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# **The Effect of Sound and Crowding on Tourist Experiences in a National Park Setting**

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## **Abstract**

*Understanding tourist experiences in national parks can assist park managers in meeting the goal of preserving resources while providing opportunities for enjoyment of them. In an effort to contribute to this understanding, this study focused on the effect of human sound and crowding conditions in a national park setting. Previous studies of sound in national park and wildland settings have focused primarily on sounds of aircraft or other mechanically-produced sounds. For this study, a multi-sensory research approach, based on visual methods for studying crowding, was developed to investigate the acceptability of varying sound and crowding levels in a slot canyon in Zion National Park, Utah. Results indicate that both sound level and the number of people have an effect on setting acceptability, with sounds perhaps having the larger effect of the two. The multi-sensory research approach provided valuable information about the acceptability of social conditions in a specific area. Similar studies conducted in the field may provide national park managers with useful information about social conditions in other areas which will allow for better-informed management decisions related to tourist experiences in national parks.*

## **Introduction**

Several hundred million people visit national parks each year. These visitors contribute to tourism and the economy in areas surrounding parks by spending on travel, accommodations and food as well as purchasing services and retail goods. In fact, in 2004, national park visitors spent an estimated \$11.3 billion in areas around the parks. As a direct result of this spending, local tourism-related businesses employed 212,000 people who earned \$3.3 billion in personal income, and \$9.2 billion was generated in sales. The total economic impact of this spending supported 267,000 jobs and \$13.3 billion in sales, and generated \$4.8 billion in personal income (Hardner & McKenney, 2006). The large number of national park visitors clearly plays an important role in tourism and contributes significantly to the economies of areas surrounding national parks.

Of the hundreds of millions of people who visit national parks each year, the vast majority feel that an important part of their visit is to enjoy natural quiet and the sounds of nature (Mace, Bell & Loomis, 2004; National Park Service, 1995). Likewise, 72 percent of visitors indicated “Providing opportunities to experience natural peace and the sounds of nature” as an

important reason to preserve national parks (NPS, 2003). Amidst the hustle and bustle of the modern world, the opportunity to experience such natural sounds is somewhat unique to places like many of our national parks and other wildland areas.

In such wildland settings, people tend to be very sensitive to even low levels of noise<sup>1</sup> from human sources (Mace, et al., 2004). Noise in parks can be annoying or intrusive to visitors (Miller, 1999) and can detract from their enjoyment of the experience. Sources of human-caused sounds in national parks include airplanes and helicopters on commercial, military, or sight-seeing flights; cars and buses driving through parks; maintenance operations within parks; and highway, railroad or other sounds of development outside of parks, as well as hikers or other recreationists. Particularly in popular parks and heavily used areas, the large number of visitors can have a significant impact on park soundscapes. Ironically, while many people choose to visit national parks so that they can experience the natural sounds, these visitors have some impact on the soundscapes, and may alter the very thing they came to experience.

Visitors to natural areas, including national parks, often have certain expectations about what the area will be like or should be like and visit particular destinations for specific reasons (Chhetri, Arrowsmith & Jackson, 2004). When planning a trip, not only do people need to choose what kind of activities they wish to engage in and what kind of experience they want, but also what type of setting to visit (Harrison, Clark, & Stankey, 1980). It seems likely that people's expectations for a setting are somewhat responsible for, or at least influential in, their decision to visit a particular area. It follows, therefore, that visitors' experiences in an area may certainly be affected by the characteristics of the setting. With this in mind, it is clear that the setting in which people recreate or which they choose to visit is important to them. Their satisfaction with or enjoyment of the experience is related to what characteristics, such as sights and sounds, they perceive in that setting (Chhetri, et al., 2004). If these setting characteristics are not what was expected or are perceived as unpleasant or unacceptable, visitors may not enjoy their experience. Areas that are perceived as too crowded or too noisy, especially if travelers were expecting quiet and natural sounds, may certainly result in a national park visit that is not considered enjoyable.

The prevalence and distribution of human-produced sounds vary from park to park. Some parks, such as Grand Canyon, have suffered fairly severe impacts to their soundscapes because of sounds from human sources. The soundscapes in other parks may not have been so obviously or seriously impacted, but it is safe to say that no park is entirely free of human-produced sounds and still enjoys an exclusively natural soundscape. Considering the large number of travelers to national parks and the potential impact they can have on tourism and regional economies, it seems worthwhile to further investigate the importance of sounds in national park settings. In this study, sound was considered as part of the social setting in a national park.

