0, p = 0.45$).

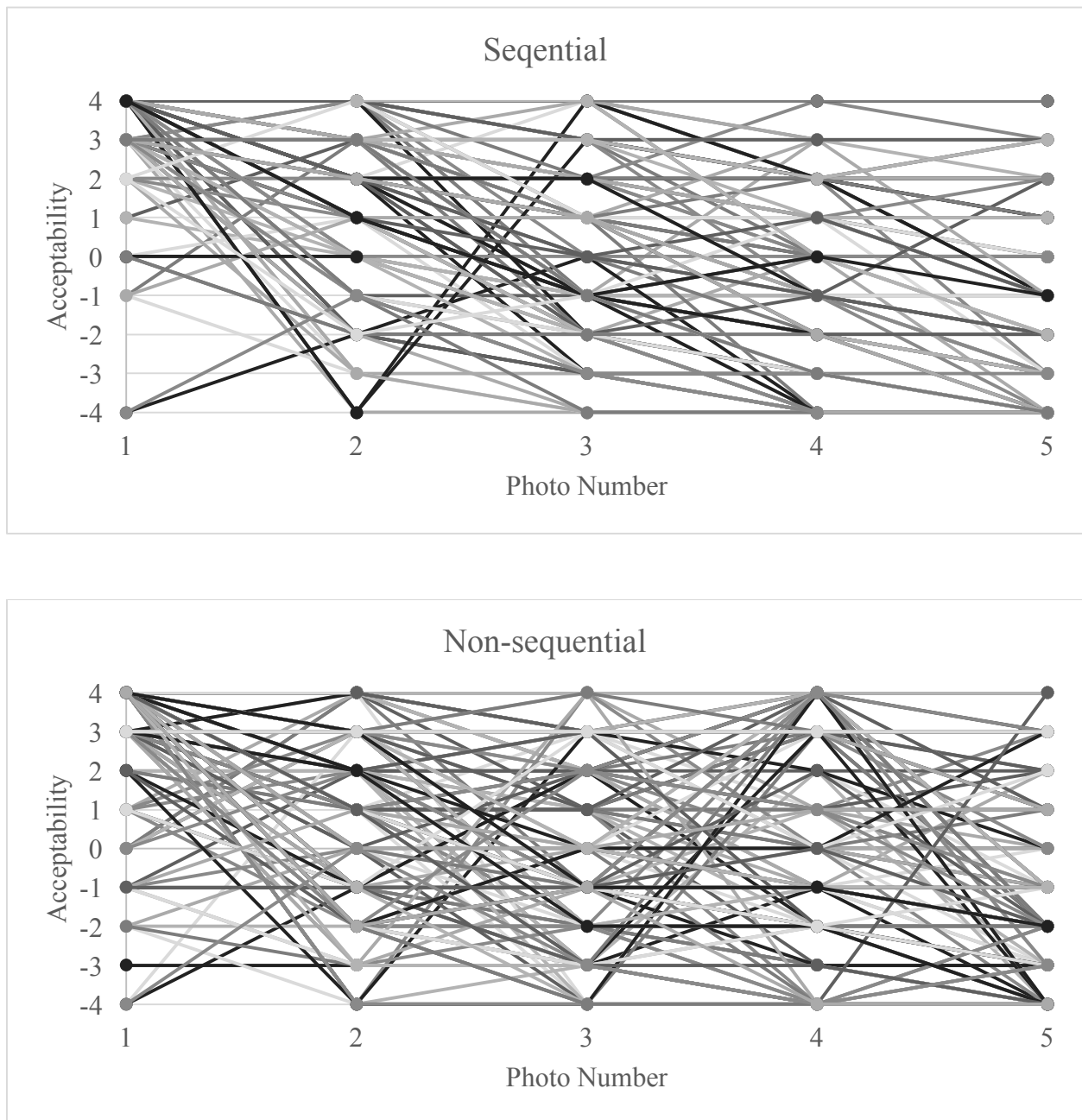


Figure 6 Summary of individual's acceptability curves

Interquartile Ranges

In order to gather accurate information about the social norms of any specific location, it is critical that the group that is being tested has some level of norm crystallization (Krymkowski et al., 2009). Like Gibson et al. (2014), the authors of this study chose to investigate the

interquartile ranges (IQR) (the range between the 25th and 75th percentile) of photograph acceptability for PAOT by order number in order to measure for norm crystallization. Table 4 displays the summary of the IQR investigation and suggests that there could be the possibility of order effects amongst sequential and non-sequential photograph presentation orders for Photograph 2 and 4. The others do not show any evidence that order effect had any influence on responses.

Table 4 Summary of Interquartile Ranges for Each Photograph Order by Photograph Number (Photo Order 1 = Sequential and Photo Order 2-6 = Non-sequential)

Photo Order	Photo 1	Photo 2	Photo 3	Photo 4	Photo 5
1	1	2.25	4	5	4
2	1	2	3	4	3.75
3	1	2.5	4	4	4
4	1	4	5	6	5
5	1	3.5	4	4	3
6	1	4	4	3	5

Linear Models

A Log₋₁₀ of PAOT was used for this analysis in order to maintain the assumption that the relationship between PAOT and acceptability is not linear (similar to Gibson et al. (2014)). This assumption comes from the idea that it is easier to observe the changes in photographs when PAOT is lower compared to when PAOT is higher (Manning, Lime, Freimund, & Pitt, 1996). As in the Gibson et al. (2014) study, the limitation of not being able to use the photograph with PAOT set to 0 applies (as the Log₋₁₀ of 0 is undefined). However, this may not have been that

significant as median acceptability for Photograph 1 (PAOT of 0) had a median acceptability of +4.

Table 5 Summary of Linear Models for Order Effect Analysis

	Variable(s)	Results
Order effect		
Model 1	Log ₋₁₀ of PAOT	$F(1, 1206) = 210.1, p < 0.001$, adjusted $R^2 = 0.15$
Model 2	Log ₋₁₀ of PAOT; Photo Order	$F(5, 1184) = 1.79, p > 0.05$, adjusted $R^2 = 0.15$

Order Effect Model 1- Photograph Acceptability and Photograph Number. Model 1 utilized log₁₀ of PAOT to predict photograph acceptability (Table 5). This one-way ANOVA investigated the differences amongst acceptability of all PAOT levels, rather than differences in mean acceptability of one PAOT. Model 1 significantly predict photograph acceptability ratings ($F(1, 1206) = 210.1, p < 0.001$) where log₁₀ of PAOT predicted 15% of variance in acceptability (using adjusted R^2).

Order Effect Model 2- Photograph Acceptability and Photograph Number with Photo Order. Model 2 used photograph presentation order to predict photograph acceptability ratings while controlling for log₁₀ PAOT (Table 5). This two-way ANOVA analyzed the differences in the main effect of photograph presentation order. The results indicated that photograph order did not significantly predict photograph acceptability ratings ($F(5, 1184) = 1.79, p > 0.05$).

Figure 7 displays the coefficients for each photograph by presentation order displayed as acceptability curves. Even though Model 2 was not statistically significant, it is still important to see that the general trend of PAOT is still present across all photograph presentation orders.

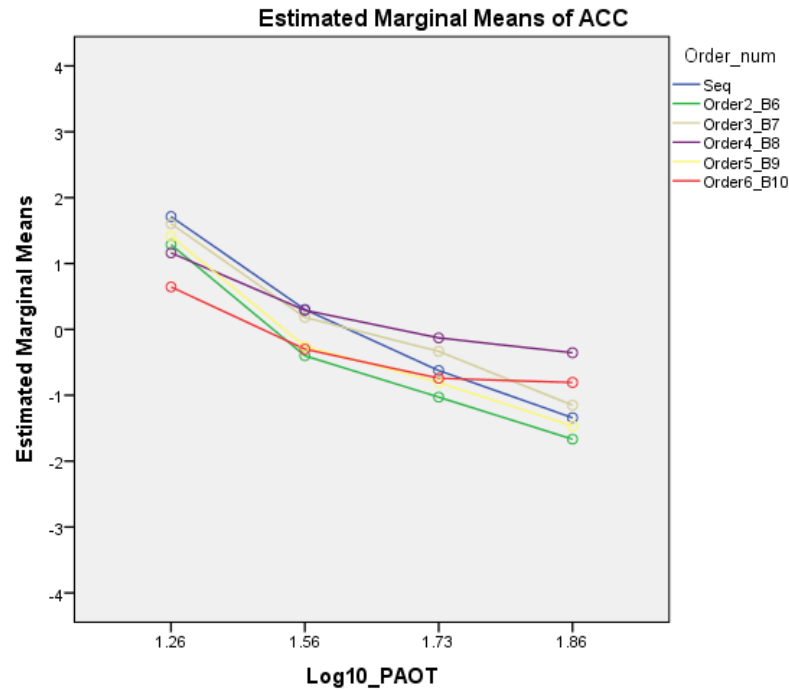


Figure 7 Plot of the coefficients as acceptability curves

Discussion

There are two major factors that all visual-based studies are dependent on: (1) that the monotonic relationship between PAOT and acceptability is inverse in nature; and (2) that the participants of the study have crystalized norms about the crowding that may occur in the protected area of study (Manning, 2007; Vaske, & Shelby, 2008; Gibson et al., 2014). Researchers were able to account for assumption two by conducting this study in a field setting where the average participant has over 6 years of experience at the research location (thus displaying their familiarity with the location) (Brownlee et al., 2018). Contrary to the findings in a lab study done by Gibson et al. (2014), the results of this study found little to no significant order effects by photograph presentation order on visitor's acceptability rating of PAOT.