Social settings in national parks, primarily focusing on crowding conditions and encounter numbers, have been studied fairly extensively. Crowding in recreation areas has been studied for years because it is assumed to not only have an effect on resource conditions, but also on the quality of and satisfaction with visitor experiences (Cole, 2001). It has been shown, however, that simply the number of other people in an area does not necessarily determine how wildland visitors feel about their experience or whether they feel crowded in that place. The behavior of other people in an area and whether those people are perceived as alike or different from the visitors plays a significant role (Cole, 2001; Manning & Freimund, 2004; Vaske &

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<sup>1</sup> According to NPS policy, the term "noise" refers to "undesirable human-caused sound," and must be considered in the context of what is appropriate or inappropriate in a park and whether or not it detracts "from the stated purposes for which a park was created." (NPS, 2003)

Donnelly, 2001). The sounds people make are an indicator of their behavior and how alike or different they may be from other visitors. This can completely change the feelings that visitors have about social conditions and their experience in wildland areas such as national parks.

There have been several studies of the effect of sound on people in wildland areas, but these studies have focused on mechanically-produced sounds (e.g. aircraft, traffic), not sounds created by people themselves in wildland settings (Smith & Stansfeld, 1986; Staples, Cornelius & Gibbs, 1990; Miller, 2003). To better understand the role of sound as an aspect of social conditions in national parks, methods for studying crowding were built upon to include an aural aspect. Considering all of the people who visit national parks each year, it only makes sense to strive for an understanding of how all of the various sounds in the parks, in addition to crowding conditions, affect visitors' experiences, and to try to preserve the type of soundscape they desire (and perhaps expect) when they travel to the wildland settings of national parks.

## **Research Methods**

In this study, visual methods for studying crowding conditions were the basis for a multi-sensory approach to studying social conditions (crowding and human sound) in a national park. Visual methods for studying crowding typically employ the use of pictures depicting different numbers of people in an area. Because things such as visitor behavior, group size and type of recreation activity can have an effect on perceived crowding, Manning and Freimund (2004) contend that visual research methods are a better way to study crowding than simply using narrative descriptions of crowding because setting characteristics can be consistently presented visually to study participants. Behavior, in particular, is something which is not easily conveyed through narrative descriptions and can be presented, to some extent, through visual representations of recreation settings. By adding an auditory element to visual research methods for studying crowding, certain aspects of visitor encounters can be conveyed even more realistically, the behavior of visitors in particular.

The use of a multi-sensory approach has, in part, been well-grounded in crowding research literature, and the benefits of a visual research approach have been documented in studies of subjects such as recreation crowding, scenic beauty, and campsite impacts. Adding sound to this approach is a new method, but the success of previous visual research methods is encouraging.

For this study, images depicting varying numbers of people in a slot canyon in Zion National Park were paired with sounds recorded in the area. The settings presented to study participants were composed of different levels of crowding (zero, four, or sixteen people at one time) combined with different levels of sound (natural sound and low- or high-level human sounds). The resulting 16 settings were made up of the following combinations of sound level and number of people: natural sound with zero, four and 16 people; low levels of human sound with zero, four and 16 people; high levels of human sound with four and 16 people. The settings were presented in random order to study participants in the form of a PowerPoint presentation with images projected on a screen and sounds played over speakers in a darkened room. The decibel level of the sounds played over the speakers was calibrated to reflect actual decibel levels recorded in the slot canyon. Natural sounds ranged from 40 to 50 decibels, while low- and high-level human sounds ranged from 50 to 60 decibels and 60 to 70 decibels, respectively.

This study was conducted in a laboratory setting because it allows for controlled study conditions. A controlled study assured that each study participant was exposed to the same set of sounds, leading to greater consistency in the study. Additionally, previous research (Aasvang and

Engdahl, 2004; Boster and Daniel, 1972; Brown and Daniel, 1986; Daniel and Boster, 1976) has shown that results from studies conducted in laboratory settings are similar to results from field studies.

The settings were evaluated by participants on an acceptability scale ranging from -4 (very unacceptable) to +4 (very acceptable), which was recoded as 1 to 9 for analysis. The use of an acceptability scale was based on the literature indicating that it is a mid-range scale, neither too liberal nor too conservative (Manning, Valliere, Wang & Jacobi, 1999). Acceptability scales have been used frequently in studies of crowding in recreation settings and studies of visitor experiences. Because images and sounds are perceived separately (Carles, Barrio & de Lucio, 1999), participants were asked to provide an acceptability rating for both the sound level and crowding level of each setting independently. This approach allowed sound level and number of people present in the settings to be assessed independently in later analysis. To allow for analysis of overall setting acceptability, the two separate ratings were added together, resulting in a -8 to +8 scale.

Participants in this study were 197 undergraduate students. Students were chosen as subjects because they are an easily accessible population, and research indicates that they are a diverse population who represent society well (Arthur, 1977; Brown & Daniel, 1986; Buyhoff & Leuschner, 1978; Buyhoff, Wellman & Daniel, 1982; Schroeder & Daniel, 1981). The student participants in this study were 48 percent male and 52 percent female and represented 37 different major courses of study.

## Findings

After setting response data were collected, several analyses were run to determine the significance of sound level and crowding level to the acceptability of settings. A regression on the acceptability of the number of people, with acceptability of people as the dependent variable and number of people as the independent variable, resulted in an  $R^2$  of 0.38 with a significance of 0.00. This indicates that the number of people in a setting explains 38 percent of the variance in acceptability of people, and a slope of -2.75 indicates that for each increase in the number of people there is an expected decrease of 2.75 in acceptability of the number of people.

A regression with sound acceptability as the dependent variable and sound level as the independent variable resulted in an  $R^2$  of 0.63 with a significance of 0.00. This indicates that 63 percent of the variance in sound acceptability ratings is explained by the level of sound. The slope for sound level was -3.07, indicating that for each increase in sound level there is an expected decrease of 3.07 in sound acceptability ratings. The results of the regressions indicate that both number of people and sound level do indeed have an effect on their respective acceptability ratings.

In order to observe the effects of sound level and number of people together, the acceptability ratings for sound and people were added together to provide an overall setting acceptability. The combined acceptability ratings for the settings ranged from -8 to +8. A regression on setting acceptability with both sound level and number of people as independent variables resulted in an  $R^2$  of 0.55 ( $p = 0.00$ ) and the following regression equation:

$$\text{Setting acceptability} = 13.52 - 3.61(\text{sound level}) - 2.60(\# \text{ of people}) + \text{error}$$

A general linear model also provided useful information by allowing for independent observation of the effect of the number of people and the level of sound on the acceptability of

the settings. In the table below, the settings are organized by increasing sound level first and within sound level by increasing numbers of people.

Setting number	Sound Level	# of People	Mean Setting Acceptability
Setting 4	Natural	0	7.29
Setting 7	Natural	4	4.36
Setting 1	Natural	4	5.42
Setting 11	Natural	4	5.54
Setting 10	Natural	16	1.33
Setting 5	Natural	16	2.29
Setting 12	Natural	16	2.57
Setting 14	Low	4	0.13
Setting 13	Low	4	0.50
Setting 6	Low	4	1.70
Setting 3	Low	16	-0.90
Setting 8	Low	16	-1.42
Setting 16	Low	16	-2.75
Setting 9	High	16	-4.40
Setting 2	High	16	-4.43
Setting 15	High	16	-5.50

It is clear that the number of people in the settings influenced setting acceptability ratings. For example, settings with natural sound and four people had higher setting acceptability ratings than settings with natural sound and 16 people. Also, when comparing settings with the same number of people but different sound levels, settings with natural sounds had higher setting acceptability ratings than settings with low levels of human sound, which, in turn, had higher acceptability ratings than settings with high levels of human sound. Sound level clearly made a difference in setting acceptability ratings.

In general, the settings with natural sound were perceived as the most acceptable, even if there were 16 people. The settings with 16 people were perceived as the least acceptable except when paired with natural sound. There is a measurable difference in both sound acceptability and setting acceptability based on sound level. Setting acceptability is improved by at least 1.65 for settings with 16 people when the level of human sound decreases from high to low. Likewise, for settings with four people, acceptability of the settings increases by at least 2.66 if the sound level decreases from low levels of human sound to natural sound.

To further understand how the level of sound in a setting affects the perceived acceptability of the number of people in the setting, ANOVAs (analysis of variance) were performed with the acceptability of the number of people as the dependent variable and sound level as the independent variable. Because the settings did not include combinations of high levels of human sound with zero or four people or low levels of human sound with zero people, two separate sets of analyses were run. The first set included settings with four people and the second set included settings with 16 people. By holding the number of people constant, it was possible to isolate and observe the effect of sound in the settings on the acceptability of the number of people.

The table below presents the mean acceptability ratings for the number of people at each sound level with the number of people held constant. It is clear by comparison of acceptability means between the settings with four and 16 people that the number of people in the settings has an effect on the acceptability of people. It is also clear, however, that the level of sound has a significant effect on mean acceptability ratings of people. Looking only at settings with four people, there is a difference of almost 1.0 between settings with natural sound and settings with low levels of human sound. This is a significant difference in means ( $p = 0.00$ ) according to an independent samples t-test, used to compare two means. The difference between the means at each sound level in settings with 16 people is also significant ( $p = 0.00$ ), according to a Bonferroni post hoc test, which is used to compare multiple means.