Nonmonotonic Values

A nonmonotonic value is considered to be any result that differs from the expected trend or result (i.e. as PAOT increases, acceptability decreases). It was found that only 4% (6 out of 147) of individual's acceptability curves who received photographs in sequential order (Order 1) were found to be nonmonotonic and 9% (15 out of 162) of individual's acceptability curves who received photographs in non-sequential order (Orders 2-6) were found to be nonmonotonic. Percentages for nonmonotonic curves evaluated according to Mahalanobis distance decrease further. Only 0.6% of individuals who received sequential photograph presentation orders and 6% of individuals who received non-sequential photograph presentation orders were considered to be nonmonotonic.

Based on these results, researchers can conclude that photograph presentation order had an effect on individual's acceptability of PAOT and that at most (using the visually identified values), 13% of all individuals did not follow the monotonic, normative trend that has been observed by a large body of visual-based research (Freimund et al., 2002; Hall & Roggenbuck, 2002; Krymkowski et al., 2009; Manning, 2011; Manning & Freimund, 2004; Manning, Lime, Freimund, & Pitt, 1996; Manning, Valliere, & Jacobi, 1996; Manning et al., 1999; Needham et al., 2004; Needham & Rollins, 2005; Needham et al., 2011) while contrasting the findings found by Gibson et al. (2014) where nearly 20% of their participants did not follow the monotonic relationship. These results may also indicate that the participants of this study have had more developed, well-formed norms about the area that was depicted in the photographs when it comes to the appropriate level of PAOT at this location (as opposed to the lab setting conducted by Gibson et al. (2014)).

The results of this test raise two questions, (1) what percentage of visitors is acceptable to manage for? If 87% of visitors followed the monotonic trend, ultimately preferring less PAOT in a given area, is that an acceptable amount of people to base management decisions on?; and (2) are these results of order effect or are there other factors that are accounting for the nonmonotonic responses?

Interquartile Ranges

Interquartile ranges were used to investigate whether study participants have well-developed, crystalized norms for the level of PAOT at the study site (Krymkowski et al., 2009). The results found in Table 4 show that there was relative agreement in the acceptability of each photograph no matter the photograph presentation order except for Photo 2 and 4. While this suggests that the participants of this study poses a higher level of norm crystallization with respect to PAOT and acceptability at the research site, it indicates that there may be disagreement amongst visitors at BUFF when PAOT increases from 0 (Photo 1) to a PAOT of 18 (Photo 2).

While Gibson et al. (2014) found interquartile ranges that varied as much as three units on a 9-point scale, this study had much closer interquartile ranges amongst photograph presentation orders. For Photos 1, 3, and 5, the amount of variation in the interquartile ranges between the sequential (Order 1) and non-sequential (Orders 2-6) photograph orders never reached beyond one unit. However, in Photo 2 and 4, a variation of over one unit was found between sequential and non-sequential photograph presentation orders, specifically Orders 4-6. This suggests that this studies participants possessed more well-formed norms compared to the participants in the Gibson et al. (2014) study. At this time, it is not exactly clear as to why this disagreement is occurring, but the authors surmise that it may be attributed to either a range

effect that could be present when PAOT transitions from 0 to 18 between Photos 1 and 2, or this could be another case where photograph presentation order could have an effect on visitor's perceptions.

Linear Models

Neither of the models used in this study (Table 5) proved to be good predictors of whether photograph presentation order had any effect on PAOT and acceptability rating for Photos 2-5. Model 1 and Model 2 provided little utility in predicting the variance (15% each, respectively). While the one-way ANOVA (Model 1) did show that photograph number (PAOT) did influence the acceptability of PAOT, the two-way ANOVA (Model 2) did not show any significance that photograph presentation order influenced the acceptability ratings of various PAOT levels.

The results gathered from Figure 7 cannot confirm that photograph presentation order had an effect on the perceptions of PAOT and their associated acceptability ratings when using $\log_{10}$ of PAOT. Because Model 2 was not significant, we cannot assume that the differences in the coefficient acceptability curves is due to any form of order effect. Figure 7 does, however, display that the participants of this study possess norm crystallization and that the individual's mean acceptability curve at each photograph presentation order follows the inverse relationship of PAOT and acceptability observed in both crowding norms and normative theory studies.

Conclusions and Recommendations

Based on the results, there are clear differences between the findings of this study and the results found by Gibson et al. (2014). These differences could stem from where each of these studies were conducted. By conducting research *in situ*, participants already have a sense of the norms

at the location which is depicted within the photographs used in a visual-based study even if they are first time users. By having participants with crystalized norms, it may have limited the order effects that could have occurred within a sample that may not have as much familiarity with the research site (e.g. the lab setting used by Gibson et al 2014).

Even though the results of this study align with the findings of most other visual-based studies (Freimund et al., 2002; Hall & Roggenbuck, 2002; Krymkowski et al., 2009; Manning, 2011; Manning & Freimund, 2004; Manning, Lime, Freimund, & Pitt, 1996; Manning, Valliere, & Jacobi, 1996; Manning et al., 1999; Needham et al., 2004; Needham & Rollins, 2005; Needham et al., 2011), and contrasts both the findings of Gibson et al. (2014) and the hypothesis made by the authors of this study, more research into both order effects and range effects is recommended to ensure that researchers collect the most accurate information for protected area managers. It is our prerogative as researchers to develop the best practices for visual-based methods to provide the most accurate data possible so that protected area managers may make the best-informed management decisions.

Limitations

Due to the nature of conducting this study in a field setting, there are a few methodological limitations that may affect the validity of the comparisons that are made between this study and the one done by Gibson et al. (2014). In the Gibson et al. (2014) study, participants were only allowed to view each photograph for about 20 second and then after viewing all five photographs, asked to rate the acceptability of each photograph in terms of PAOT. In this study, participants were allowed to view each photograph as long and as often as they wanted while completing the survey.

Chapter 3 -

Reflection

Introduction

The objective of this chapter is to reflect on the process of completing a research project, writing the associated thesis, and reflect on my own graduate school experience as a whole. This section is meant to be an open forum to discuss these successes and challenges that I have experienced throughout my time at Kansas State University and to offer advice to those students that may follow in my footsteps in the years to come.

Successes and Challenges in the Field

My thesis project was a comprehensive analysis of visitor use within Buffalo National River, Arkansas. This was a yearlong project that incorporated a wide variety of techniques, including: the placement, maintenance, and monitoring of human behavior cameras, trail counters, and visitor GPS mapping units along with the collection of survey data. As the lead project manager, I led the planning, organizing, and managing of all data collection during seven data collection periods. Along with the technical management that was necessary for the success of these data collections, I also managed the data collection teams. My responsibilities included the preparation and gathering of equipment, the organization of travel to the research sites, and the creation of daily data collection schedules during field work.

One skill I have developed the most in the almost two years at Kansas State is my ability to plan, organize, and oversee a project. As any good researcher knows, something always goes wrong in the field. I made a concerted effort to do everything I could to prepare everyday,

knowing that I could expect the unexpected during field work. By doing so, if everything does not go as planned, my team and I were able to be as prepared as possible and were able to problem solve our way through any situation.

One of the biggest struggles for me in the field was being able to trust that everyone was doing their assigned job and that everyone was safe. Buffalo National River is a linear park that spans approximately 135 miles from one end to the other. The comprehensive nature of the project meant that each day, the research team would have to split up to administer surveys and monitor field equipment throughout the park. Having limited to no contact with each other throughout the day, I had to trust that my team was doing their best work. I had to trust that they would be able to overcome any obstacles they may face throughout the day, whether it be any difficult interactions with visitors while administering surveys or any troubleshooting that may be necessary with faulty equipment.

Safety was also a major concern for me. I was told by a professor that driving was going to be the most dangerous activity we would experience while in the field. Knowing that I was responsible for the safety of the entire research team, I was always concerned and anxious when parts of the group were late making it to a checkpoint at the end of each day. I knew the odds of something going wrong were slim, but not having the ability to check in and call them gave me a lot of anxiety.

As slim as those odds may have been, I had a few brushes with unfortunate luck. While in the field, the vehicle I had experienced not one, but two flat tires between two different research trips. The first flat that occurred happened during the October collection period where we discovered a nail had been lodged in the tread of the tire and was slowly releasing pressure. In order to make it to the auto-shop, we had to stop at every gas station on the way to refill the

tire before it would go completely flat. The second time this happened, we hit a large pothole which ripped open the tire in a few locations causing it to completely lose pressure. Thankfully, we were able to change the tire on the spot and only go two more days in the field with a “doughnut”.

Overall, I feel that the successes of the project far outweigh the failures or mishaps we experienced along the way. I feel fortunate that I had such a strong cast of graduate and undergraduate students from both Kansas State University and University of Utah that helped me during the field data collection process. I am also relieved that most of the misfortunes happened to me and not the rest of my team because if it were to have happened to them, I know I would have made the situation seem much more dire than it really was.

Advice

Coming to Kansas State University has been a life-changing experience for me. The whole process of completing a Master’s program has taught me a lot about myself and how to become more professional when it comes to my work.

My biggest piece of advice to anyone who is interested in this line of work and education is to not be afraid of failure or being disheartened when something does go wrong. A master Jedi once said, “The greatest teacher, failure is.” (Kennedy, Bergman, & Johnson, 2017). In field research, it’s not if something will go wrong, but when it will go wrong, and it is critical for you not to get discouraged. I sometimes think of field work as more of an art than a science. As structured as it may seem on paper, projects are much freer flowing and each data collection has its own ebb and flow. It is important to remind yourself that when things do go wrong, that you have made it this far in the profession for a reason and that you have the ability to work through

whatever obstacles that may arise. Do not get disheartened when someone says no to taking your survey or when a piece of field equipment begins to malfunction. Learn from each of those small failures and strive to create a better approach or learn how to troubleshoot so the next time another piece of equipment malfunctions, you know how to fix it.

The ability to trust the process and to acknowledge that failures are a part of that process is the biggest lesson I have learned while at Kansas State University. Learning from each misstep and preparing for the next one is not only a valuable lesson to learn in science, but in life as well.