	Mean acceptability of 4 people	Mean acceptability of 16 people
Natural	6.97	3.93
Low human	5.98	3.51
High human		2.96

Based on these analyses, sound level does affect the acceptability ratings of the number of people in a setting. By holding the number of people in the settings constant, it is possible to observe the significant difference in the mean acceptability rating of people at each sound level.

These analyses indicated that sound level does indeed have an effect on the perceived acceptability of social conditions presented in the settings. In this case, natural sounds appeared to improve the acceptability of settings with high numbers of people in them. This may indicate that even in fairly crowded national park settings, the acceptability of those settings may improve for visitors if the sounds in the area consist of the sounds of nature, rather than the sounds of the visitors themselves. Furthermore, the development and use of a multi-sensory research approach provided useful information in this study. There was a definite interaction between the number of people and level of sound and the subsequent acceptability ratings for each.

### **Application of Results**

The results of this study highlight the importance of human sound to visitors in a national park setting. Previously, studies of soundscapes in these areas focused primarily on the sounds of aircraft and how those sounds affected visitors. While such research can be extremely useful to managers in some ways, it cannot help them to manage other aspects of the soundscape that influence visitor experiences. Knowing the importance of human sound can assist managers of national parks and other wildland areas in making decisions which may affect visitors traveling to the parks. Many of the hundreds of millions of visitors to national parks each year feel that natural quiet and sounds of nature are an important part of their visit and are also an important reason to preserve national parks. Management policies that can help to protect those types of sounds can preserve the value of the experience of a national park visit for those people.

Levels of human sound can be managed to some extent, unlike sounds such as those from aircraft or nearby highways or railways. Managers can communicate the importance of natural quiet and the sounds of nature to visitors through education and interpretation materials. For example, the importance of sound can be stressed as part of the education provided to visitors applying for permits to use wildland recreation areas. Similar to the way Leave No Trace

promotes safe, low impact recreation, being mindful of the sound one creates and how those sounds can affect other visitors can be mentioned as well.

This research indicates that the sounds of other people that visitors hear are an important part of how wildland recreation areas are assessed. If visitors have a complaint about their experiences, the sounds of their experiences should be considered as something that may have had an effect. Even in fairly heavily used areas, the number of people they encountered may not be the problem so much as the sound created by the other visitors.

Another implication for managers results from the conclusion that the possibility of measuring sound acceptability in a laboratory setting is promising. Further research may clarify whether sound acceptability is also measurable in the field. This may be important in the development of specific standards of quality for levels of human sound in wildland recreation areas, an important tool in monitoring and managing visitor experiences.

This study is experimental in nature, and therefore does not only offer information, but raises questions as well. However, it is hoped that this study will prompt further research which will begin to provide information that is applicable to a wider variety of real world settings, perhaps resulting in better management through more informed decisions and planning.

## **Conclusions**

National parks contribute to the tourism industry by providing destinations for visitors who spend money on travel, lodging, food, souvenirs and other goods and services. Hundreds of millions of tourists visit national parks each year, enough visitors to have a positive economic impact on regional economies. Understanding what type of experience visitors desire allows for more successful management of parks and their resources. Likewise, providing them with the type of experience they expect and enjoy is a good way to ensure that tourists will continue to visit national parks, therefore contributing to regional economies.

The results of this study indicate that, in a laboratory setting, people find the sounds of nature more acceptable than human sounds. Likewise, higher numbers of people are more acceptable to the study participants when paired with natural sounds, rather than the sounds of people. This study shows that the level of human sound is an important characteristic of visitors' experiences in national parks. In this case, the natural soundscape of Zion National Park appears to be an important component of a national park experience. These findings support the importance of the management goal of protecting park resources, in this case the natural soundscape. National parks are mandated to protect natural resources while at the same time providing opportunities for high-quality visitor experiences. By having a better understanding of what tourists expect from national park visits and what is important to them, park managers can fulfill their obligation to provide opportunities for enjoyment of the natural resources in a way that preserves them as well.

Using methods similar to those employed in this study, it may be possible to develop specific standards of quality for levels of human sound within parks. This can lead to more informed management practices in national parks, potentially resulting in more satisfied visitors. Likewise, a multi-sensory approach to studying crowding may provide more realistic standards of quality for crowding than simply a visual approach alone. More research similar to this study will further the understanding of tourist experiences in national park settings, making it possible to better manage national parks for both the preservation and enjoyment of the resources.



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