References

- Altman, I. (1975). *The Environment and Social Behavior: Privacy, Personal Space, Territory, Crowding*. Monterey, CA: Brooks/Cole Publishing Company
- Andereck, K. L., & Becker, R. H. (1993). Perceptions of carry-over crowding in recreation environments. *Leisure Sciences*, 15(1), 25-35.
- Anderson, D. H. (1984). Displacement: One consequence of not meeting people's needs. *USDA Forest Service general technical report NE-United States, Northeastern Forest Experiment Station*.
- Brownlee, M.T.J., Sharp, R.L., Peterson, B. & Cribbs, T. (2018). Visitor use and associated thresholds at Buffalo National River. Report delivered to management staff at Buffalo National River, Department of Interior, National Park Service. In fulfillment of agreement P16AC00194. Harrison, AR.
- Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. *Advances in experimental social psychology*, 24, 201-234.
- Conlon, K. E. (2014). *Investigating the Relationship between Trail Conditions and Visitor Behavior Using the Camera Trap Method*. (Unpublished master's thesis). North Carolina State University, Raleigh, North Carolina
- Cronbach, L. J. (1946). Response sets and test validity. *Educational and psychological measurement*, 6(4), 475-494.
- Daniel, T. C., & Boster, R. S. (1976). Measuring landscape esthetics: the scenic beauty estimation method. *Res. Pap. RM-RP-167. US Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station*. 66 p., 167.
- Ditton, R. B., Fedler, A. J., & Graefe, A. R. (1983). Factors contributing to perceptions of recreational crowding. *Leisure Sciences*, 5(4), 273-288.
- Freimund, W. A., Vaske, J. J., Donnelly, M. P., & Miller, T. A. (2002). Using video surveys to assess dispersed backcountry visitors' norms. *Leisure Sciences*, 24(3-4), 349-362.
- Gibson, A. W., Newman, P., Lawson, S., Fristrup, K., Benfield, J. A., Bell, P. A., & Nurse, G. A. (2014). Photograph presentation order and range effects in visual-based outdoor recreation research. *Leisure Sciences*, 36(2), 183-205.
- Graefe, A. R., Kuss, F. R., & Vaske, J. J. (1990). *Visitor impact management. 2. The planning framework* (Vol. 2). Washington, DC: National Parks and Conservation Association.

- Graefe, A. R., Vaske, J. J., & Kuss, F. R. (1984). Social carrying capacity: An integration and synthesis of twenty years of research. *Leisure Sciences*, 6(4), 395-431.
- Hall, T. E., & Roggenbuck, J. W. (2002). Response format effects in questions about norms: Implications for the reliability and validity of the normative approach. *Leisure Sciences*, 24, 325-337.
- Harper, D. (2002). Talking about pictures: A case for photo elicitation. *Visual studies*, 17(1), 13-26.
- Hof, M., & Lime, D. W. (1997). Visitor experience and resource protection framework in the national park system: Rationale, current status, and future direction. *United States Department of Agriculture Forest Service General Technical Report INT*, 29-36
- Interagency Visitor Use Management Council (2017). IVUMC-VUM Framework. Retrieved from *Visitorusemanagement.nps.gov*
- Jackson, J. M. (1965). Structural characteristics of norms. *Current studies in social psychology*, 301-309.
- Kennedy, K., Bergman, R., & Johnson, R. (2017) *Star Wars VIII: The Last Jedi* [Motion Picture]. United States: Walt Disney Studios Motion Pictures
- Krymkowski, D. H., Manning, R. E., & Valliere, W. A. (2009). Norm crystallization: Measurement and comparative analysis. *Leisure Sciences*, 31(5), 403-416.
- Lapenta, F. (2011). Some theoretical and methodological views on photo-elicitation. *The SAGE handbook of visual research methods*, 201-213.
- Luque-Gil, A. M., Gómez-Moreno, M. L., & Peláez-Fernández, M. A. (2018). Starting to enjoy nature in Mediterranean mountains: Crowding perception and satisfaction. *Tourism Management Perspectives*, 25, 93-103.
- Manfredo, M. J., Vaske, J. and Teel, T. 2003. The potential for conflict index: A graphic approach to practical significance of human dimensions research. *Human Dimensions of Wildlife*, 8: 219-228.
- Manning, R. 1999. *Studies in outdoor recreation: Search and research for satisfaction*, 2nd ed, Corvallis: Oregon State University Press.
- Manning, R. E. (2007). *Parks and carrying capacity: Commons without tragedy*. Island Press.
- Manning, R. E. (Ed.). (2009). *Parks and people: Managing outdoor recreation at Acadia National Park*. UPNE.

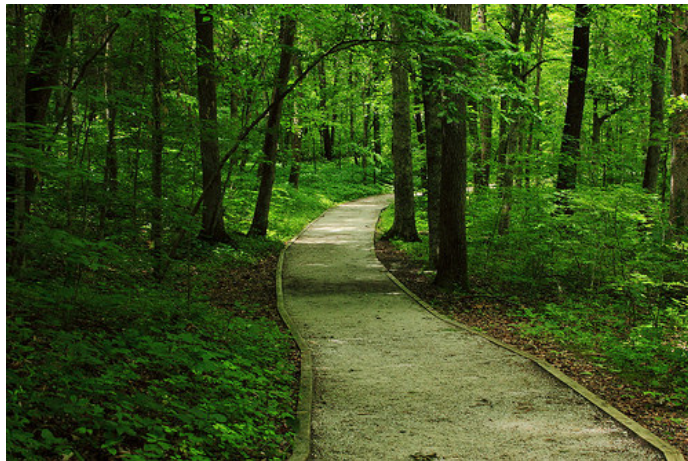
- Manning, R. E., & Freimund, W. A. (2004). Use of visual research methods to measure standards of quality for parks and outdoor recreation. *Journal of leisure research*, 36(4), 557.
- Manning, R.E., Lime, D.W., Freimund, W.A., & Pitt, D.G. (1996). Crowding norms at front country sites: A visual approach to setting standards of quality. *Leisure Sciences*, 18, 39–59.
- Manning, R. E., & Valliere, W. A. (2001). Coping in outdoor recreation: Causes and consequences of crowding and conflict among community residents. *Journal of Leisure Research*, 33(4), 410.
- Manning, R.E., Valliere, W.A., & Jacobi, C. (1996). Crowding norms for the carriage roads of Acadia National Park: Alternative measurement approaches. Proceedings of the 1996 Northeastern Recreation Research Symposium, USDA Forest Service General Technical Report Northeastern Forest Experimental Station, 232, 139–145.
- Manning, R., Valliere, W., Minter, B., Wang, B., & Jacobi, C. (2000). Crowding in parks and outdoor recreation: A theoretical, empirical, and managerial analysis. *Journal of Park and Recreation Administration*, 18(4), 57-72.
- Manning, R. E., Valliere, W. A., & Wang, B. (1999). Crowding norms: Alternative measurement approaches. *Leisure Science*, 21(2), 97–115.
- National Park Service Visitor Use Statistics. (2018). Retrieved March 19, 2018, from <https://irma.nps.gov/Stats/Reports/National>
- Needham, M.D., & Rollins, R.B. (2005). Interest group standards for recreation and tourism impacts at ski areas in the summer. *Tourism Management*, 26(1), 1–13.
- Needham, M. D., Szuster, B. W., & Bell, C. M. (2011). Encounter norms, social carrying capacity indicators, and standards of quality at a marine protected area. *Ocean & Coastal Management*, 54, 633–641.
- Needham, M. D., Wood, C. J. B., & Rollins, R. B. (2004). Understanding summer visitors and their experiences at the Whistler Mountain Ski Area, Canada. *Mountain Research and Development*, 24(3), 234–242.
- Nickerson, N. P. (2016), What We Know About Crowding and Visitor Experiences. *Institute for Tourism and Recreation Research Publications*. 340.
- Nielsen, J. M., & Shelby, B. (1977). River running in the Grand Canyon: how much and what kind of use. In: Proceedings river recreation management and research symposium, USDA Forest Service. *General Technical Report, North Central Forest Experiment Station, USDA Forest Service*, (NC-28), 168-177.

- Price, S., Blacketer, M., & Brownlee, M. (2018). The influence of place attachment on campers' evaluations of ecological impacts due to recreation use. *Journal of Outdoor Recreation and Tourism*, 21, 30-38.
- Ribe, R. G. (1989). The aesthetics of forestry: what has empirical preference research taught us?. *Environmental management*, 13(1), 55-74.
- Rokeach, M. (1973). *The nature of human values*. New York, NY, US; Free press.
- Schreyer, R., & Roggenbuck, J. W. (1978). The influence of experience expectations on crowding perceptions and social-psychological carrying capacities. *Leisure Sciences*, 1(4), 373-394.
- Schwarz, N., Hippler, H. J., Deutsch, B., & Strack, F. (1985). Response scales: Effects of category range on reported behavior and comparative judgments. *Public Opinion Quarterly*, 49(3), 388-395.
- Shelby, B., Heberlein, T. A., Vaske, J. J., & Alfano, G. (1983). Expectations, preferences, and feeling crowded in recreation activities. *Leisure Sciences*, 6(1), 1-14.
- Shelby, B., Vaske, J. J., & Heberlein, T. A. (1989). Comparative analysis of crowding in multiple locations: Results from fifteen years of research. *Leisure Sciences*, 11(4), 269-291.
- Shuttleworth, S. (1980). The use of photographs as an environmental presentation medium in landscape studies. *J. Environmental Management*, 11, 61-76.
- Stankey, G. H., McCool, S. F., & Stokes, G. L. (1984). Limits of acceptable change: a new framework for managing the Bob Marshall Wilderness complex. *Western Wildlands*, 10(3), 33-37.
- United States of America. (1916). *The National Park Service Organic Act*. National Park Service.
- Vaske, J. J., & Donnelly, M. P. (2002). Generalizing the encounter--norm--crowding relationship. *Leisure Sciences*, 24(3-4), 255-269.
- Vaske, J. J., & Shelby, L. B. (2008). Crowding as a descriptive indicator and an evaluative standard: Results from 30 years of research. *Leisure Sciences*, 30(2), 111-126.
- Wagar, J. A. (1964). The carrying capacity of wild lands for recreation. *Forest Science*, 10(3), a0001-a0001.
- Zehrer, A., & Raich, F. (2016). The impact of perceived crowding on customer satisfaction. *Journal of Hospitality and Tourism Management*, 29, 88-98.

Appendix A -

Buffalo National River Visitor Survey: Lost Valley Conditions

Buffalo National River Visitor Survey Lost Valley Conditions 2016/2017



ID _____ Date _____ Location _____
Tracker _____ Field staff _____

Notes _____

SECTION 1: YOUR PAST AND CURRENT EXPERIENCE AT BUFFALO NATIONAL RIVER

1. Please tell us about your past use history at Buffalo National River. The term “outdoor recreation activities” refers to recreation-based activities at Buffalo National River (for example, fishing hiking, swimming, canoeing, kayaking, rafting, tubing, wildlife watching, etc.):
 - a. Including today, how many **days in the last month** (30 days) have you used Buffalo National River for outdoor recreation activities? _____
 - b. Including today, how many **days in the last year** (12 months) have you used Buffalo National River for outdoor recreation activities? _____
 - c. Including today, how many **years (total)** have you used Buffalo National River for outdoor recreation activities? _____
2. How many people were in your travel party during your visit today? _____
3. Below is a list of activities available at Buffalo National River. Please indicate:
 - (A) The activities that were your main reason for visiting Buffalo National River
 - (B) The activities you participated in during this visit to Buffalo National River
 - (C) The activities you participated in during the past twelve months at Buffalo National River
 - (D) The location of the activities you participated in at Buffalo National River

	(A) Main reason for visiting (Check <u>only one</u>)	(B) Participated in on this visit (Check all that apply)	(C) Participated in during the <u>PAST 12</u> <u>MONTHS</u> (Check all that apply) <i>Please list location of activity in column D</i>	(D) Location of activity
Riding	Horseback ☐	☐	☐	
	Hiking ☐	☐	☐	
	Camping ☐	☐	☐	
observation	Nature/wildlife ☐	☐	☐	
	Canoeing ☐	☐	☐	
	Kayaking ☐	☐	☐	
	Tubing ☐	☐	☐	
Sites	Visit Historic ☐	☐	☐	
	Other Specify: ☐	☐	☐	

SECTION 2: YOUR OPINIONS ABOUT BUFFALO NATIONAL RIVER

4. Using the scale below, please rate the level of crowding you experienced at Buffalo National River today. Please circle the number that best matches your response:

Not Crowded
Moderately Crowded
Extremely Crowded

1
2
3
4
5
6
7
8
9

5. Please rate each photograph on **Binder 1** by indicating how acceptable you think it is based on the conditions displayed. A rating of -4 means the conditions displayed are “very unacceptable”, and a rating of +4 means the conditions displayed are “very acceptable”. *(Circle one number for each photograph.)*

	Very Unacceptable	Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither acceptable or unacceptable	Slightly Acceptable	Moderately Acceptable	Acceptable	Very Acceptable
Photo 1	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 2	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 3	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 4	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 5	-4	-3	-2	-1	0	+1	+2	+3	+4

- a. Which photograph looks most like the conditions you experienced today during this visit?

Photo number: _____

- b. Which photo (if any) displays the conditions where you believe park managers should take action to improve the area in **Binder 1**?

☐ None of the conditions in the photographs are so

Photo number: _____

OR

_____ unacceptable that park managers should take action to improve the area in Poster 1

- c. Which photograph (if any) displays the conditions that are so unacceptable that you would no longer use the area in **Binder 1**?

Photo number: _____ ☐ None of the conditions in the photographs are so unacceptable that I would no longer use the area in Binder 1

- d. Which photograph (if any) in **Binder 1** shows the highest level of use that you believe park managers should allow? In other words, at what point should visitor use be limited? (If use should not be limited at any point represented by the photographs, or not restricted at all, you may indicate that)

Photo number: _____ ☐ None of the conditions in the photographs are so unacceptable that visitor use should be limited

OR ☐ Visitor use should never be limited

6. Please rate each photograph on **Binder 2** by indicating how acceptable you think it is based on the conditions displayed. A rating of -4 means the conditions displayed are “very unacceptable”, and a rating of +4 means the conditions displayed are “very acceptable”. (*Circle one number for each photograph.*)

	Very Unacceptable	Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither acceptable or unacceptable	Slightly Acceptable	Moderately Acceptable	Acceptable	Very Acceptable
Photo 1	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 2	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 3	-4	-3	-2	-1	0	+1	+2	+3	+4
Photo 4	-4	-3	-2	-1	0	+1	+2	+3	+4

- e. Which photograph looks most like the conditions you experienced today during this visit?

Photo number: _____

- f. Which photo (if any) displays the conditions where you believe park managers should take action to improve the area in **Binder 2**?

Photo number: _____
OR ☐ None of the conditions in the photographs are so unacceptable that park managers should take action to improve the area in Binder 2

- g. Which photograph (if any) displays the conditions that are so unacceptable that you would no longer use the area in **Binder 2**?

Photo number: _____
OR ☐ None of the conditions in the photographs are so unacceptable that I would no longer use the area in Binder 2

- h. Which photograph (if any) in **Binder 2** shows the highest level of use that you believe park managers should allow? In other words, at what point should visitor use be limited? (If use should not be limited at any point represented by the photographs, or not restricted at all, you may indicate that)

Photo number: _____
OR ☐ None of the conditions in the photographs are so unacceptable that visitor use should be limited

OR ☐ Visitor use should never be limited

7. We would like to know how your opinions about encountering other people **during a one-hour period** on a trail at Buffalo National River. Using the scale below, please rate the acceptability of the number of other people encountered during a one-hour period on a trail. A rating of -4 means the number of other people encountered in one hour is “very unacceptable”, and a rating of +4 means the number of other people encountered in one hour is “very acceptable”. (*Circle one number for each photograph.*)

	Very Unacceptable	Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither acceptable or unacceptable	Slightly Acceptable	Moderately Acceptable	Acceptable	Very Acceptable
0 people in 1 hour on a trail	-4	-3	-2	-1	0	+1	+2	+3	+4
10 people in 1 hour on a trail	-4	-3	-2	-1	0	+1	+2	+3	+4
20 people in 1 hour a trail	-4	-3	-2	-1	0	+1	+2	+3	+4
30 people in 1 hour on a trail	-4	-3	-2	-1	0	+1	+2	+3	+4
40 people in 1 hour on a trail	-4	-3	-2	-1	0	+1	+2	+3	+4
50 people or more in 1 hour on a trail	-4	-3	-2	-1	0	+1	+2	+3	+4

a. Which conditions listed above is most like what you experienced today?

- ☐ 0 people in 1 hour on a trail ☐ 30 people in 1 hour on a trail
☐ 10 people in 1 hour on a trail ☐ 40 people in 1 hour on a trail
☐ 20 people in 1 hour on a trail ☐ 50 people or more in 1 hour on a trail

b. Which condition listed above do you believe would require park managers to take action to improve the trail experience at Buffalo National River

- ☐ 0 people in 1 hour on a trail ☐ 30 people in 1 hour on a trail
☐ 10 people in 1 hour on a trail ☐ 40 people in 1 hour on a trail
☐ 20 people in 1 hour on a trail ☐ 50 people or more in 1 hour on a trail

c. Which condition listed above is so unacceptable that you would no longer use the trails Buffalo National River?

- | | |
|---|---|
| ☐ 0 people in 1 hour on a trail | ☐ 30 people in 1 hour on a trail |
| ☐ 10 people in 1 hour on a trail | ☐ 40 people in 1 hour on a trail |
| ☐ 20 people in 1 hour on a trail | ☐ 50 people or more in 1 hour on a trail |

SECTION 3: ABOUT YOU

8. What is your zip code? _____

9. What year were you born? _____

10. What is your gender? (*select one*) ☐ Male ☐ Female ☐ Other

11. What is the highest level of school you have completed? (*select one*)

- | | | |
|--|---|--|
| ☐ Less than high school | ☐ Some college | ☐ Graduate or professional degree |
| ☐ Some high school | ☐ Two-year college graduate | ☐ Do not wish to answer |
| ☐ High school graduate | ☐ Four-year college graduate | |

12. What is your race? (*select all that apply*)

- | | | |
|---|---|--------------------------------------|
| ☐ American Indian or Alaska Native | ☐ Hawaiian or Pacific Islander | ☐ Other |
| ☐ Asian | ☐ Hispanic or Latino/Latina | ☐ Do not wish |
| ☐ Black or African American | ☐ White | to answer |

13. Which category best describes your total household income in U.S. dollars during 2015 before taxes? (*select one*)

- | | | |
|---|---|---|
| ☐ Less than \$24,999 | ☐ \$50,000 to \$74,999 | ☐ \$150,000 to \$199,999 |
| ☐ \$25,000 to \$34,999 | ☐ \$75,000 to \$99,999 | ☐ \$200,000 or more |
| ☐ \$35,000 to \$49,999 | ☐ \$100,000 to \$149,999 | ☐ Do not wish to answer |

Thank you for your help with this survey!

Please return it to the person who gave it to you.

If you have any question or concern, please contact:

Dr. Ryan Sharp – ryansharp@ksu.edu

Dr. Matt Brownlee – matthew.brownlee@hsc.utah.edu

PRIVACY ACT and PAPERWORK REDUCTION ACT statement:

16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary and anonymous. Your name will never be associated with your answers, and all contact information will be destroyed when the data collection is concluded. No action may be taken against you for refusing to supply the information requested. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

BURDEN ESTIMATE STATEMENT: Public reporting burden for this form is estimated to average 10 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to: